Responses to Comments on the
Draft Subsequent Environmental Impact Report

EVENT CENTER AND MIXED-USE DEVELOPMENT AT MISSION BAY BLOCKS 29-32

Office of Community Investment and Infrastructure Case No. ER 2014-919-97
San Francisco Planning Department Case No. 2014.1441E
State Clearinghouse No. 2014112045

Draft SEIR Publication Date: June 5, 2015
Draft SEIR Public Hearing Date: June 30, 2015
Draft SEIR Public Comment Period: June 5, 2015 – July 27, 2015
Responses to Comments Publication Date: October 23, 2015
Final SEIR Certification Date: November 3, 2015

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Volume 6

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Responses to Comments

APPENDIX COM
Written Comments on Draft SEIR, Coded

This appendix contains copies of all written comments received on the Draft SEIR, including comments submitted either by letter, fax, or email. Transcripts of oral comments presented at the public hearing on the Draft SEIR are included in a separate appendix, Appendix PH.

Written comments are grouped under one of three categories: public agencies, non-governmental organization, or individuals. Tables summarizing all of the commenters in each of these three categories are presented in Chapter 11 of the Comments and Responses document and are repeated in this appendix at the beginning of each of the three groups of comments. Within each category, commenters are organized in alphabetical order by code.

To facilitate the commenter in locating the responses to his or her comments, the SEIR assigns a unique comment code plus one or more topic code to each individual comment, as explained below. Both the comment and topic codes are shown in the margin of each written comment, with the unique comment code shown first and the topic code(s) in square brackets beneath the commenter code. This information shown in the margins of each written comment serves as the cross-reference guide for the comment and topic codes.

Comment Codes

This document assigns a code to each comment letter, email, comment card, and public hearing transcript based on the name of the agency, organization, or individual submitting the comment. Comments submitted by mail, email, facsimile, comment card, or orally at the public hearing (as transcribed in the official public hearing transcript) are all coded and numbered the same way. Each commenter code has three parts. It begins with a prefix indicating whether the commenter represents a public agency (A), a non-governmental organization (O), an individual (I), or a speaker at the public hearing (PH). This is followed by a hyphen and the acronym of the agency or organization, or the individual's last name. The third part of the comment code is the sequential numbering of individual comments within a letter or email that represents a distinct topic. The first two parts of the comment codes is shown in bold at the top of each page of every written comment, and the third part is shown in the margin alongside the individual bracketed comment. Only substantive comments received on the Draft SEIR are bracketed; for example, comments that describe an agency's or organization's mission or that describe an individual's biographical background are not bracketed.

As an example of the comment coding system, the comment letter from the California Department of Transportation is coded A-Caltrans, and the first comment in the letter is coded A-Caltrans-1, the second comment on a different topic is coded A-Caltrans-2, etc. If a single agency, organization, or individual submitted comments more than once (e.g., a person spoke at the public hearing in addition to submitting written comments), a number is inserted at the end of the identifying initials. For example, an individual (John deCastro) submitted comments both at the public hearing and in a letter; the written comment set is coded as I-deCastro1, and the public hearing transcript is coded PH-deCastro2. The subsequent sequential numbers denote the individual comments from that commenter (e.g., I-deCastro1-1, I-deCastro1-2, I-deCastro1-3, etc.).

Topic Codes

The prefixes for the topic codes used in the organization of Chapter 13, Responses to Comments, are shown below:

General Comments (GEN)
Environmental Review Process (ERP)
AB 900 Process (AB)
Project Description (PD)
Plans and Policies (PP)
Impact Overview (IO)
Land Use (LU)
Cultural Resources (CULT)
Transportation and Circulation (TR)
Noise and Vibration (NOI)
Air Quality (AQ)
Greenhouse Gases Emissions (GHG)
Wind and Shadow (WS)
Recreation (RE)
Utilities (UTIL)
Public Services (PS)
Biological Resources (BIO)
Geology and Soils (GEO)
Hydrology and Water Quality (HYD)
Hazards and Hazardous Materials (HAZ)
Energy and Mineral Resources (EN)
Alternatives (ALT)

Within each topic area, similar comments are grouped together, and Chapter 13 provides a comprehensive response to those related comments under one topic code. Topic codes are numbered sequentially using the topic code prefix and sequential numbering for each subtopic. For example, General Comments [GEN] are listed as [GEN-1], [GEN-2], [GEN-3], and so on. Under each topic code in each section of Chapter 13, all of the comment codes that are addressed under each topic code as a cross-reference. As described above, topic codes are shown in this appendix in the margin of each written comment in square brackets underneath the comment code.

Supplemental Materials Submitted During Review Period

Several comment letters included attachments that did not address the adequacy or accuracy of the SEIR, such as background reports, reference lists, or resumes. These supplemental materials are not coded as comments and are not included in Appendix COM, but they are listed in the table below. The complete comment letters with all attachments are included in Appendix COM2.

TABLE COM-1
SUPPLEMENTAL MATERIALS SUBMITTED ON THE DRAFT SEIR

Commenter Code	Exhibit or Attachment	Description of Supplemental Materials
O-MBA7S2	Exhibit A	Resume of Patrick S. Sullivan, CPP, REPA; Resume of John Henkelman
O-MBA7S2	Exhibit B	Resume of Martin B. Cline, CEG- Project Geologist; Resume of Kurt Balasek, PG, CHG, QSD- Senior Hydrogeologist
O-MBA7S2	Exhibit C	Partial References of Geotechnical Review from Lawrence B. Karp, Consulting and Geotechnical Engineer
O-MBA7S2	Exhibit D	Tsunami Inundation Map; Resume of Martin B. Cline, CEG- Project Geologist; Resume of Kurt Balasek, PG, CHG, QSD-Senior Hydrogeologist
O-MBA7S2	Exhibit E	Resume of Philip G. King, Ph.D.
O-MBA8L2	End of letter	List of Exhibits
O-MBA8L2	Exhibit 1	Statement of Qualifications for Autumn Wind Associates
O-MBA8L2	Exhibit 2	Scenarios detailing waste material transportation; Resume of Paul Roseneld, Ph.D.; Resume of Jessie Marie Jaeger
O-MBA8L2	Exhibit 3	Starfield, L.E., "The 1990 National Contingency Plan: More Detail and More Structure, But Still a Balancing Act"; Environmental Law Reporter, June 1990
O-MBA8L2	Exhibit 4	Excerpts from EIR for the 5M Project, October 15, 2014, pp. 425-426.
O-MBA8L2	Exhibit 5	Excerpts from EIR for the SF Museum Of Modern Art Project, July 11, 2011, pp. 367-368.
O-MBA8L2	Exhibit 6	Excerpts from EIR for the 706 Mission Project, June 27, 2012, pp. IV.G.20.
O-MBA8L2	Exhibit 7	Excerpts from EIR for the 8 Washington Street/Seawall Lot 351 Project, June 15, 2011, pp. IV.E.15-IV.E.18.
O-MBA8L2	Exhibit 8	Excerpts from EIR for the 801 Brannan St 1 Henry Adams St Project, June 22, 2011, pp.262-266, 270-272.
O-MBA8L2	Exhibit 9	Excerpts from EIR for the Transit Center District Plan and Transit Tower Project, September 28, 2011, pp. 381-382, 387-388, 413-414, 419-420.
O-MBA8L2	Exhibit 10	Excerpts from EIR for the 34th America's Cup and James R. Herman Cruise Terminal and Northeast Wharf Plaza Project, July 11, 2011, pp. 5.8-15 - 5.8-20, 5.8-26 - 5.8-27, 5.8-32 - 5.8-33.
O-MBA8L2	Exhibit 11	Excerpts from EIR for the Western SoMa Community Plan, Rezoning of Adjacent Parcels and 350 Eighth Street Project, June 20, 2012, pp. 4.G.18 - 4.G.21, 4.G.53 - 4.G.54, 4.G.58 - 4.G.59.
O-MBA8L2	Exhibit 12	Excerpts from DEIR for the 200-214 6th Street Affordable Housing with Ground-Floor Retail Project, February 27, 2013, pp. 69 - 72, 76 - 78.
O-MBA8L2	Exhibit 13	Excerpts from Preliminary Mitigated Negative Declaration for the 345 Brannan Street Project, March 20, 2013, pp.63 - 66, 69 - 72.

TABLE COM-1 (Continued)
SUPPLEMENTAL MATERIALS SUBMITTED ON THE DRAFT SEIR

Commenter Code	Exhibit or Attachment	Description of Supplemental Materials
O-MBA8L2	Exhibit 14	Excerpts from Preliminary Mitigated Negative Declaration for the 101 Polk Street Residential Project, March 27, 2013, pp. 63 - 64, 68 - 69, 74.
O-MBA8L2	Exhibit 15	Excerpts from Mitigated Negative Declaration for 850 Bryan St - Hall of Justice Project, May 13, 2015, pp. 113-114.
O-MBA8L2	Exhibit 16	Excerpts from EIR for the Academy of Art Project, February 15, 2015, pp. 4.8.26-27.
O-MBA8L2	Exhibit 17	March 17, 2015, Sacramento Bee newspaper, Business & Real Estate section, article New 'green diesel' rolls out for Sacramento motorists.
O-MBA8L2	Exhibit 18	California Emissions Estimator Model, CALEEMOD.COM.
O-MBA8L2	Exhibit 19	San Francisco Ordinance No. 27-06.
O-MBA8L2	Exhibit 20	San Francisco Ordinance No. 27-06, List of Registered Transporters and Registered Facilities.
O-MBA8L2	Exhibit 21	March 4, 2015, San Francisco Planning Department Notice of Availability of and Intent to Adopt a Negative Declaration; Agreement for Disposal of San Francisco Municipal Solid Waste at Recology Hay Road Landfill in Solano County.
O-MBA8L2	Exhibit 22	California Environmental Protection Agency, Air Resources Board, EMFAC2011 Web Database.
O-MBA8L2	Exhibit 23	April 4, 2014, United States Environmental Protection Agency, Climate Leadership; Emission Factors for Greenhouse Gas Inventories.
O-MBA8L2	Exhibit 25	August 2012, United States Environmental Protection Agency, Office of Transportation and Air Quality; Frequently Asked Questions from Owners and Operators of Nonroad Engines, Vehicles, and Equipment Certified to EPA Standards.
O-MBA8L2	Exhibit 26	August 2012, Northeast Diesel Collaborative, Best Practices for Clean Diesel Construction.
O-MBA8L2	Exhibit 27	Northeast Diesel Collaborative, Construction, NEDC Clean Construction Workgroup.
O-MBA8L2	Exhibit 28	Construction Industry Air Quality Coalition (CIAQC), White Paper: An Industry Perspective on the California Air Resources Board Proposed Off Road Diesel Regulations.
O-MBA8L2	Exhibit 29	Milton CAT, Tier 4 – How it will affect your equipment, your business and your environment.
O-MBA8L2	Exhibit 30	September 20, 2013, United States Environmental Protection Agency, Federal Register Volume 78, Number 183.

NOTE: Page 21 of Comment Letter O-MBA8L2 makes reference to an Exhibit 24 (Dieselnet.com Emission Standards, Nonroad Diesel Emissions); however, no Exhibit 24 was included.

TABLE COM-1 (Continued)
SUPPLEMENTAL MATERIALS SUBMITTED ON THE DRAFT SEIR

Commenter Code	Exhibit or Attachment	Description of Supplemental Materials
O-MBA9L3	FHA Attachment 1	Email exchange with Luke Molinar
O-MBA9L3	FHA Attachment 2	Photograph- Mission Bay Housing & Hearst Tower
O-MBA9L3	FHA Attachment 3	Photograph-Hearst Tower
O-MBA9L3	Attachment (no number)	Curriculum Vitae of Frank Hubach
O-MBA10L4	Exhibit 1	Resume of Daniel T. Smith Jr.
O-MBA10L4	Exhibit 2	Larry Wymer & Associates Traffic Engineering Qualifications; Curriculum Vitae of Larry C. Wymer
O-MBA10L4	Exhibit 3	Email Correspondence
O-MBA10L4	Exhibit 4	San Francisco Transportation Plan 2040 Final Report December 2013
O-MBA10L4	Exhibit 5	San Francisco Transportation Plan 2040 Appendix B: Transportation Needs
O-MBA10L4	Exhibit 6	San Francisco Transportation Plan 2040 Appendix C: Core Circulation Study
O-MBA10L4	Exhibit 7	San Francisco Transportation Plan 2040 Appendix K: SF Travel at a Glance
O-MBA10L4	Exhibit 8	San Francisco Transportation Plan Update, SPUR Annie Alley Forum
O-MBA11L5	Exhibit 1	Resume of Matthew F. Hagemann, P.G. C.Hg., QSD, QSP
O-MBA11L5	Exhibit 2	Aerial Photograph of Project Site; Project Area Soil Map; National Wetland Inventory Map; Observed Wetland Features Map; Resume of Erik Ringelberg, Ecological Services Group Manager; Resume of Kurt Balasek, PG, CHG, QSD- Senior Hydrogeologist
O-MBA11L5	Exhibit 3	San Francisco Bay Regional Water Quality Control Board September 2013 report; San Francisco Bay PCBs TMDL - Implementation at Cleanup Sites
O-MBA11L5	Exhibit 4	San Francisco Stormwater Design Guidelines, prepared by City of San Francisco, San Francisco Public Utilities Commission and Port of San Francisco, November 2009
O-MBA11L5	Exhibit 5	US EPA Polychlorinated Biphenyls (PCBs) - PCBs in Caulk in Older Buildings, February 21, 2014
O-MBA11L5	Exhibit 6	San Francisco Estuary Partnership, Taking Action for Clean Water, PCBs in Caulk Project, July 22, 2015
O-MBA11L5	Exhibit 7	US EPA Mid-Atlantic Toxic Substances - Polychlorinated Biphenyls (PCBs), PCB Transformers, April 28, 2015
O-MBA11L5	Exhibit 8	US EPA Polychlorinated Biphenyls (PCBs) - Contractors: Handling PCBs in Caulk During Renovation, February 21, 2014
O-MBA11L5	Exhibit 9	California Native Plant Society - CNPS Botanical Survey Guidelines, December 9, 1983, Revised June 2, 2001

TABLE COM-1 (Continued)
SUPPLEMENTAL MATERIALS SUBMITTED ON THE DRAFT SEIR

Commenter Code	Exhibit or Attachment	Description of Supplemental Materials
O-MBA11L5	Exhibit 10	General Rare Plant Survey Guidelines by Ellen A. Cypher, California State University, Stanislaus, Endangered Species Recovery Program, July 2002
O-MBA11L5	Exhibit 11	State of California, California Natural Resources Agency, Department of Fish and Game - Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities, November 24, 2009
O-MBA11L5	Exhibit 12	State of California, Department of Fish and Game - Forest and Woodlands Alliances and Stands, September 2010
O-MBA11L5	Exhibit 13	US EPA Toxic and Priority Pollutants, May 2, 2014
O-MBA12S3	Letter and attachment	Summary of qualifications and expertise of Lawrence B. Karp to supplement comment letter O-MBA7S2

TABLE COM-2
PUBLIC AGENCIES COMMENTING ON THE DRAFT EIR

Commenter Code	Name of Person and Agency Submitting Comments	Comment Format	Comment Date
State			
A-Caltrans	Patricia Maurice, District Branch Chief, Local Development-Intergovernmental Review, State of California Department of Transportation	Letter	07/20/2015
A-CHP	C. Sherry, Captain, Commander San Francisco Area, California Highway Patrol	Letter	08/03/2015 *
A-SC1	Scott Morgan, Director, State of California Governor's Office of Planning and Research, State Clearinghouse and Planning Unit	Letter	07/20/2015
A-SC2	Scott Morgan, Director, State of California Governor's Office of Planning and Research, State Clearinghouse and Planning Unit	Letter	08/06/2015 *
A-UCSF	Lori Yamauchi, Associate Vice-Chancellor, Campus Planning, University of California San Francisco	Letter	07/27/2015
Regional/Local			
A-BAAQMD	Jean Roggencamp, Deputy Air Pollution Control Officer, Bay Area Air Quality Management District	Letter	07/20/2015
A-BART	Val Menotti, Chief Planning and Development Officer, BART Planning, Development and Construction, San Francisco Bay Area Rapid Transit District	Letter	07/27/2015
A-Caltrain	Marian Lee, Executive Officer, Caltrain Modernization Program, Peninsula Corridor Joint Powers Board	Letter	07/27/2015
A-SMCTD	Sebastian Petty, Senior Planner, CalMod Program Office, San Mateo County Transit District	Email	07/15/2015

* NOTE: Comment letters with a date annotated with an asterisk were received after the close of the Draft SEIR public review period.

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A-CALTRANS

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 4
P.O. BOX 23660
OAKLAND, CA 94623-0660
PHONE (510) 286-5528
FAX (510) 286-5559
TTY 711
www.dot.ca.gov

Serious Drought. Help save water!

July 20, 2015

SF280144
SF-280-R 6.6
SCH# 2014112045

Mr. Brett Bollinger
Planning Department
City and County of San Francisco
1650 Mission Street, Suite 400
San Francisco, CA 94103

Event Center & Mixed-Use Development at Mission Bay Blocks 29-32 – Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the project referenced above. The proposed project, located on an approximate 11-acre site, would construct a multi-purpose event center and a variety of mixed uses including office, retail, open space, and parking within the Mission Bay South Redevelopment Plan Area of San Francisco. The project site is approximately one half mile from the Interstate 280 (I-280) ramps at Mariposa Street, 18th Street, and Pennsylvania Avenue. Our comments seek to promote the State's smart mobility goals that support a vibrant economy and build active communities rather than sprawl. We have reviewed the Draft Subsequent Environmental Impact Report (SEIR) and have the following comments to offer.

Forecasting

Please clarify why there is only minor difference in volumes at Study Intersections 9, 10, 11, 12, and 13 between Cumulative Project-No Event and Cumulative Project-With Basketball Game Conditions, as shown in Figures 13a and 15a (SEIR, Appendix TR, pgs. TR-156, TR-152). Additionally, Study Intersection 12 shows greater southbound and eastbound volumes in Figure 13a than 15a. The volumes of inbound vehicle trips during the weekday 4-6 and 6-8 peak hour periods are estimated 379 & 2,489 respectively and 2,797 outbound vehicle trips during the 9-11 PM peak period (pg. TR-37). This would appear to show significant Cumulative volumes. Please clarify or revise the report. 1 [TR-2d] The report should identify traffic turning movements per study intersection under Basketball Game Only, Convention Only Conditions separately. 2 [TR-2a]

Parking

- Given the Project is located on AT&T Parking Lots B & E, please clarify if Mitigation Measure M-TR-11c, which provides additional off-site parking from the Project Plus 3 [TR-13]

A-CALTRANS

Overlapping Giants Evening Game Scenario, should be revised from 1,000 to 1,600 spaces to account for AT&T Park's displaced 600 parking spaces. Table 1-1, which presents the Summary of Proposed Project Facilities, shows the arena will have seating capacity of maximum 18,500 patrons. Approximately 950 vehicle parking spaces are proposed from the combined Blocks 29-32 and the existing off-site 450 South Street Parking Garage (SEIR, Vol. 1, pg. 1-7). Mitigation Measure M-TR-11c states the City shall identify one or more off-site parking lots to provide approximately 250 additional parking spaces for all events and up to approximately 750 additional parking spaces for use during dual events of 12,500 or more event center attendees, for a total of 1,000 additional offsite parking spaces (pg. 1-23). The AT&T Park Post-Game Event Traffic Plan, courtesy of the Mission Bay Transportation Management Agency, is available at the following webpage and identifies AT&T Parking Lots B & E: http://sanfrancisco.giants.mlb.com/sf/downloads/y2015/postgame_map.pdf. 3 [TR-13] cont.

- Please elaborate how the AT&T Park Post-Game Event Traffic Plan is incorporated within the Project's Transportation and Circulation analysis regarding parking impacts on the surrounding neighborhood and roadways. According to the Post-Game Event Traffic Plan and noted in the report, some streets near AT&T Park and its parking lots are closed beginning in the 7th inning to approximately one hour post-event. Given the Project's additional number of vehicles seeking parking, potential safety issues for all road users should be identified and fully mitigated. 4 [TR-2a] Project-related queuing impacts on nearby State facilities should be analyzed. 5 [TR-2b] The AT&T Park Post-Game Event Traffic Plan is available at the webpage above. 6 [TR-2a]

- Please quantify how many additional Parking Control Officers (PCOs) will be utilized when there are overlapping events. Mitigation Measure M-TR-11a, under Conditions With a SF Giants Evening Game at AT&T Park, states the Project's Transportation Management Plan shall be expanded to include additional PCOs that shall be deployed at some specific intersections (pg. 1-22). Mitigation Measure M-TR-2a, under Conditions Without a SF Giants Game at AT&T Park, states "four additional PCOs shall be deployed to intersection where the proposed project would result in significant impacts, as conditions warrant during events (pg. 1-15). 7 [TR-3b]

Interstate 280 Mitigation

Please explain the possible interventions on the I-280 Mariposa Street on-ramp, listed under Contraflow Lane Mitigation in Table 2-1 (pg. 2-17). 8 [TR-12a]

Transportation Management Plan

We commend the City's Transportation Management Plan (TMP) to encourage sustainable mode shares and reduce single vehicle occupancy trips. The Project's participation in the Waterfront Transportation Assessment reflects comprehensive early planning efforts and on-going coordination between agencies to assess the mobility needs of travelers and provide 9 [TR-3a]

"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"

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Mr. Brett Bollinger, City and County of San Francisco
July 20, 2015
Page 3

additional services within the Mission Bay Area. We agree the TMP should include documentation for monitoring vehicle trip reduction, including annual reports to demonstrate the ongoing reduction of vehicle trips while continuing to survey the travel patterns of residents and employees within the project area. We recommend the TMP elaborate future coordination between nearby proposed large-scale development projects and their associated Transportation Management Agencies and various Transportation Demand Management measures to ensure the TMP is thoughtfully planned. 9 [TR-3a] cont.

Transportation Impact Fees

Please identify any transportation impact fees to be used for project mitigation. Consider including information from the City's local and any relevant regional impact fee program and identify if those programs include improvements to alternative modes. Caltrans encourages the City to ensure sufficient allocation of contributions toward regional transit improvements in order to better mitigate and plan for the impact of future cumulative growth on the regional transportation system. We support projects and measures to reduce vehicle miles traveled and to increase sustainable mode shares. 10 [TR-3c]

Mitigation Responsibility

As the lead agency, the City and County of San Francisco is responsible for identifying and ensuring the coordinated implementation of all project mitigations. The project's fair share contribution, financing, scheduling, implementation responsibilities associated with planned improvements on Caltrans ROW should be listed, in addition to identifying viable funding sources per General Plan Guidelines. 11 [TR-12a]

Should you have any questions regarding this letter or require additional information, please contact Sherie George at (510) 286-5535 or by email at: sherie.george@dot.ca.gov.

Sincerely,

PATRICIA MAURICE
District Branch Chief
Local Development - Intergovernmental Review

c: State Clearinghouse

"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"

A-CHP

State of California—Transportation Agency EDMUND G. BROWN Jr., Governor

DEPARTMENT OF CALIFORNIA HIGHWAY PATROL
San Francisco Area
455 Eighth Street
San Francisco, CA 94103
415-557-1094
(800) 735-2929 (TT/TDD)
(800) 735-2922 (Voice)

LATE
7-20-15
E

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STATE C_EARING HOUSE

August 3, 2015

File No.: 335.14995.12893

State Clearinghouse
1400 Tenth Street, Room 121
Sacramento, CA 95814

Thank you for the opportunity to review the "Notice of Completion" environmental document from the State Clearinghouse regarding the Golden State Warriors multi-purpose event center project, State Clearinghouse #2014112045. The California Highway Patrol is the primary agency that provides traffic law enforcement, safety and traffic management on Interstate 80, Interstate 280 and US 101 within the city limits of San Francisco, California. The San Francisco Area is responsible for these functions and will be affected by the implications of this project. To that end, we offer the following comment: 1 [TR-4]

Our concerns relate to the final design of the proposed 18,064 seat multi-purpose event center with regard to the potential increase in traffic congestion, changes in traffic congestion patterns and the additional enforcement demands on freeways and transition ramps at and near the proposed event center. A year-round event center of this magnitude could potentially affect emergency response times for Area personnel during peak commute times which may have a negative impact on departmental services. 2 [TR-2] Furthermore, in addition to a potential increase in overall traffic congestion, Area resources may also be negatively affected with a potential increase in the number protective service details associated with this event center. 3 [PS-1] Our recommendation would be to further analyze traffic patterns and schedule events appropriately with other event centers and/or city organizers in order to reduce traffic congestion to the greatest extent possible. 4 [TR-4]

If you have any questions, or wish to discuss this matter further, please contact Lieutenant R. Rios at (415) 557-1094.

Sincerely,

C. SHERRY, Captain
Commander
San Francisco Area

cc: Valley Division
Special Projects Section

Safety, Service, and Security *An Internationally Accredited Agency*

A-SC1

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

July 21, 2015

Brett Bollinger
City and County of San Francisco
Office of Community Investment & Infrastructure
1650 Mission Street, Ste. 400
San Francisco, CA 94103

Subject: Event Center and Mixed-Use Development at Mission Bay Blocks 29-32
SCH#: 2014112045

Dear Brett Bollinger:

The State Clearinghouse submitted the above named Supplemental EIR to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on July 20, 2015, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process. 1 [ERP-1]

Sincerely,

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

1400 10th Street P.O. Box 3044 Sacramento, California 95812-3044
(916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

A-SC1

Document Details Report
State Clearinghouse Data Base

SCH#	2014112045
Project Title	Event Center and Mixed-Use Development at Mission Bay Blocks 29-32
Lead Agency	San Francisco, City and County of
Type	SIR Supplemental EIR
Description	GSW Arena LLC (GSW), an affiliate of Golden State Warriors, LLC, which owns and operates the Golden State Warriors National Basketball Association (NBA) team, proposes to construct a multi-purpose event center and a variety of mixed uses, including office, retail, open space and structured parking on an ~11 acre site (Blocks 29-32) within the Mission Bay South Redevelopment Plan Area of San Francisco. The proposed event center would host the Golden State Warriors basketball team during the NBA season, as well as provide a year round venue for a variety of other uses, including concerts, family shows, other sporting events cultural events, conferences and conventions. GSW has entered into an agreement to purchase the site. The project requires approval of amendments to the Mission Bay Plan Design for Development, among other approvals.

Lead Agency Contact

Name	Brett Bollinger
Agency	City and County of San Francisco
Phone	(415) 575-9024 *Fax*
email	
Address	Office of Community Investment & Infrastructure 1650 Mission Street, Ste. 400
City	San Francisco *State* CA *Zip* 94103

Project Location

County	San Francisco
City	San Francisco
Region	
Lat / Long	37° 46' 04" N / 122° 23' 16" W
Cross Streets	16th Street & 3rd Street
Parcel No.	Block 8722, Lots 001 and 008
Township	*Range* *Section* *Base*

Proximity to:

Highways	Hwy 101, I-280, I-80
Airports	
Railways	Caltrain
Waterways	San Francisco Bay, Mission Creek
Schools	SFUSD
Land Use	MB-RA; Mission Bay South Redevelopment Plan - Commercial/Industrial/Retail Designation
Project Issues	Archaeologic-Historic; Biological Resources; Drainage/Absorption; Flood Plain/Flooding; Forest Land/Fire Hazard; Geologic/Seismic; Minerals; Population/Housing Balance; Public Services; Recreation/Parks; Schools/Universities; Sewer Capacity; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazardous; Vegetation; Water Quality; Water Supply; Wetland/Riparian; Growth Inducing; Landuse; Cumulative Effects; Other Issues
Reviewing Agencies	Resources Agency; Department of Fish and Wildlife, Region 3; Cal Fire; Department of Parks and Recreation; San Francisco Bay Conservation and Development Commission; Department of Water Resources; Office of Emergency Services, California; Resources, Recycling and Recovery; California Highway Patrol; Caltrans, District 4; Air Resources Board; Regional Water Quality Control Board, Region 2; Native American Heritage Commission; Public Utilities Commission; State Lands Commission

Note: Blanks in data fields result from insufficient information provided by lead agency.

Document Details Report
State Clearinghouse Data Base

A-SC1

Date Received 06/04/2015 *Start of Review* 06/04/2015 *End of Review* 07/20/2015

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A-SC2

Edmund G. Brown Jr.
Governor

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit

Ken Alex
Director

August 6, 2015

Brett Bollinger
City and County of San Francisco
Office of Community Investment & Infrastructure
1650 Mission Street, Ste. 400
San Francisco, CA 94103

Subject: Event Center and Mixed-Use Development at Mission Bay Blocks 29-32
SCH#: 2014112045

Dear Brett Bollinger:

The enclosed comment (s) on your Supplemental EIR was (were) received by the State Clearinghouse after the end of the state review period, which closed on July 20, 2015. We are forwarding these comments to you because they provide information or raise issues that should be addressed in your final environmental document.

The California Environmental Quality Act does not require Lead Agencies to respond to late comments. However, we encourage you to incorporate these additional comments into your final environmental document and to consider them prior to taking final action on the proposed project. 1 [ERP-1]

Please contact the State Clearinghouse at (916) 445-0613 if you have any questions concerning the environmental review process. If you have a question regarding the above-named project, please refer to the ten-digit State Clearinghouse number (2014112045) when contacting this office.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
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A-UCSF

University of California
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July 27, 2015

Tiffany Bohee, Executive Director
Office of Community Investment & Infrastructure
One South Van Ness Avenue, 5th Floor
San Francisco, CA 94103

RE: **Comments on Warriors' San Francisco Event Center Draft Subsequent Environmental Impact Report "DEIR"**
<u>OCII Case No. ER 2014-919-97</u>

Dear Ms. Bohee:

Thank you for the opportunity to review and comment on the Draft Subsequent Environmental Impact Report ("DEIR") for the proposed Golden State Warriors' ("GSW") Event Center and Mixed-Use Development project (the "Event Center" or the "Project") located at Mission Bay Blocks 29-32. UCSF appreciates the City's and the GSW's commitment to creating an Event Center project that is successful for the Mission Bay neighborhood, as well as all of San Francisco. We also appreciate the City's and GSW's commitment to identify and mitigate negative impacts that could result from the Project. After a careful review of the DEIR, UCSF continues to be concerned about the Project's potential impacts on UCSF's Mission Bay campus and Medical Center, the greater Mission Bay area and its environs. 1 [ERP-9]

UCSF acknowledges and appreciates the efforts made by the City and GSW to date to address concerns that UCSF has expressed about the impacts of the proposed Event Center on UCSF patients, patient visitors, patient care givers, and emergency vehicles. In the spirit of cooperation that has marked those conversations between UCSF, the City and GSW, UCSF offers the following comments on the DEIR, with the understanding that the City will continue to work with UCSF, GSW, and neighbors to develop more detailed plans to address and mitigate the negative impacts of the Project. We understand that these more detailed plans will be included in the Final EIR and incorporated into the Event Center's conditions of project approval, which will result in a project that will fit well in the neighborhood, be supported by UCSF, and be an asset for the City. 2 [TR-3a]

A-UCSF

A. <u>Transportation Impacts</u>

Driven by its commitment to patient care and public safety, UCSF's primary goal is to ensure that patients, patient visitors and patient care workers, as well as emergency vehicles, have 24/7 unimpeded access to its Mission Bay hospitals. This goal may be impeded by traffic congestion and parking impacts of the proposed Event Center, especially when there are dual and/or overlapping large events at the Event Center and AT&T Park. The DEIR indicates that there would be an average of nine dual and/or overlapping large events at the Event Center per year, comprised of two basketball games and seven concerts with an average attendance of 12,500 or more (DEIR p. 5.2-171). As such, large dual and/or overlapping events at AT&T Park and the Events Center should be managed judiciously. In addition, the impacts of such events—particularly on traffic flow—should be monitored and the City should have the ability to employ additional mitigation measures to ensure traffic can be maintained at acceptable levels and access to the Mission Bay hospitals is assured. Should the City's efforts to maintain acceptable traffic levels fail and access to the hospitals be impeded, UCSF supports a trigger mechanism giving the City the ability to manage the scheduling of dual and/or overlapping large events until such time that traffic can operate during such events at acceptable levels. Further, UCSF encourages City efforts to ensure funding is secured to manage these impacts and to ensure a robust monitoring program. 3 [TR-3a]

Page 5.2-32, Table 5.2-8, and page 5.2-237, Table 5.2-68 of the DEIR assumes that four UCSF lots and garages, totaling 2,590 parking spaces, will be available to event attendees. UCSF has informed the City that it should not include any of UCSF's parking spaces in the baseline parking supply in the DEIR because UCSF's current use and projected demand demonstrate that UCSF needs its parking spaces for its staff, patients and visitors. UCSF's future parking demand is expected to increase over existing demand. We appreciate that the parking supply/demand analysis in the DEIR does include tables showing the parking surplus/shortfall when UCSF's garages are not included in the parking supply. 4 [TR-13]

We support the City's efforts to optimize public transit service to and from the Event Center. Toward that end, we offer the following comments: 5 [TR-3a]

> Page 5.2-51, funding of incremental event-only Mission Bay shuttles is left to the discretion of GSW. Please consider making it a requirement that GSW fund additional shuttles if the Mission Bay TMA requests such service.
>
> Page 5.2-52, Table 5.2-14, we suggest Mission Bay TMA shuttle hours be expanded to cover post-game as well as pre-game (6-8 pm) hours.
>
> Page 5.2-53, it is unclear whether GSW or the City will pay for the four additional light rail vehicles. The Final EIR should specify.

Page 5.2-56, we would appreciate the City/GSW consulting UCSF when the number and location of PCOs are refined after Year 1.

Page 5.2-57 through 58, the text indicates that the listed transportation management strategies would apply to concerts with more than 12,500 attendees, but Table 5.2-16 (footnote b) says more than 14,000 attendees. UCSF believes that the lower number should be used.

Page 5.2-64 through 68, it is unclear who will decide which TDM measures will be implemented. We recommend that this not be solely at the discretion of GSW. Please describe which City agency will have the authority to order specific additional TDM measures.

Page 5.2-67 through 68, UCSF appreciates the performance standards set forth in the TMP. Please describe how the City would enforce these measures. In addition, we would appreciate receiving copies of the monitoring reports upon their submittal to OCII. 5 [TR-3a] cont.

Page 5.2-68, third bullet, in addition to event traffic not blocking access to the UCSF emergency room entrance, please consider deploying PCOs to ensure vehicle queuing does not block access to the UCSF hospital and hospital garage for medical staff, patients and visitors.

Page 5.2-80, the TSP should apply to all large events (+12,500).

Page 5.2-130, we request that marquee events, such as National Hockey League regular season games, not be allowed to be regularly scheduled as overlapping events given the significant traffic impacts posed by such overlapping events and the unknown transportation mode profile of those attending such events.

Page 5.2-146 through 147 and 5.2-185, given the relatively high auto mode share by South Bay and North Bay event attendees, can funding be secured for additional South Bay and North Bay transit service needs? Mitigation Measures M- TR-5a and b require GSW to "work with the Ballpark/Mission Bay Transportation Coordinating Committee to coordinate" with Caltrain, Golden Gate Transit and WETA to provide additional service; how can this mitigation measure be strengthened? 6 [TR-12b]

Page 5.2-167 and page 5.2-181, Table 5.2-50, the fact that the I-280 northbound off-ramp at Mariposa is projected at LOS F during the evening peak hour during overlapping events is significant. This off ramp is an important access path to the UCSF hospitals and to neighboring land uses, and cannot be in a failing condition on a regular basis. We request a mitigation measure requiring the City to investigate the reconfiguration of the I-280 Mariposa Street northbound off-ramp lanes to better segregate Event Center traffic from UCSF and other non-Event Center traffic. 7 [TR-12a]

Page 5.2.169, Improvement Measure 1-TR-10b, we request that the traffic engineering study for Mariposa Street be completed prior to, not after, certification of the Final EIR and that it be implemented and included as a condition of project approval, if determined feasible. 8 [TR-11]

Page 5.2-180, Mitigation Measure M-TR-11c, UCSF encourages efforts to avoid scheduling non-Warriors events at the Event Center of 12,500 or more attendees that start within 60 minutes of the start of events at AT&T Park, as stated in this mitigation measure. We suggest that the mitigation measure be modified to limit large overlapping non-GSW events to what was analyzed in the DEIR -- no more than seven large Arena concerts per year. In 2014, the City imposed a numeric limit on large concerts at the Masonic Auditorium, providing a precedent for this type of condition. 9 [TR-12a]

Page 5.2-249, we request that the City commit to the additional parking lots south of the Event Center in order to minimize traffic and parking impacts of overlapping events. The total projected shortfall of about 2,000 spaces in the cumulative condition during overlapping events is substantial. 10 [TR-12a]

Comments on May 2015 TMP

Section 10.2.8, UCSF surveys need not be limited to only emergency access, but also could include surveys of general patient and staff access to the UCSF campus and Medical Center. 11 [TR-3a]

Section 10.4.4, we request that this performance standard be expanded to require that event traffic not block patient, staff and visitor access to the UCSF hospitals, not just emergency room access.

B. **Impacts on UCSF Helipad Operations Have Not Been Adequately Addressed**

After a review of the DEIR, UCSF remains concerned about the projected impact on UCSF's medical helipad, and about the DEIR's analysis of this matter. UCSF's helipad provides access to critical emergency care for children and pregnant women in distress. UCSF undertook an extensive community process and received helipad and access route approval by various regulatory agencies, including the Federal Aviation Administration, the California Department of Transportation's Aeronautics Division, and the San Francisco Board of Supervisors. Any activities proposed by GSW that would render UCSF's flight paths unusable or that would compromise the safety of air medical access are unacceptable to UCSF. 12 [TR-14]

UCSF understands and appreciates that the City and GSW continue to work on addressing the impacts. Nonetheless, the DEIR identifies the following:

- There would be 5 construction cranes at the Event Center construction site (see DEIR Figure 5.2-28), which would extend over all streets surrounding the project site, Third Street, 16th Street, Terry Francois Boulevard, and South Street.

- One crane would penetrate the airspace of UCSF's primary flight path --the flight path over 16th Street that is most frequently used, which arrives from and departs to the east. The DEIR concluded that this constitutes a potentially significant impact.

- Other cranes could penetrate the airspace of one or more of UCSF's secondary flight paths.

12 [TR-14] cont.

We understand that GSW may have a revised plan that relocates the construction cranes so that no penetration of the UCSF flight path airspace would occur, and we appreciate GSW's efforts on this matter. However, there is no commitment to avoid penetration of the flight path airspace at this time. We would appreciate GSW working toward a commitment to avoid penetration of the UCSF flight path, which we want included in the Final EIR. Also, we have the following concerns about the DEIR analysis:

- Page 5.2-265, the mitigation measure calls for the development of a Crane Safety Plan. The DEIR provides that the safety plan would identify appropriate measures "to reduce, and where possible, avoid, potential conflicts", by, among other things, seeking to "minimize penetrations" or "the duration of penetrations" into helicopter flight airspace. As currently written, the mitigation measure would allow for construction cranes to penetrate the flight path's airspace, which potentially compromises the ability of the helipad to operate 24/7. Accordingly, UCSF does not concur that Mitigation Measure M-TR-9a reduces this impact to less than significant levels. Rather, UCSF requests that the mitigation measure be revised with the objective to ensure safe, 24/7 operation of the UCSF medical helipad by requiring GSW to locate their constructions cranes so that no penetrations of airspace occur during the construction of the Project. 13 [TR-14]

- Page 5.2-263, the discussion of impacts on the alternative flight path over South Street is unclear. The text states that the working radii of the two construction cranes over South Street are not located under any part of UCSF's alternative arrival/departure flight path. However, the text also identifies the minimum amount of vertical clearance anticipated between the cranes and the approach and transitional surfaces of the flight path. It is extremely important that the analysis of impacts be clear. 14 [TR-14]

- Page 5.2-270 through 272, while the DEIR does require GSW to develop an exterior lighting plan, it does not discuss the impact of laser pointers and drones which could present a real danger to helicopter pilots and passengers. Both UCSF's helipad consultant and pilots whom we have consulted agree that this is a real safety issue. 15 [TR-14]

Although incidents are rare, it seems that in an event/crowd atmosphere, especially if there were an outdoor activity at the Third Street Plaza, the likelihood would be increased that an incident could occur. UCSF requests that mitigation measures be identified to reduce or eliminate this potential. Mitigation Measure M–TR–9d does not go far enough. It promises to develop an exterior lighting plan that incorporates measures to ensure specialized exterior lighting systems "would not have an undue impact on helipad operations." Any impact to a helicopter pilot transporting a critically-ill patient should be considered an undue and unacceptable impact, and further mitigation should be imposed. 15 [TR-14] cont.

C. Noise Impacts Have Not Been Adequately Addressed

When UCSF planned and developed a large student housing complex along Third Street in 2002, it relied on the zoning districts in the South Plan, which called for commercial/industrial uses on adjacent blocks such as Blocks 29-32. Those uses would be primarily daytime uses, not uses that would disgorge up to 18,000 people after 10:00 p.m. on more than 100 days per year. 16 [NOI-5]

Page 5.3-26, Improvement Measure I-N0–3. UCSF requests that this measure be modified to expand the distance for notification of owners and occupants to include all occupants of the UCSF Medical Center at Mission Bay and the student housing on Third Street.

Pages 5.3–37 through 5.3-38, the DEIR indicates that the excessive noise would occur at the northbound Muni line platform adjacent to the UCSF student housing building on up to 105 evenings following basketball games, concerts and other major event. To address this impact, the DEIR indicates that the project sponsor will urge patrons to respect the quiet of the neighborhood as they leave the area and provide to all interested neighbors a contact agency and phone number that would be prepared to respond to complaints. We respectfully request that GSW and the City devise more effective mitigation measures to address this significant impact.

17 [NOI-6]

The land uses most affected are the UCSF Mission Bay Housing units on Block 20 that front onto Third Street and onto Gene Friend Way. These buildings have no air conditioning and rely on a passive ducting system for ventilation when windows are closed for noise control. At the time these structures were built, it was anticipated that adjacent development would consist of biotechnology or office uses. It was not anticipated that an arena and event center with over 200 events per year would be proposed directly across the street, of which up to 150 large events would generate crowd noise that, according to the DEIR, would be significant and unavoidable due to "the increase in noise levels from crowds gathering at the Muni T-line platform during quieter nighttime periods". The significant and unavoidable impact of crowd noise on the UCSF Mission Bay Housing complex would most acutely affect those units in Hearst Tower which contain bedrooms that face Third Street or Gene Friend Way (83 units), those units in the

South Building which contain bedrooms that face Gene Friend Way (63 units), and those units in the North Building which contain bedrooms that face Third Street (18 units). For these reasons, UCSF requests that the following mitigation measure be included in the Final EIR:

> To minimize the effect of crowd noise on nearby sensitive receptors at the UCSF Mission Bay Housing complex, the project sponsor will evaluate and implement feasible noise control measures to limit the significant increase in noise affecting the existing UCSF Mission Bay Housing complex on Block 20. The noise control measures will be submitted to the City for review and approval, and following City approval, will be implemented to reduce the significant and unavoidable noise impacts affecting UCSF Mission Bay Housing on Block 20.

17 [NOI-6] cont.

Page 5.3–41, the DEIR provides that construction-related vehicles and equipment will be required to use designated truck routes to travel to and from the project site, as determined in consultation with the SFMTA. UCSF requests that truck routes be designated in consultation and coordination with UCSF and other nearby developers. 18 [NOI-4]

Tables 5.3-2 and 5.3-4, the distance from the "project site" to the UCSF Medical Center at Mission Bay is listed as 560 feet, without any explanation of measuring points. Elsewhere in the DEIR it is listed as 300 feet. This distance needs to be confirmed because at page 5.3-14, summarizing Article 1, Section 47.2 of the San Francisco Police Code, the DEIR states that "except as permitted by the Entertainment Commission, [amplified] sound shall not be issued within 450 feet of hospitals." As GSW proposes noise sources and noise generating events in the outdoor plaza areas as well as within the Event Center, the Final EIR should be specific and consistent about the locations from which distances were measured and what those distances are. 19 [NOI-1]

D. Inadequate Mitigation Measures

"An EIR shall describe feasible mitigation measures which could minimize significant adverse impacts…" CEQA Guidelines section 15126.4(a)(1). "Mitigation measures must be fully enforceable through permit conditions, agreements, or other legally-binding instruments." CEQA Guidelines sections 15126.4(a)(2).

Many of the Mitigation Measures contained in the DEIR, as summarized in Table 1–2, are conditioned upon language such as "if feasible." 20 [IO-2]

In addition, some Mitigation Measures lack implementation or enforcement mechanisms or performance standards include TR – 2 ("if feasible", "if available", "working in good faith", "make good faith efforts"), TR – 4, TR – 5, TR –9a, TR –11 ("make good faith efforts", "if feasible", "shall exercise commercially reasonable efforts"), NO-4, and WS –1.

A-UCSF

We suggest that the significance determination for each of these impacts be reassessed assuming a worst-case scenario in which the proposed mitigation measures are not feasible. Also, the Final EIR should identify whom at OCII or other City agencies will be responsible for determining "feasibility," "availability," "good faith," and "commercially reasonable efforts." We respectfully submit that GSW should not be allowed to make these determinations. 20 [IO-2] cont.

The adoption of an effective mechanism to fully fund the City's operating costs to manage impacts as described above for the life of the Event Center would help to eliminate funding as a criteria for determining the feasibility of the measures that are the responsibility of the City. 21 [GEN-1a]

E. Utilities and Service Systems

Page 5.7–2, the DEIR indicates that the Mission Bay FSEIR determined that the projected increases in wastewater generation and storm water flows could be accommodated by the planned infrastructure at Mission Bay, and that the Mission Bay Plan's effects on wastewater and stormwater collection and treatment facilities would be less than significant. The DEIR now states that wastewater capacity will be inadequate when Project flows are added to existing and planned flows. But the DEIR presents no evidence other than a letter to SFPUC from its consultant, Hydroconsultant Engineers, as to current demands on the wastewater and stormwater collection and treatment facilities at Mission Bay and concerning what happened to make the 1998 prediction untrue. The DEIR discussion suggests that UCSF development at Mission Bay is the reason why peak flows would exceed the capacity of the dry weather pump stations, but this contention is contradicted by the analysis recently conducted by UCSF's consultants, as described below. In response to the UCSF's review of the supporting studies listed in the DEIR on page 5.7-7 (SF-DPW / SF-PUC memos "Mariposa Pump Station (MPS) Dry Weather Flow Hydraulic Analysis" dated February 3, 2015, and "Hydraulic Assessment of Mission Bay Sanitary Pump Station" dated February 25, 2015), UCSF undertook sanitary sewer flow monitoring to address questions in those analyses of the actual sewage flow contributions UCSF has to the respective pump stations. This information was provided to the City, however the relevant information from this study does not seem to be incorporated into the DEIR. 22 [UTIL-4]

Page 5.7-7, the DEIR indicates that the SFPUC is performing interim improvements at the Mariposa Pump Station to accommodate planned and approved peak wastewater flow rates from UCSF that would exceed the Mariposa Pump Station's dry weather capacity. Also, at page 5.7-12, a similar statement is made that the peak flows from UCSF are contributing to peak dry weather flows from the Mariposa subbasin that now exceed the Mariposa Pump Stations dry weather capacity and therefore interim improvements are being made. The interim improvements described in the DEIR include connecting the existing 10-inch dry weather force to the 20-inch wet weather force main as well as upsizing the influent sewer to the pump station.

The February 2015 SF DPW memo did describe the same force main improvements, but the increases in dry weather flows were not attributed to UCSF. UCSF's consultants, Freyer & Laureta, Inc., prepared a May 15, 2015, memorandum presenting results of flow monitoring from Blocks 24a/b, 25a, and Phase I of the UCSF Medical Center. The memorandum concluded that the cumulative measured average and peak sanitary sewer flow rates from these UCSF facilities was generally less than both the Mission Bay Master Plan and 2014 LRDP estimated sanitary sewer flow rates. 22 [UTIL-4] cont.

Page 5.7-13 through 17, the discussion related to Impact C-UT-2 indicates that the projected peak flow rates from the UCSF planned development of Block 25b, Block 33/34, Block 40, and Phase 2 of the MCMB is 1.2 mgd. However, the 1.2 mgd projected peak flow rate includes both Phase 1 and Phase 2 of the Hospital construction. The correct projected peak wastewater flow rate from Block 25b, Block 33/34, Block 40, and Phase 2 of the Hospital should be 0.95 mgd based on the LRDP. 23 [UTIL-4]

Page 5. 7–16, the statement that UCSF flows to the Mission Bay Pump Station would be 6.63 mgd with full LRDP development is not accurate. See 2014 LRDP Draft EIR at page 7-99 (indicating that the estimated peak flow increase to the Mission Bay Block P15 pump station from UCSF's proposed growth under the 2014 LRDP would be 0.23 mgd, resulting in a need for P15 pump station capacity of 6.63 mgd.). 24 [UTIL-4]

Page 5.7-13 through 5.7-17, it is not clear why Impact C–UT–2 does not require mitigation involving a fair share contribution by the project sponsor; rather it states that no mitigation is currently available. 25 [UTIL-5]

Page 5.7–19, the DEIR indicates again that existing and planned UCSF development at Mission Bay would result in a major contribution to cumulative wastewater flows in the subbasin. (See responses above) 26 [UTIL-4]

F. Other Issues

1. Project Description

Page 3-36 through 37, UCSF appreciates the City and GSW's commitment to the improvements listed. UCSF requests the DEIR include documentation to confirm these improvements are fully funded. 27 [GEN-1a]

Page 3-49, as discussed in greater detail in Section B, above, contractor compliance with all codes, rules and regulations is not enough to ensure that tower cranes do not interfere with helicopter flight path. 28 [TR-14]

Again, thank you for the opportunity to comment on the DEIR. We acknowledge the City's and GSW's efforts to address our concerns about the potential impacts of the proposed project. UCSF is supportive of a successful Event Center project, and looks forward to changes to the Project's EIR mitigation measures that will bring about meaningful improvements in projected conditions in the area.

Should you have any questions about these comments, please contact me at (415) 476-8312.

Sincerely,

Lori Yamauchi

Lori Yamauchi
Associate Vice Chancellor

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

July 20, 2015

Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: Event Center & Mixed-Use Development at Mission Bay Blocks 29-32 DSEIR

Dear Mr. Bollinger:

Bay Area Air Quality Management District (Air District) staff has reviewed the City and County of San Francisco's (City) Draft Subsequent Environmental Impact Report (DSEIR) prepared for the Event Center & Mixed-Use Development at Mission Bay Blocks 29-32 (Project). The Project applicant proposes to construct a multi-purpose 750,000 square foot event center and 605,000 square feet of office, 125,000 square feet of retail, 475,000 square feet of parking and loading use, and approximately three acres of open space. The Project site is approximately 11 acres. The site is within the Mission Bay South Redevelopment Plan Area of San Francisco. The event center would have a capacity of 18,064 seats and host the Golden State Warriors, and provide a year-round venue for a variety of other uses, including concerts, family shows, other sporting events, cultural events, conferences and conventions.

Air District staff greatly appreciates the opportunity to work with the City to address the potentially significant air quality impacts estimated for this Project. Project design features and the mitigation measures identified in the DSEIR will substantially lessen the local and regional air quality impacts from construction and operation of the Project.

However, even with these Project design features and on-site mitigation measures, air quality impacts from the Project still exceed the City's thresholds of significance. Therefore, Mitigation Measure M-AQ-2b Emissions Offsets (M-AQ-2b) commits the Project applicant to providing funds to achieve additional emission reductions to reduce air emissions below the thresholds of significance. To this end, M-AQ-2b states that the Project applicant would provide funding of $321,646 to the Air District to fund emissions reduction projects in the region in order to 1 [AQ-7]

A-BAAQMD

offset the remaining criteria pollutant emissions generated by both the construction and operation activities from the Project.

However, as Air District staff previously has discussed with the City, the Project Applicant would need to contribute $620,922 to fully offset the remaining criteria pollutant emissions from this Project through the Air District's grant programs. The Air District recommends that the DSEIR MM-AQ-2b be updated to reflect this funding amount. 1 [AQ-7] cont.

Air District staff is available to assist the City to address these comments. If you have any questions, please contact Alison Kirk, Senior Planner, at (415) 749-5169 or akirk@baaqmd.gov.

Sincerely,

Jean Roggenkamp
Deputy Air Pollution Control Officer

cc: BAAQMD Vice Chair Eric Mar
BAAQMD Director John Avalos
BAAQMD Director Edwin M. Lee

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT
300 Lakeside Drive, P.O. Box 12688
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(510) 464-6000

July 27, 2015

Tiffany Bohee, OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Attn: Brett Bollinger

Re: BART District Comments on the Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 (OCII Case No. ER 2014-919-97)

Dear Director Bohee,

The San Francisco Bay Area Rapid Transit District (BART) has reviewed the Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center and Mixed-Use Development at Mission Bay Blocks 29-32. BART appreciates the coordination with the City and County of San Francisco on this important project, and supports many of the transit-first actions proposed to encourage multi-modal access to the site.

For context, BART's Transbay service began in 1974, and the original planning horizon has been surpassed by more than a decade. Given strong job expansion in San Francisco, BART has experienced unprecedented ridership growth (~25% over the last four years), which creates a number of peak period capacity challenges. BART is in the process of replacing the existing rail car fleet, modernizing the train control system, and expanding train storage, which will allow BART to carry more San Francisco-bound patrons. However, as the Bay Area concentrates more growth around the region's rail systems, BART anticipates substantial ridership increases — beyond what the current system can safely and comfortably accommodate. The Metropolitan Transportation Commission's (MTC's) Plan Bay Area (2013) and Core Capacity Challenge Grant does partially fund several of BART's most important capacity projects serving San Francisco, but BART looks forward to partnering with the City to address cumulative impacts and funding solutions.

We understand that the development proposal is for a mixed-use project that features an 18,500-seat multi-purpose event center, along with open space, parking and retail uses in the Mission Bay South Redevelopment Area. BART submitted Scoping Comments in a letter dated January 23, 2013 based on the Notice of Preparation (NOP) issued by the City of San Francisco for the project (at the former location). We are submitting the following comments based on our review of the DSEIR to the City and County of San Francisco for your consideration in proceeding with the document.

1. System capacity improvements (i.e., rail car fleet expansion, stations, train control modernization, and additional shop & yard facilities) are needed to alleviate peak period constraints from projected ridership, but are unfunded. The BART Fleet Management Plan (FMP) (2010) service levels shared with the City in our January 23, 2013 Scoping Comments on the NOP are based on projected demand. The BART FMP indicates that BART will need to increase base service frequency from 15- to 12-minute headways, and have approximately 1,100 vehicles by 2025 in order to adequately serve the demand generated in San Francisco. BART's current funding, however, leaves us more than 300 rail cars short of this total. The DEIR should take this information into account in analyzing projected transit capacity and crowding. 1 [TR-5b]

2. BART should be represented on the Ballpark/Mission Bay Transportation Coordinating Committee. BART looks forward to working with the City to identify appropriate short-term and long-term mitigation strategies and operational actions to address identified transportation shortcomings. 2 [TR-1]

3. The proposed Transportation Management Plan's (TMP) objective is to mitigate surface traffic impacts by shifting trips from personal vehicles to other modes. Given the significant traffic impact of the project under all scenarios analyzed and the subsequent need for a successful implementation of the TMP, the impacts of the target mode shift to transit on BART capacity should be anticipated, quantified and closely monitored. 3 [TR-3a]

4. The DSEIR analysis does not sufficiently detail its methodology and assumptions to enable the reader to interpret the analysis and the extent of impact for both BART operations and station capacity. For all scenarios, assumptions should be documented, including numbers of trains, train capacity, transfer (station) locations and directions of travel, average travel times to each station (to better understand passenger arrival times at the stations and their impact on station and operation capacity), etc. 4 [TR-5b]

5. Timing of Central Subway Service: Currently, the arena is scheduled to open prior to commencement of Central Subway service. If that sequence holds, Warriors fans taking BART will rely almost solely upon the Embarcadero Station - with nearly 38,000 daily boardings, the most heavily patronized station in the BART system. BART currently experiences heavy congestion at both Embarcadero and Montgomery Stations (and is working with the City to develop capacity improvements to these stations). Embarcadero Station also has the narrowest platform width of the Market Street stations. To ensure that BART can safely deliver patrons to events (in addition to accommodating peak commute loads), the City should work with BART to mitigate the short-term impact to ridership at these stations. BART seeks mitigation measures in the both short and long term to divert trip generation at Montgomery and Embarcadero stations. 5 [TR-5b]

6. The project sponsor should work with regional transit providers to encourage inbound event patrons to consider AC Transit Transbay service during the Inbound PM Peak. In general, all transit information should be seamlessly integrated with proposed dissemination of parking information so patrons understand all travel options simultaneously, including transit. 6 [TR-3a]

A-BART

7. BART is concerned about Transbay operating capacity in the eastern direction during the late evenings after events, especially after simultaneous events throughout the city on Friday and Saturday nights. Analysis for this scenario (OUTBOUND from project site) was not included in the DSEIR. Given the timing of the ends of basketball games and large events, and the time required to travel to BART stations, event patrons may be using the last trains of the evening when stations and trains are already crowded. For this scenario, the DSEIR needs a broader definition of "simultaneous events" that are known to significantly increase BART ridership. This includes other events occurring and ending simultaneously throughout the city and along the Market Street Corridor (i.e. concert venues), as well as the "ambient" increase in ridership on weekend late evenings. At a minimum, the project should call for monitoring transit capacity during this condition (late evening OUTBOUND to East Bay on Fridays and Saturdays). 7 [TR-5b]

8. Station Capacity: BART's NOP comment letter stated that the City needs to work with BART to analyze the impacts of the proposed Project on peak period travel for station capacity as well as line haul capacity to ensure that BART can safely deliver patrons to and from events. However, there was no station level ridership forecast, or analysis, to determine the impacts to individual stations. 8 [TR-5b]

9. 16th Street Station: BART is particularly aware of station loading capacity constraints at the 16th St. station. It is unclear from the analysis how many patrons would need to transfer to Muni service at this station, or what impacts that could have at the station plazas. This station does not have faregates on the concourse level nearest the entrance on the north-east corner of Mission St. and 16th St. To accommodate passengers that will be dropped off at this entrance from either MUNI #22 buses or supplementary shuttles, a new fare area may need to be added, including faregates, station booth and support infrastructure such as CCTV. Staffing needs include a station agent, police and possibly staff to meter passengers at the concourse and platform level. 9 [TR-5b]

Thank you for the opportunity to comment on this Draft SEIR. Please call me if you have any questions.

Sincerely,

Val Joseph Menotti
Chief Planning & Development Officer
BART Planning, Development & Construction
San Francisco Bay Area Rapid Transit
300 Lakeside Drive, 21st Floor
Oakland, CA 94612
510.287.4794

A-CALTRAIN

Caltrain

July 27, 2015

Ms. Tiffany Bohee
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Ms. Bohee:

Subject: Comments on the Draft Subsequent Environmental Impact Report for the Event Center & Mixed Use Development at Mission Bay

On behalf of the Peninsula Joint Powers Board (JPB) Caltrain is submitting the following comments on the Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center & Mixed-Use Development at Mission Bay Blocks 29-32 (the Project). Caltrain provides commuter rail service between San Francisco, San Jose and Gilroy, operating a mix of express, local and limited service. Today, Caltrain operates 92 trains per weekday, 36 trains on Saturday and 32 trains on Sunday. Caltrain also operates supplemental service for a variety of special events including extra trains after San Francisco Giants games.

The Project site is located 0.8 miles south of the Caltrain terminal at Fourth/King and 0.9 miles northeast of Caltrain's station at 22nd Street and the analysis in the DSEIR indicates that travel demand generated by the project on event days will result in a substantial addition of riders to the Caltrain system. Specifically Caltrain notes that Impacts TR-5 and TR-14 identify Caltrain service as being significantly capacity-impacted to and from the South Bay during the weekday evening, weekday late evening, and Saturday evening peak hours during both the "Basketball Game Scenario" (Impact TR-5) and the "Basketball Game with Overlapping SF Giants Game at AT&T Park Scenario" (Impact TR-14) evaluated in the DSEIR. 1 [TR-5c]

In response to the above impacts the DSEIR identifies mitigation measure M-TR-5a "Additional Caltrain Service," noting that implementation of this measure would reduce or minimize the severity of the capacity utilization exceedances for Caltrain and would not result in secondary transportation impacts. The DSEIR also notes, however, that the provision of additional Caltrain service is uncertain and full funding for the service has not yet been identified. Implementation of the mitigation measure thus remains uncertain and impacts TR-5 and TR-14 are found to be Significant and Unavoidable with mitigation.

PENINSULA CORRIDOR JOINT POWERS BOARD
1250 San Carlos Ave. – P.O. Box 3006
San Carlos, CA 94070-1306 650.508.6269

A-CALTRAIN

Caltrain agrees with the DSEIR's analysis of capacity impacts to our service, the conclusion that additional service has the potential to mitigate a portion of these impacts, and the statement that additional Caltrain service has not yet been defined, funded or agreed to. Caltrain understands the importance of the regional transportation services we provide and we look forward to working collaboratively with the City and County of San Francisco and the project sponsors to address the transportation challenges and opportunities presented by this unique project. As the project advances through the environmental process we encourage the City and the project sponsors to engage with us directly to more formally define, analyze and identify funding for any contemplated increase in Caltrain service. 1 [TR-5c] cont.

Sincerely,

Stacy A. Cocke
on behalf of

Marian Lee
Executive Officer, Caltrain Modernization Program

Ec: Chuck Harvey, Deputy CEO, Operations, Engineering & Construction
Rita Haskin, Executive Officer, Marketing
Hilda Lafebre, Manager, Environmental Planning

A-SMCTD

From: Petty, Sebastian
To: Warriors, PLN (CPC)
Subject: Caltrain contact information
Date: Wednesday, July 15, 2015 6:21:17 PM

Hi Brett,

It was nice talking to you this afternoon! Per our conversation, could you provide information on the following?

- Who at Caltrain (or Samtrans) was the notice of availability sent to? 1 [ERP-2]
- Did the EIR analyze capacity impacts to Caltrain inbound service during the PM (pre-event) condition? 2 [TR-5c]

Thanks!

Sebastian Petty, AICP, Senior Planner
CalMod Program Office
2121 S. El Camino Real, Suite 300
San Mateo, CA 94403
t: 650.622.7831 c: 650.730.8858
www.caltrain.com/calmod

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TABLE COM-3
NON-GOVERNMENTAL ORGANIZATIONS COMMENTING ON THE DRAFT EIR

Commenter Code	Name of Person and Organization Submitting Comments	Comment Format	Comment Date
O-Audubon	Cindy Margulis, Executive Director, Golden Gate Audubon Society	Letter	07/17/2015
O-BCTA	Multiple Authors, Bayview Community Truckers Association	Letter	07/24/2105
O-Fibrogen	Catherine Sharpe, Director, Community Affairs & Real Estate FibroGen, Inc.	Email	07/06/2015
O-Kane	Robert F. Kane, Law Offices of Robert F. Kane	Letter	06/18/2015
O-MBA1L1	Thomas N. Lippe, Law Offices of Thomas N. Lippe, APC, on behalf of Mission Bay Alliance	Letter	06/29/2015
O-MBA2S1	Osha R. Meserve, Soluri Meserve, on behalf of Mission Bay Alliance	Letter	07/09/2015
O-MBA3	Thomas N. Lippe, Susan Brandt-Hawley, Osha Meserve, and Patrick Soluri, on behalf of Mission Bay Alliance	Letter	07/26/2015
O-MBA4	Thomas N. Lippe, Susan Brandt-Hawley, Osha Meserve, and Patrick Soluri, on behalf of Mission Bay Alliance	Letter	07/26/2015
O-MBA5	Bruce Spaulding, on behalf of Mission Bay Alliance	Letter	07/27/2015
O-MBA6B1	Susan Brandt-Hawley, Skyla Olds, Brandt-Hawley Law Group, on behalf of Mission Bay Alliance	Letter	07/26/2015
O-MBA7S2	Patrick M. Soluri, Osha R. Meserve, Soluri Meserve, on behalf of Mission Bay Alliance	Letter	07/26/2015
O-MBA8L2	Thomas N. Lippe, Law Offices of Thomas N. Lippe, APC, on behalf of Mission Bay Alliance	Letter	07/26/2015
O-MBA9L3	Thomas N. Lippe, Law Offices of Thomas N. Lippe, APC, on behalf of Mission Bay Alliance	Letter	07/25/2015
O-MBA10L4	Thomas N. Lippe, Law Offices of Thomas N. Lippe, APC, on behalf of Mission Bay Alliance	Letter	07/27/2015
O-MBA11L5	Thomas N. Lippe, Law Offices of Thomas N. Lippe, APC, on behalf of Mission Bay Alliance	Letter	07/24/2015
O-MBA12S3	Osha R. Meserve, Soluri Meserve, on behalf of Mission Bay Alliance	Letter	08/07/2015 *
O-MBA13S4	Osha R. Meserve, Soluri Meserve, on behalf of Mission Bay Alliance	Letter	10/07/2015 *
O-MM	Mary Miles, Attorney at Law	Email	07/27/2015
O-PBNA	J.R. Eppler, President, Potrero Boosters Neighborhood Association	Letter	07/27/2015
O-Sabelli	Marin Antonio Sabelli, Law Offices of Martin A. Sabelli	Email	07/23/2015
O-SFBC	Paolo Cosulich-Schwartz, Business and Community Program Manager, San Francisco Bicycle Coalition	Letter	07/27/2015
O-SFBT	Maureen Gaffney, Bay Trail Planner, San Francisco Bay Trail	Letter	07/27/2015
O-Sierra	Susan Elizabeth Vaughan, Chair, San Francisco Group, Sierra Club	Letter	07/27/2015

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inspiring people to protect Bay Area birds since 1917

July 17, 2015

Ms. Tiffany Bohee, OCII Executive Director
c/o Mr. Brett Bollinger, SF Planning Department
1650 Mission St, Suite 400
San Francisco, CA 94103

Mr. David Kelly, Project Sponsor GSW Arena LLC
warriors @sfgov.org

re: Draft SEIR for case number: OCII: ER 2014-919-97; Planning Dept: 2014.1441E

Dear Sirs and Ladies:

I am writing on behalf of the Golden Gate Audubon Society in response to the Draft SEIR for the Event Center and Mixed-use Development project at Mission Bay Blocks 29-32. We were pleased to see that this SEIR included planned mitigations for possible impact to resident and migratory birds. Two specific areas are addressed: Mitigation Measure M-BI-4a: Pre-construction surveys for nesting birds; and Mitigation Measure M-BI-4b: Bird-Safe Building Practices (refer to details in table 1-2, biological resources, initial study section E13; vol 1 pages 1-58, 1-59). Also the project description in section 3 (page 3-28) mentions Bird-Safe Design: *"The project sponsor proposes to incorporate bird-safe design measures that would reduce the potential effects of the proposed buildings, signage and lighting on birds."* The bird-safe building codes are important regulations that San Francisco has adopted – making our city a national leader in environmental stewardship. **We hope that you will do your utmost to meet and even exceed the bird-safe building design codes.** 1 [BIO-6]

There are some open questions regarding the planned open space near the project (Bayfront Park, and Agua Vista Park). It is not clear if the scope of this SEIR includes those spaces. These are additional areas of possible impact to bird populations on the shoreline. For example, the old piers off the Bayfront Park area served as the last remaining sites in San Francisco where Caspian Terns had nested collectvely. Replacement nesting platforms were proposed to be built by the Port of SF as required mitigation for America's Cup (and hasn't been done as promised yet). The shoreline beach area is also used by birds on migration, so further development of this area could have deleterious impact on wildlife use. Part of the beauty and attraction of these areas is the waterfront, so to the extent that you can incorporate natural waterline and structures that sustain the presence of charismatic wildlife (such as birds), you are serving both the people and the health of the San Francisco Bay. We encourage you to consider native plantings and features that support native wildlife. To the extent that these natural resources are negatively impacted, it will be necessary to mitigate for those impacts. 2 [BIO-6]

Thank you for your consideration of comments on this project. We encourage project leaders to be familiar with the biological report which both Golden Gate Audubon had submitted a few years back pertaining to this general area. It is called, *A Summary Report of Avian Surveys Conducted in 2008 at Dilapidated Piers and Other Structures along the Port of San Francisco's Southern Waterfront Properties* which was provided to the Port of San Francisco. 3 [BIO-6]

GOLDEN GATE AUDUBON SOCIETY
2530 San Pablo Avenue, Suite G, Berkeley, CA 94702
phone 510.843.2222 *web* www.goldengateaudubon.org *email* ggas@goldengateaudubon.org

O-Audubon

As the project proceeds, GGAS would like to be kept informed about the results of the surveys, and proposed construction plans to reduce instances of collisions with birds. We can be reached at (510) 843-2222. 3 [BIO-6] cont.

Very sincerely yours,

Cindy Margulis
Executive Director
Golden Gate Audubon

2

Bayview Community Truckers Association
1485 Bayshore Boulevard - #139
San Francisco, CA 94124

July 24, 2015

Ms. Tiffany Bohee
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Market Street – Suite 400
San Francisco, CA 94103

Sent via e-mail: warriors@sfgov.org

Re: Comments On Golden State Warriors Arena Draft SEIR

Dear Ms. Bohee:

The undersigned small business owner/operators of trucks locally based in Bayview-Hunters Point want to thank you and OCII for giving us the opportunity to comment on the Draft SEIR for the proposed Golden State Warriors Arena at Mission Bay. Our group of highly qualified hazardous-certified truckers are made up of local minority truck owners who reside in and/or hire our drivers and other employees from the local community. We park our vehicles at the Port of San Francisco railyard off Third Street, which also hires exclusively from the local community. Our member truckers transport contaminated and hazardous waste to the railyard from remediation projects all over San Francisco and the Bay Area. The local truck-to-rail system offers the following benefits to projects like the Warriors Arena project: 1 [GEN-6, HAZ-3]

- Railyard is just a few blocks from arena site compared to 250 miles one-way for long-haul truck trip to Southern California landfills;
- Excavation phase impacts can be reduced months by using truck-to-rail option;
- Reduced fuel consumption by hundreds of thousands of gallons and reduced toxic air emissions (CO2) by millions of pounds per project;
- Reduced liability of hazardous waste at high speeds down public highways;
- Economic development dollars stay in our neighborhood.

With that in mind, here are our comments on the Draft SEIR:

1. We found no mention in the EIR documents about the geology or toxic contaimination at the proposed site. Our group of truckers hauled more than 100,000 tons of toxic soils from the Shorenstein office buildings site (formerly Union Oil tank farm owned by Chevron-Texaco) immediately adjacent to the south side of the proposed arena site. Our understanding is that the arena site has similar contamination, which should be discussed in the EIR. 2 [HAZ-1]

2. The project plans show the arena building being sunken down into the site, which means the soils currently there will need to be excavated and removed. Since the arena site is at least as big as the adjacent Shorenstein site, and since the fill material is likely similar, in excess of 100,000 tons of soils will likely need to be removed. The traffic, air and other impacts from this soil removal activity during the construction period should be discussed in the EIR. We believe using the same very successful approach as used on the Shorenstein project, mass excavation and 1-mile haul down Illinois Street to the railyard – would result in the least environmental impacts of all options. 3 [TR-10, HAZ-3]

3. We would like to see the direct excavation of all Class 1 toxic soils and use of our local truck-to-rail as the preferred remediation option because: 4 [HAZ-3]

   (a) any *on-site treatment* of toxic soils means double or triple-handling of the waste and airborne toxics spread into nearby neighborhoods and the Bay;

   (b) *long-haul trucking* has the ability to remove from the site only 500 tons daily maximum, and due to a shortage of hazardous trucks in the State, possibly far less. This means the excavation phase of the site preparation could take months more than the local rail option; would generate many times the amount of CO2 and other toxic air emissions as the rail option; and would have far greater risk of impacts on the driving public due to millions of high speed truck miles with toxic waste from the project.

   (c) *local truck-to-rail* option can remove 3,000 tons daily and reduce the period of construction (and impacts from construction) by months; offers a 1-mile one-way truck haul versus a 250-mile one-way truck haul to Southern California; offers significantly reduced fuel use and toxic emissions; offers the ability to use 100% local-based minority and women-owned truckers.

O-BCTA

Other projects that our team of local truckers have successfully hauled hazardous and contaminated soils to the railyard at the Port, in addition to the adjacent Shorenstein project, include: UCSF Medial Center at Mission Bay; Kaiser Medical Center @ Mission Bay; Transbay Terminal; Pac Bell Park; The Gap Headquarters; SFMTA Third Street Light Rail; Hunters Point Naval Shipyard; Equity Potrero –16th Street; Embarcadero Waterfront Improvement; Avalon Bay Communities; SFMTA Central Subway; and hundreds more that have chosen the local truck-to-rail option as the best option.

We would like that our community truckers be able to take part in this exciting and historic project using our successful truck-to-rail approach. And again, we appreciate the opportunity to comment on the EIR.

5 [GEN-6]

Sincerely,

LEE G & COMPANY
Lee Gray, President

L.C.E TRANSPORT
Regena Jones, President

MCD TRUCKING
Olivia Dews-Smith, Principal

BIG "M" TRUCKING
Maurice Wysinger, President

NORTHERN TRUCKING
Asteria Hunter, President

HARMON TRUCKING
William Harmon, Owner

JOE WILLIAMS TRUCKING
Joe Williams, Owner

DONESSDE TRUCKING
Don Durkee, Owner

O-Fibrogen

From: Sharpe, Catherine [mailto:casharpe@Fibrogen.com]
Sent: Monday, July 06, 2015 10:54 AM
To: Myall, Hilde (CII)
Cc: Corinnewoods@cs.com
Subject: RE: Mission Bay CAC Agenda - July 9th Meeting
Importance: High

Hilde, good morning. We are reading through the Warrior's DEIR and encountering major heartburn with the noise and vibration analysis and mitigation. First, we see continuing reference to the MB Good Neighbor Policy and the SFEIR for MB completed in 1998. None of us in the MB life science community have seen those documents much less participated in the development of same. Life science and specifically sophistication of instrumentation and evolution of preclinical work has changed dramatically since 1998.

Could you please forward a copies of at least the Good Neighbor Policy as soon as is possible.

1 [ERP-3, NOI-5]

Best regards

Catherine

Catherine Sharpe
Director, Community Affairs & Real Estate
FibroGen, Inc.
409 Illinois Street
San Francisco, CA 94158 USA
Phone: (415) 978-1870
Cell: (650) 278-5010
Email: casharpe@fibrogen.com
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O-Kane

Law Offices of
ROBERT F. KANE
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San Francisco, California 94102
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Facsimile (415) 982-5821
Email RKane1089@aol.com

June 18, 2015

San Francisco Chronicle

Dear Sir or Madam:

Professor Richard Zitrin is absolutely correct in his June 18th op ed that the Warriors need to stay in Oakland. What he did not address is what one of my law professors said you always need to examine: "cui bono", to whose benefit. Moving the Warriors to San Francisco is all about getting more money for the out-of-state owner of the Warriors. Think luxury boxes and increased ticket prices. Just like Larry Ellison after extracting concessions for the America's Cup abandoned San Francisco and chose to go to San Diego for the next Cup, do you think the Warrior's owners are acting in the best interest of the Bay Area. The ads they have placed in the Chronicle using sports figures like Joe Montana to promote their scheme is pure hypocrisy. Where was Joe when the 49ers moved, looking to invest in real estate in Santa Clara. Remember how San Francisco felt when the Yorks moved the 49ners. Let's put a stop to such behavior. Maybe we should be talking about with public ownership of sports teams such as in Green Bay and demand the owners provide that as a condition of locating in a city. Over the 40 years between championships, the arena in Oakland has been sold out regardless of the Warrior's record. There is no reason to move the Warriors from Oakland. The Coliseum site has much better access, particularly to public transportation than the proposed Mission Bay site adjacent to a new hospital. One only needs to go to ATT Park and recognize the traffic problems when the Giants are playing. Hopefully, you do not need to see a doctor when the Warrior's are playing. Its about time that we see professional sports teams as a benefit to the entire Bay Area and that we plan for multiple venues so all cities can share the benefit and burdens. This is the true "sharing" economy. 1 [GEN-5]

ROBERT F. KANE

O-MBA1L1

Law Offices of
THOMAS N. LIPPE, APC

201 Mission Street
12th Floor
San Francisco, California 94105

Telephone: 415-777-5604
Facsimile: 415-777-5606
Email: Lippelaw@sonic.net

June 29, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: **Request for extension of comment period.** Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms. Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance, an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project").

I write to request a 45-day extension, to September 3, 2015, of the public comment period on the Draft Subsequent Environmental Impact Report ("DSEIR"), currently set to expire on July 20, 2015. This extension is necessary for the public, including my client, to meaningfully comment on the DSEIR.

The Project is a large, multifaceted sports, entertainment, and office complex situated in a densely populated metropolitan area. The Project vicinity is expected to experience large increases in traffic even without this Project. (See San Francisco Transportation Plan, 2040.) Also, the Project setting has a long history of industrial and chemical pollution, yet retains a wide diversity of environmental resources and amenities that are threatened by further development. 1 [ERP-4]

As a result, this DSEIR has a long and complex environmental review history under CEQA, including the 1990 FEIR for the Mission Bay Plan, the 1998 FSEIR for the Mission Bay North Redevelopment Plan and the Mission Bay South Redevelopment Plan, and nine addenda to the 1998 Mission Bay FSEIR (completed between 2000 and 2013) for specific developments within Mission Bay that required additional environmental review beyond the 1998 FSEIR. (See DSEIR, p. 2-4 - 2-

5.)

Consequently, 45-days is simply not enough time to meaningfully review and comment on the DSEIR. Indeed, in recognition of the depth and complexity of the environmental review needed for the Project, the City recently obtained a one year extension (from January 1, 2016, to January 1, 2017),[1] from the state legislature of the deadline by which the City must certify the Project's Final SEIR in order to qualify for the "super fast track" litigation schedule provided in AB 900 (codified at Public Resources Code section 21178 et seq.).

The City has been engaged in the environmental review of development in Mission Bay for over 25 years. The City has also been engaged in the environmental review of the Warriors Arena Project for over a year, since April 29, 2014,[2] or at least since preparing the June 24, 2015, Administrative Draft of the DSEIR. Further, with the comment period ending on July 20, 2015, the City will have almost a year and a half to respond to public comments and issue the Final SEIR, and process any appeal of the FSEIR certification to the Board of Supervisors and still take advantage of AB 900's "super fast track" litigation schedule.[3] 1 [ERP-4] cont.

These facts reveal an EIR preparation schedule that confers a vast advantage on the City over members of the public who do not share the City's strong desire to locate the Warriors arena in Mission Bay. In the interests of fairness and meaningful public participation in the EIR process, the City should extend the comment period on the DSEIR for at least 45 additional days, to September 3, 2015. Indeed, public participation in the EIR process is fundamental state policy:

> An EIR is an "environmental 'alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return." [citations omitted] The EIR is also intended "to demonstrate to an apprehensive citizenry that the agency has, in fact, analyzed and considered the ecological implications of its action." [citations omitted] Because the EIR must be certified or rejected by public officials, it is a document of accountability. If CEQA is scrupulously followed, the public will know the basis on which its responsible officials either approve or reject environmentally significant

[1]See Public Resources Code section 21189.1.

[2]See April 29, 2014, CCII Agenda, Item # *.

[3]The deadline for filing the EIR appeal is 30-days after OCII certifies it. The clerk is required to schedule the hearing on the appeal no earlier than 21-days and no later than 45-days after the 30-day appeal period expires. (San Francisco Administrative Code § 31.16.)

> action, and the public, being duly informed, can respond accordingly to action with which it disagrees. [citation omitted] The EIR process protects not only the environment but also informed self-government.

Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 392.) 1 [ERP-4] cont.

Thank you for your attention to this matter.

Very Truly Yours,

Tom Lippe

Thomas N. Lippe

cc:
Bruce Spaulding
Susan Brandt-Hawley
Osha Meserve
Josh Schiller

SOLURI MESERVE
a law corporation

tel: 916.455.7300 · fax: 916.244.7300
1010 F Street, Suite 100 · Sacramento, CA 95814

July 9, 2015

SENT BY U.S. MAIL AND EMAIL (warriors@sfgov.org**)**

Tiffany Bohee
Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Notice Regarding Incomplete Record for Warriors Event Center Environmental Review

Dear Ms. Bohee and Mr. Bollinger:

This firm represents the Mission Bay Alliance with respect to the Warriors Event Center project. Under Public Resources Code section 21186, which pertains to preparation of the administrative record for projects under the AB 900 "Environmental Leadership" process:

> (a) The lead agency for the project shall prepare the administrative record pursuant to this division concurrently with the administrative process.
> (b) All documents and other materials placed in the administrative record shall be posted on, and be downloadable from, an Internet Web site maintained by the lead agency commencing with the date of the release of the draft environmental impact report.
> (c) The lead agency shall make available to the public in a readily accessible electronic format the draft environmental impact report and all other documents submitted to, or relied on by, the lead agency in the preparation of the draft environmental impact report. 1 [AB-2]

Upon review of the records posted at www.gsweventcenter.com it is apparent that all of the available documents that would be part of the record as defined by Public Resources Code section 21167.6, subdivision (e) are not included. For instance, references cited in the 2015 DSEIR, 2014 NOP/Initial Study, the 1998 Mission Bay SEIR and the 1990 Mission Bay EIR are not included. These references would fall under both Public Resources Code section 21186, subdivision (c) (documents relied upon by lead agency) as well as Public Resources Code section 21167.7, subdivision (e)(10) (materials relevant to compliance with CEQA). (See also CEQA Guidelines, § 15150, subd. (b)

("Where part of another document is incorporated by reference, such other document shall be made available to the public . . . .).)

As just one example, a cultural resources evaluation that was prepared for the 1990 Mission Bay EIR and referenced in the 2014 NOP/Initial Study that is the basis of the entire cultural resources section is also missing.[1] Since the 2015 DSEIR completely relies on analyses found in prior environmental review documents for analysis of cultural impacts (and several other resources), it is essential that the public have access to all of the documents that form the basis for this analysis. Additionally, some references in the 2015 DSEIR are not yet included on the website. For instance, the 2015 DSEIR cites to "54 Federal Register 38044, September 14, 1989." (DSEIR, p. 5.4-13, fn. 21.) This office has also already requested several reference documents cited in the NOP/Initial Study and other reference documents that are critical to analysis of seismic hazards for the site and appreciates your attempts to locate those documents. (See email attached as Exhibit A.) 1 [AB-2] cont.

Moreover, we believe that not all of the correspondence regarding the project has been posted. (See Pub. Resources Code, §§ 21167.6, subd. (e)(7), (10), 21186, subd. (c).) Specifically, all of the documents responsive to Mr. Spaulding's May 18, 2015 Sunshine Act/Public Records Act request would properly be included in the record and appear to not yet be posted on the record website.

AB 900 expressly mandates that a complete record be posted online at the time of release of the DSEIR in order to receive streamlining benefits. (Pub. Resources Code, § 21167.6, subd. (b).) As those documents already in existence that comprise the record have not yet been posted, the 45-day comment period has not properly commenced, and may only commence when all of the documents now in the City/OCII's possession that constitute the record are posted. The current comment deadline of July 20, 2015, will need to be extended accordingly. Until there is compliance with the record posting requirements of Public Resources Code section 21086, this project cannot proceed under the AB 900 process. 2 [ERP-4]

[1] "Cultural Resources Evaluation for the Mission Bay Project, San Francisco, CA" Dec. 1987, prepared by David Chavez & Associates. This report is cited at page VI.J.30 of the 1990 EIR and referenced on page 46 of the November 19, 2014 NOP/Initial Study. There is also a 1997 Archaeological resources review, also prepared by David Chavez & Associates, and referenced in the Initial Study that is not included in the online record.

O-MB2S1

Please feel free to call me to discuss proper resolution of the issue of the posting of a complete record as required under the AB 900 process. I also request immediate confirmation that the 45-day DEIR comment period will not commence until the necessary documents, as set forth above, are posted in compliance with AB 900. We look forward to your prompt response. 2 [ERP-4] cont.

Very truly yours,

SOLURI MESERVE
A Law Corporation

By:
Osha R. Meserve

ORM/mre

Attachment: Exhibit A

cc: Sarah Jones, Director of Environmental Planning (Sarah.B.Jones@sfgov.org)
John Rahaim, Director of SF Planning (John.Rahaim@sfgov.org)
Kate Stacy, Deputy City Attorney (kate.stacy@sfgov.org)

O-MB2S1

EXHIBIT A

Mae Empleo

From: Osha Meserve <osha@semlawyers.com>
Sent: Tuesday, July 07, 2015 4:38 PM
To: 'Warriors, PLN (CPC)'
Subject: RE: Request for EIR Reference Documents

Hi Brett,
Thank you for your call. The date of the report linked below is March 28, 2008, whereas the date of the document referenced on p. 3 of the April 11, 2014 Updated Phase I Assessment is March 7, 2008. The document title appears to be the same, but if there was a prior draft, we would request that as well.

Here are the additional source documents citations to references that my consultant has identified as essential to his review of the DSEIR:

1. The September 17, 1998 SEIR, Section V.H.5 cites a 1995 geotechnical investigation by Treadwell & Rollo, Inc. The reference listed "/15/" for that report cites to "The results of earlier geotechnical investigations are discussed in the 1990 FEIR, Volume One, pp. II.76-II.77, and Volume Two, pp. VI.K. 1-VI.K. 11, VI.K.24-VI.K.30.*"

   The 1995 Treadwell & Rollo report is needed for review.

2. Reference "/16/" cites to the following:
   Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, Lori A. Simpson, PE, and Frank L. Rollo, PE, Proposed UCSF Site, Mission Bay, San Francisco, CA, letter report to Kerstin Magary, Catellus Development Corporation, 31 October 1994, 2 pages accompanied by 38 figures; Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, Loft A. Simpson, PE, letter to EIP Associates, March 12, 1997, 1 page accompanied by 6 figures.

   The 1994 Treadwell & Rollo report letter report and 1997 letter report are needed for review. 3 [ERP-3]

3. Recent Geotechnical Reports: The only geotechnical report that is listed on the http://www.gsweventcenter.com/ site is a March 28, 2014 Preliminary Geotechnical Evaluation by Langan Treadwell Rollo. This letter report is lacking any site data or analysis. The report presents conclusions and recommendations based on unidentified previous site investigations. The supporting data/reports/analysis should be identified and presented for review.

4. According to the June 2015 Phase II ESA by Langan Treadwell Rollo, the following geotechnical reports have been completed for the site:

   Langan, 2011. Geotechnical Investigation, Blocks 29-32, Mission Bay, San Francisco, California. 21 December.

5. According to the April 11, 2014, Update Phase I, ESA by Langan Treadwell Rollo, the following geotechnical reports have been completed for the site:

   Treadwell & Rollo (T&R), 2007. Geotechnical Investigation, Block 30, Mission Bay, San Francisco, California. 17 October.
   T&R, 2008. Preliminary Geotechnical Evaluation, Blocks 29-32, Mission Bay, San Francisco, California. 7 March.

O-MBA2S1

T&R, 2008. Preliminary Geotechnical Evaluation, Blocks 33-34, Mission Bay, San Francisco, California. 29 May. 3 [ERP-3] cont.

I look forward to receiving the documents previously requested on July 3rd, as well as those listed above, as soon as possible as they are needed for our review and comment on the DSEIR.

Best regards,
Osha

Osha R. Meserve
(916) 455-7300

From: Warriors, PLN (CPC) [mailto:warriors@sfgov.org]
Sent: Tuesday, July 7, 2015 4:06 PM
To: Osha Meserve
Subject: RE: Request for EIR Reference Documents

The second of the 3 documents listed is included on the GSW AB900 website

http://www.gsweventcenter.com/Draft_SEIR_References/2014_0328_Prelim_Geotech_Eval.pdf

From: Osha Meserve [mailto:osha@semlawyers.com]
Sent: Friday, July 03, 2015 1:14 PM
To: Warriors, PLN (CPC)
Subject: Request for EIR Reference Documents

Dear Mr. Bollinger and Ms. Bohee,

We are trying to locate the references listed below from pp. 3-4 the Phase I Environmental Site Assessment dates April 11, 2014 that was prepared by Langan Treadwell Rollo that is posted at the Record website (http://www.gsweventcenter.com/). The direct link to the document is: http://www.gsweventcenter.com/Draft_SEIR_References/2014_0411_Updated_Phase_1_ESA.pdf.

Treadwell & Rollo (T&R), 2007. Geotechnical Investigation, Block 30, Mission Bay, San Francisco, California. 17 October. 4 [ERP-3]

T&R, 2008. Preliminary Geotechnical Evaluation, Blocks 29-32, Mission Bay, San Francisco, California. 7 March.

T&R, 2008. Preliminary Geotechnical Evaluation, Blocks 33-34, Mission Bay, San Francisco, California. 29 May.

Would you please provide these documents to me?

Thanks,
Osha

Osha R. Meserve
Soluri Meserve
1010 F Street, Suite 100
Sacramento, CA 95814
tel: 916.455.7300 ▪ *fax:* 916.244.7300 ▪ *mobile:* 916.425.9914 ▪ *email:* osha@semlawyers.com

MISSIONBAY ALLIANCE

July 26, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045: **EIR Tiering**

Dear Director Bohee and Mr. Bollinger:

The undersigned counsel for the Mission Bay Alliance write on the Alliance's behalf regarding a threshold procedural issue affecting the Draft Subsequent EIR ("DSEIR") for the Warriors Event Center & Mixed Use Development (the "Project"). The DSEIR unlawfully tiers to prior CEQA documents.

The Mission Bay Alliance objects to the improper use of "tiering" to avoid analysis of important environmental issues in the DSEIR. Both the NOP/IS and the DSEIR announce that they "tier" to the 1998 Mission Bay EIR pursuant to CEQA Guideline 15168(c). (NOP/IS, pp. 23-24; DSEIR, pp. 1-1, 5.1-2, 3.) Both the NOP/IS and the DSEIR exclude resource topics from the DSEIR based on standards CEQA provides to determine when a subsequent EIR is required under Public Resources Code ("CEQA") section 21166 and Guideline section 15162. (See NOP/IS, pp. 23-25; DSEIR, p. 5.1-3.) 1 [ERP-7]

Based on these predicates, the City prepared a focused EIR and conducted no environmental review regarding Biological Resources, Aesthetics, Land Use, Cultural Resources, Paleontological Resources, Geology and Soils, Recreation, Hazardous Materials, and Population and Housing. The exclusion of those topics from the DSEIR is erroneous as a matter of law and precludes informed public review.

"Tiering" under CEQA is not permitted where the later project is a separate project from the earlier project, where the EIR for the earlier project did not include an analysis of the environmental impacts of the later project, or where the later project is inconsistent with the "program, plan, policy, or ordinance for which an environmental impact report has been prepared and certified" or is inconsistent with "applicable local land use plans and zoning of the city, county, or city and county in which the later project would be located." (*Center for Sierra Nevada Conservation v. County of El Dorado* (2012) 202 Cal.App.4th 1156, 1173 (*Sierra Nevada Conservation*); *Sierra Club v. County of Sonoma* (1992) 6 Cal.App.4th 1307, 1318; CEQA, § 21094(b).) 1 [ERP-7] cont.

Here, as shown in the "Land Use" section of the July 26, 2015, letter from the Brandt-Hawley Law Group, the Project is not consistent with the Mission Bay Redevelopment Plan or with the land use plans and zoning controls that are subordinate to the Mission Bay Redevelopment Plan. None of them include, anticipate, or allow a 750,000 square foot Event Center! The 2015 DSEIR also states that the Project requires "amendments to the Mission Bay South Design for Development, and modifications to the Mission Bay South Signage Master Plan and Mission Bay South Streetscape Plan, and conditions of approval," among other changes, in the list of approvals required for the Project. (DSEIR, p. 3-51.) 2 [PD-1]

These major differences between the project described in the 1998 FSEIR (that evaluated the effects of developing the Mission Bay plan area as described in 1998 [see DSEIR Figure 3-7]) and the Warriors Event Center and Mixed Use Development now being proposed, preclude tiering under CEQA section 21094. Therefore, the City cannot use a "tiered" EIR and the DSEIR must be reissued in "non-tiered" form. 3 [ERP-7]

Further, the exclusion of resource topics from the DSEIR is not, as the NOP/IS and DSEIR presume, governed by CEQA section 21166 and Guideline section 15162 or their standards. Pursuant to section 21151, the DSEIR must analyze the Project's impacts on any environmental resource for which substantial evidence supports a fair argument of significant impact. (*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099 ["EIRs must "consider and resolve every fair argument that can be made about the possible significant effects of a project."]; see also, *Sierra Nevada Conservation, supra*, 202 Cal.App.4th 1156, 1173 ["If a proposed new activity is a separate project, the "fair argument" test should apply to an agency's decision whether to require a tiered EIR.] Sierra Nevada Conservation cited the holding of *Sierra Club v. County of Sonoma, supra*, 6 Cal.App.4th 1307, 1318, that under the fair argument test, "deference to the agency's determination is not appropriate and its decision not to require an EIR can be upheld only when there is no credible evidence to the contrary." (Ibid.) *Sierra Club* applied the fair argument standard to a proposed project that was not "either the same as or within the scope of" the program described in the EIR. (*Sierra Club, supra*, 6 Cal.App.4th 1307, 1321.)

3 [ERP-7] cont.

As discussed in comment letters submitted on behalf of the Mission Bay Alliance, evidence relating to these excluded resource topics meets the "fair argument" standard. Although CEQA section 21166 does not apply here, its standards are also met. Therefore, the City must prepare and recirculate for public review a Revised Draft EIR addressing all Project-related environmental impacts. (Since this is a stand-alone EIR, the title 'Subsequent' is a misnomer.)

To the extent the City chooses to use data from the 1990 or 1998 Mission Bay EIRs, that information must be restated in the Revised Draft EIR in a manner that results in a single, cohesive, understandable document meeting CEQA's mandates for adequacy, completeness, and a good faith effort at full disclosure. (Guideline § 15151.)

O-MBA3

Thank you for your attention to this matter.

Sincerely,

Thomas N. Lippe	Susan Brandt-Hawley	Osha Meserve	Patrick Soluri

cc: Bruce Spaulding

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July 26, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045: **AB 900 and Litigation Streamlining**

Dear Director Bohee and Mr. Bollinger:

The undersigned counsel for the Mission Bay Alliance write on the Alliance's behalf regarding the Draft Subsequent EIR ("DSEIR") for the Warriors Event Center & Mixed Use Development (the "Project"). The City's failure to post online administrative record documents before starting the DSEIR comment period renders the Project ineligible for the litigation streamlining provisions of AB 900.

On July 9, 2015, the Mission Bay Alliance advised the City that it had failed to post available portions of the administrative record online as required by CEQA section 21186, subdivision (b), and as a result, the 45-day comment period on the DSEIR could not commence. The City responded on July 16, 2015, stating that the record was complete and that the documents alleged to be missing were not considered by the City in preparing the DSEIR. The City also extended the public comment period by a mere seven days, a decision it explained elsewhere was to "account for any time off that the public may have enjoyed over the Independence Day holiday." (July 15, 2015, Letter from OCII to Tom Lippe.)

1
[AB-2]

The City's position ignores CEQA's statutory language regarding the required content of the record. Under CEQA section 21186, subdivision (a), preparing the "administrative record pursuant to this division" means that the record posted must include all of the available documents that are part of the record as defined by section 21167.6, subdivision (e).[1] The 45-day public comment period cannot begin until all existing administrative record documents are posted to the City's record website.

Regarding specific documents the City has omitted from its record website, the City has taken the position that references cited in the 2015 DSEIR, 2014 NOP/Initial Study, the 1998 Mission Bay SEIR and the 1990 Mission Bay EIR are not part of the record and that the online record is complete. But this position is entirely at odds with the City's reliance on a tiered SEIR. Since the 2015 DSEIR relies completely on analyses found in prior environmental review documents to avoid analysis in the DSEIR of at least half the CEQA mandated resource areas, it is essential that the public have access to all of the documents that form the basis for these analyses.

1
[AB-2]
cont.

Additionally, the online record is missing additional categories of documents. For example, the City has failed to post correspondence among City employees and with consultants regarding the project. The Mission Bay Alliance understands that several different consultants and City agencies are involved in the project, yet there is not even a category on the record website for this correspondence. These materials are part of the record. (CEQA §

[1]The City cannot argue AB 900 implicitly repealed section 21167.6 because the Legislature is presumed aware of existing law when it acts (see, e.g., *Voters for Responsible Retirement v. Board of Supervisors* (1994) 8 Cal.4th 765, 779, fn. 3). This is especially true here, where the relevant definition is within the same statute the Legislature amended.

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21167.6, subd. (e)(2).) The City has also failed to post agendas and staff notes from ongoing weekly City meetings regarding this Project and its environmental review.[2]

There has also been staff correspondence regarding the procedures applicable to the online record, such as a June 10, 2015, ESA memorandum entitled: AB 900 Administrative Record Update Procedures for the Golden State Warriors Event Center and Mixed Use Development at Mission Bay Blocks 29-32.

These are just a few examples of how the City has not carried out its obligation to post all available record documents online before commencing the 45-day comment period. Contrary to the position taken in the City's July 16, 2015, letter, which implies the public must identify the missing documents, it is the City's duty to locate, index, and post the documents comprising the record.

1 [AB-2] cont.

AB 900 requires the City to post all available record documents online when the DSEIR is issued in order to receive its litigation streamlining benefits. For this purpose, "record documents" is defined in CEQA section 21167.6, subdivision (e). The City cannot have it both ways. It cannot violate AB 900's record posting requirements and at the same time enjoy the benefits of AB 900's litigation streamlining provisions. Therefore, in order to take advantage of AB 900's litigation streamlining provisions, the City must post all existing record documents before commencing the 45-day comment period. Otherwise, the Project is ineligible for the streamlining provisions of AB 900.

[2]To the extent these documents are posted, they are not individually indexed as required. (See Cal. Rules Court, rule 3.2205.)

O-MBA4

Thank you for your attention to this matter.

Sincerely,

Thomas N. Lippe   Susan Brandt-Hawley   Osha Meserve   Patrick Soluri

cc: Bruce Spaulding

\\Lgw-12-19-12\tl\Mission Bay\Administrative Proceedings\Co Counsel\C009e AB 900 streamlining comment.wpd

MISSIONBAY ALLIANCE

July 27, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

I am writing on behalf of the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter. 1 [GEN-5, PD-1]

The Alliance opposes this Project because it will change the Mission Bay community and environment in ways never envisioned when the Mission Bay Redevelopment Plan was adopted in 1998, and because the City's Draft Subsequent Environmental Impact Report ("DSEIR") for the project does not present a good faith, adequate analysis of these impacts. 2 [ERP-6

The Alliance has retained several experienced CEQA attorneys to review and comment on the DSEIR, including Tom Lippe of the Law Offices of Thomas N. Lippe, Susan Brandt-Hawley

of the Brandt-Hawley Law Group, and Patrick Soluri and Osha Meserve of Soluri Meserve. Counsels' comments letters, and their retained consultants' reports, are being submitted to the City under separate cover. A complete inventory of these letters to date is presented at the end of this letter.

The DSEIR is noteworthy because it concedes the Project will cause numerous significant impacts on the Mission Bay community and environment (e.g., traffic, air pollution, noise pollution, and many others). Nevertheless, the Alliance's counsel have discovered many deep flaws in the DSEIR that obscure the true scope and severity of the Project's impacts. 3 [ERP-9]

For example, based on the incorrect premise that the DSEIR is permitted to "tier" to a seventeen year old prior EIR, the DSEIR fails to even discuss half of the environmental topics that an EIR would ordinarily include. One of these excluded topics is "land use." This is truly remarkable considering that the 1998 Redevelopment Plan to which this DSEIR attempts to tier never contemplated a major sports and entertainment center of this type and scale. Instead, the Arena will divert land and civic resources away from the land uses, i.e., health sciences and biotechnology, that the 1998 Redevelopment Plan was intended to promote. 4 [ERP-7]

In another example, the DSEIR's analysis of the Arena's severe traffic impacts is artificially and arbitrarily limited to the Mission Bay area plus a handful of additional intersections and freeway ramps. The Alliance's traffic engineers demonstrate, in a more objective analysis, that the Arena's traffic snarling influence will extend much farther into SOMA, Downtown, and Dogpatch areas. 5 [TR-2b] The DSEIR also ducks revealing more bad news about the Arena's cumulative impact on traffic in the years following its construction. Instead of projecting cumulative traffic effects 5 to 10 years out, the DSEIR offers up a virtually meaningless projection for the year 2040, fully 25 years in the future. 6 [TR-2h]

The DSEIR also offers no data to support its conclusion that Arena events will not interfere with emergency access to UCSF Hospital. Instead, it offers weak rationalizations, such as the idea that drivers are supposed to get out of the way of emergency vehicles. But it is common knowledge that in special event situations, and even on normal days in SOMA, 7 [TR-9]

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vehicles are often queued bumper-to-bumper and pedestrians are swarming the crosswalks. In these situations, drivers often cannot clear the way for emergency vehicles. Regardless of the DSEIR's prevarications to the contrary, this scenario *will* occur during basketball games and ambulances *will* be delayed. 7 [TR-9] cont.

Even the DSEIR's assumptions made about the available parking supply present a stark departure from the reality of parking conditions at Mission Bay and underscore the high level of wishful thinking involved in selling a project wholly incompatible with this region. The project itself only includes 200 onsite parking spaces specifically dedicated for the arena's use. Yet, rather than concede the limited onsite parking, the DSEIR suggests that ample parking will be available to serve the arena's needs by listing all 9,135 possible parking spaces in the Mission Bay region, including street parking. Unfortunately, the vast majority of those spots are currently reserved by UCSF hospitals, UCSF facilities, the Giant's stadium and neighboring businesses, and the DSEIR lacks any evidence to support the assumption that any of these spaces - let alone the majority - will be available for use by arena patrons. It also fails to explore the impact on neighboring communities in the Dogpatch and Potrero Hill areas that will bear the burden of accommodating the thousands of additional cars seeking, but unable, to park in Mission Bay. 8 [TR-13]

These are but a few of dozens of legal defects the Alliance's counsel found in the DSEIR. The volume, scope, and depth of the DSEIR's legal flaws demand, and suggest, an explanation. It appears the Warriors and the City have been in such a rush to get this Project approved and built that they have ignored elementary principles of environmental analysis and CEQA law in the process. The sources of this haste are presumably the previous January 1, 2016, deadline, now extended to January 1, 2017, to certify the EIR in order to obtain the litigation streamlining benefits of AB 900, and the expiration, in late September of 2015, of the Warriors option to purchase the site from Salesforce.com. 9 [ERP-6]

Given the Arena's many severe environmental and community impacts, and the DSEIR's attempt to sweep many of these issues under the rug, the Alliance urges the City to slow down 10 [PD-1]

and carefully consider both the legality of siting the Arena in Mission Bay as well as the lack of wisdom in doing so. 10 [PD-1] cont.

A list of the Alliance's counsels' and consultants' comment letters follow. 11 [ERP-3]

Thomas Lippe, Susan Brandt-Hawley, Patrick Soluri, and Osha Meserve have jointly submitted the following comment letters on Alliance letterhead:

1. July 26, 2015, letter regarding EIR tiering; and

2. July 26, 2015, letter regarding litigation streamlining under AB 900.

Thomas Lippe has submitted the following comment letters and consultant reports:

3. July 24, 2015, letter regarding impacts on Hydrology, Water Quality, and Biological Resources, including:

    a. July 21, 2015, letter report authored by Matt Hageman, P.G., C.Hg., QSD, QSP; and

    b. July 21, 2015, letter report authored by Erik Ringelberg, B.Sc., M.Sc., Ph.D candidate; and Kurt Balasek, PG, CHg, QSD.

4. July 25, 2015, letter regarding impacts on Noise and Vibration, including:

    a. July 24, 2015, letter report authored by acoustic engineer Frank Hubach.

5. July 26, 2015, letter regarding impacts on Air Quality, including:

    a. July 19, 2015, letter report authored by Greg Gilbert; and

    b. July 20, 2015, letter report authored by Paul Rosenfeld, Ph.D, and Jessie Jaeger.

6. July 27, 2015, letter regarding impacts on Transportation, including:

a. July 23, 2015, letter report authored by traffic engineer Dan Smith; and

b. July 21, 2015, letter report authored by traffic engineer Larry Wymer.

7. June 29, 2015, letter requesting an extension of the public comment period on the DSEIR.

Susan Brandt-Hawley has submitted the following comment letter:

8. July 26, 2015, letter regarding impacts on Land Use, Aesthetics, Cultural Resources, and Project Alternatives.

Patrick Soluri and Osha Meserve have submitted the following comment letters and consultant reports:

9. July 26, 2015, letter regarding impacts on Geology and Soils, Recreation, Hazardous Materials, , Greenhouse Gases, Wind and Shadow, Utilities and Service Systems, Public Services, Energy and Urban Decay, including:

a. July 22, 2015, letter report authored by air quality professionals Patrick Sullivan, CPP, REPA, and Joh Henkelman, regarding Greenhouse Gas Emissions;

b. July 22, 2015, letter report authored by geotechnical engineer Lawrence Karp, CE, CEG, regarding Geology and Soils impacts;

c. July 22, 2015, letter report authored by engineering geologist Marin Cline, CEG, and hydrogeologist Kurt Balasek, PG, CHg, QSD, regarding Geology and Soils impacts);

d. July 22, 2015, letter report authored by geotechnical engineer Martin Cline, GEG and Kurt Balasek, PG, CHg, QSD, regarding Hazardous Materials; and

e. July 22, 2015, letter report authored by economist Philip King, Ph.D., regarding Urban Decay.

11 [ERP-3] cont.

10. June 29, 2015, letter regarding the City's failure to comply with AB 900 record keeping procedures and the resultant ineligibility of the Project for AB 900's litigation fast track procedures. 11 [ERP-3] cont.

The Board of Directors of the Mission Bay Alliance fully supports and endorses the comment letters and reports listed above, and respectfully urges the City to remedy the DSEIR's informational deficiencies and circulate a Revised DSEIR for a 45 day public comment period. 12 [ERP-5]

Thank you for your attention to this matter.

Sincerely,

Bruce Spaulding
On Behalf of the Mission Bay Alliance

C007i MBA comment.wpd

Brandt-Hawley Law Group

Chauvet House • PO Box 1659
Glen Ellen, California 95442
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preservationlawyers.com

July 26, 2015

Tiffany Bohee, OCII Executive Director
Brett Bollinger, EIR Coordinator
via email warriors@sfgov.org

Subject: Comments on the Draft Subsequent EIR
Warriors Event Center & Mixed Use Development
Mission Bay Blocks 29-32
OCII: ER 2014-919-97 Planning Dept.: 2014.1441E

Dear Director Bohee and Mr. Bollinger:

On behalf of the Mission Bay Alliance ("the Alliance"), please respond to these enumerated comments on the Draft Subsequent EIR vis-à-vis project alternatives as well as the analysis and mitigation of aesthetics, land use, and cultural resources impacts. Substantial omissions in these topic areas require revision and recirculation of the EIR to inform the discretion of the City and to apprise the concerned public. 1 [ERP-5, ERP-9]

1. The Mission Bay EIRs Did Not Consider an Event Center

EIRs, including the Draft Subsequent EIR ("the DSEIR"), are measured for "adequacy, completeness, and a good faith effort at full disclosure." (CEQA Guidelines, § 15151.) Whether the Event Center EIR analysis meets that measure presents a question of law. (*E.g., Vineyard Area Citizens v. City of Rancho Cordova* (2007) 40 Cal.4th 412, p. 435.)

An overarching problem with the DSEIR is its misapplication of CEQA via a conclusory reliance on earlier CEQA documents — the 1990 Mission Bay EIR and 1998 Mission Bay Subsequent EIR — prepared for the Redevelopment Plan for the Mission Bay South Redevelopment Project and its related Design for Development. The City cannot now rely on those EIRs because both the Redevelopment Plan and the Design for Development contemplated no uses comparable to the Event Center. Its environmental effects were *not* "adequately examined by an earlier EIR." (Pub. Resources Code, § 21094; Guidelines, § 15063.) 2 [ERP-6]

Every environmental issue that has potentially significant impacts must be addressed in a project-specific EIR for the Event Center, and feasible mitigations and alternatives must be identified. The City instead improperly "tiered" the DSEIR from the prior Mission Bay EIRs to evade full environmental analysis, as counsel for the Alliance have explained in a separate letter. Consequently, the DSEIR fails to analyze many of the potentially significant project-specific environmental impacts of the Event Center. As in *Center for Sierra Nevada Conservation v. County of El Dorado* (2013) 202 Cal.App.4th 1156, a revised stand-alone EIR must do so. 3 [ERP-7]

This letter will address the DSEIR's omitted analyses of critical project-specific impacts relative to land use, aesthetics, and cultural resources. 4 [ERP-9]

2. The Draft Subsequent EIR Must Address Land Use

The Notice of Preparation and Initial Study ("NOP/IS" or "Initial Study") acknowledges that, per the 1998 Mission Bay EIR, "the Mission Bay Redevelopment Plans and Design for Development documents … constitute the regulatory land use framework for the Mission Bay plan area." (NOP/IS, p. 30.) The Initial Study finds no need to address land use issues in the DSEIR, contending that the Event Center would not conflict with land use policy, divide a community, or substantially impact area character. (NOP/IS, p. 27). Without additional discussion, the DSEIR agrees, reiterating that project land use impacts are insignificant and that no environmental analysis is required. (DSEIR, pp. 1-49, 5.1.1.)

While clearly aware that CEQA requires revision of the DSEIR to address the project's conflicts with Mission Bay land use policies and significant adverse impacts to community character, the City simply kicks the can down the road: 5 [LU-2]

> As part of the project approval process, OCII, the San Francisco Planning Commission, and other relevant regulatory agencies *would determine* whether the proposed project is consistent with their respective plans as applicable to the proposed project. Thus, the proposed project would have a less-than-significant impact with regard to conflicts with land use plans, policies, or regulations adopted for the purpose of avoiding or mitigating an environmental effect.

(NOP/IS, p. 31, italics added.) This statement implicitly acknowledges the requirements of

Appendix G of the CEQA Guidelines. Under Appendix G, Section X, a project's potentially-significant conflicts with land use plans that were adopted for environmental protection or mitigation must receive environmental review in an EIR. A rote finding by a lead agency that simply assumes that a project will comply with such land use plans via future action by involved regulatory agencies cannot substitute for the analysis contemplated by Appendix G. (*The Pocket Protectors v. City of Sacramento* (2004) 124 Cal.App.4th 903.)

The Event Center's Draft Subsequent EIR does just that; unlawfully deferring the analysis and enforcement of land use plan consistency. The DSEIR must be revised and recirculated to provide environmental analysis and mitigation. EIRs must "consider and resolve every fair argument that can be made about the possible significant effects of a project." (*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099.) Here, the record illustrates many inconsistencies with land use plans and policies that have potentially significant environmental impacts:

5 [LU-2] cont.

a. *The Event Center is not 'Nighttime Entertainment' as Defined in the Mission Bay South Redevelopment Plan*. The primary objective of the Warriors Event Center is to "[c]onstruct a state-of-the-art multi-purpose event center in San Francisco that meets NBA requirements for sports facilities […]" (DSEIR, p. 1-3.) The Mission Bay South Redevelopment Plan designates Blocks 29-32 as Commercial Industrial/Retail. While the mixed-use commercial/retail development portion of the project is an allowed primary use, the Event Center itself would have to qualify as "Assembly and Entertainment: Nighttime Entertainment" in order to be approved as an allowed "secondary use" under the Plan.

The Initial Study pronounces that the Event Center — the *primary* project use — is encompassed within the *secondary* "nighttime entertainment" use analyzed in the Mission Bay EIR and is thus allowed on the Commercial Industrial/Retail site. The City contends that the Event Center is a nighttime entertainment use per the 1998 EIR, although "the size and intensity of the event center use was not previously analyzed." (NOP/IS, p. 33.)

6 [PD-1]

This is not based on fact. Aside from being a "secondary" use of the site, the Warriors Event Center does not meet the plain language of the "nighttime entertainment" designation that anticipates and encompasses small-scale clubs, restaurants, and bars. (Mission Bay South Redevelopment Plan, p. 50.) At the time of the 1998 EIR, several small neighborhood bars occasionally offered nighttime entertainment. This minor "secondary" use that existed in the area thus appeared to be compatible with the 3rd Street Corridor and the waterfront. Nothing in the definition of "nighttime entertainment" anticipates or

allows a venue of the type or at the scale now proposed for the Event Center.

The 1998 Mission Bay EIR focused on entertainment-oriented commercial development in Mission Bay North, "intended to complement" the San Francisco Giants Ballpark. The 1998 EIR anticipated almost 400,000 square feet of related entertainment-oriented retail ancillary to the ballpark, including a theater complex of up to 25 screens. If a regional event venue had been anticipated in Mission Bay South, the 1998 EIR would have called it out. It is also telling that "entertainment-oriented retail" in Mission Bay South was projected at only 56,000 square feet, 15% of the size anticipated in Mission Bay North. (1998 Mission Bay EIR, pp. III.2, 10-11; *see also* 1998 CEQA Findings, Mission Bay Plan [projecting only 50,000 square feet of entertainment-oriented retail].)

6 [PD-1] cont.

And while professional basketball games are nighttime events, the Event Center also anticipates 31 annual events "related to conventions, conferences, civic events, corporate events and other gatherings," with an estimated attendance of between 9,000 and 18,500 patrons. (NOP/IS, p. 15.) "[T]he majority of events are expected to occur during day time hours." (*Ibid.*) The definition of "nighttime entertainment" cannot reasonably stretch to consider over a month of daytime events never contemplated or considered by the 1990 and 1998 Mission Bay EIRs.

In these many respects, the Event Center is inconsistent with the adopted land use plan and has potentially significant impacts that require revision of the EIR.

b. The Event Center Conflicts with Mission Bay South Design Criteria. Despite the Initial Study's contention that the Event Center would be consistent with adopted area land use policies established by the Mission Bay South Redevelopment Plan and the Design for Development, it concedes that the project sponsors seek material changes. The DSEIR anticipates amendments to the Mission Bay South Design for Development, the Mission Bay South Signage Master Plan, and the Mission Bay South Streetscape Plan. The Initial Study notes that the "unique nature of the proposed event center would require the sponsor to receive [City] approval of variations or amendments to some of these standards." (NOP/IS, p. 31.)

7 [PP-1]

The Mission Bay South Redevelopment Plan codifies objectives and policies for urban design that must be applied to the Event Center, including:

Objective 3: Emphasize in Mission Bay South the characteristic

San Francisco development patterns …

Policy 2: Design in consideration of protecting major views of the Bay, the Bay Bridge and the Downtown skyline from Mission Bay South … using street view corridors, open space, the careful placement of building forms and building massing.

Policy 3: Create a visual and physical access to San Francisco Bay and the channel of China Basin.

Policy 4: Recognize that buildings, open spaces and view corridors, seen together, will create the character of Mission Bay South.

Objective 4: Create a building form for the Mission Bay South area such that the scale of new development relates to the adjacent waterfront and to adjacent buildings.

Policy 1: Building heights should decrease as they approach water's edge.

The Event Center proposal creates at least 16 inconsistencies with the Design for Development (D4D), and its Appendix A recites amendments for:

- Raising maximum arena height limits from 90 to 135 feet
- Construction of a 160+ foot tower[1] close to another tower
- Increasing the bulk of the arena
- Changing arena setbacks, street wall heights, view corridors, public rights of way, and parking standards

The addition of large signage, electronic advertising, and nighttime light and searchlight effects that accompany basketball games and other large events also conflicts with design review standards and further impacts aesthetics/view corridors. The Commercial Industrial/Retail zone prohibits flashing signs, moving signs, and roof signs as well as business signs "above 1/2 of the base height of the building." (D4D, p.45.)

7
[PP-1]
cont.

[1] The tower heights exceed 160 feet with the 16-foot mechanical parapet.

Even if amendments to the Design for Development could avoid legal inconsistencies, the proposed removal of codified urban design protections significantly impacts the design of the Mission Bay community and aesthetic environment and requires EIR analysis and mitigation.

The Design for Development also delineates urban design concepts that protect the community character of Mission Bay South via view corridors and a planned street grid that extends "San Francisco's historic urban pattern of Spanish measure Vara blocks." (D4D, p. 39.) "A Vara is an early Spanish unit of measure equal to 2.75 feet." (D4D, p.16.)

> First is an urban street grid which builds off of the primary existing streets and a traditional San Francisco pattern of Vara blocks, to allow for the transformation of an industrial pattern to one which welcomes the buildings and open spaces of a living/working/shopping neighborhood. In the tradition of cities by the water, this same framework of streets serves as view corridors that visually connect Mission Bay to the Bay and the City's downtown.
>
> View corridors are based on the following principles: to preserve the orientation and visual linkages to the Bay and Channel; as well as vistas to hills, the Bay Bridge and the downtown skyline; to preserve orientation and visual linkages that provide a sense of place within Mission Bay.

(D4D, pp. 39, 47.) The Design for Development specifies that "no building or portion thereof shall block a view corridor." (D4D, p. 39.)

As explained in the statewide planning publication *California Planning & Development Report* in a 1998 article praising the Mission Bay South Redevelopment Plan, "a 'vara block' is the same dimension as the first 10 blocks of San Francisco laid out by Vioget in 1839." (*CP&DR*, 1 September 1998, *attached*.) The vara block is not only of historic importance but "has near-ideal dimensions for an urban block" and "helps clarify, if clarity were needed, what precisely makes San Francisco the most walkable city in America: the dimensions of the grid …" "This new plan … promises to extend the pedestrian experience of San Francisco to the newest part of the city."

7
[PP-1]
cont.

CP&DR marvels that the Redevelopment Plan takes a "giant canvas of largely undeveloped waterfront acreage" and uses vara blocks "to integrate this former railyard into the cultural and business life of the larger city." And "what is most remarkable about this scheme is how thoroughly the [UCSF] campus has been integrated into the grid … likened [] to residential blocks in Paris."

The Warriors Event Center proposes to eliminate four blocks, including two vara blocks and two smaller blocks, creating one large single block for the Event Center with structures that obscure both a north-south and east-west view corridor. The DSEIR must be revised to analyze and mitigate the environmental impacts of required amendments to adopted land use plans and policies, addressing the destruction of vara blocks and the related adverse impacts to aesthetics, view corridors, and pedestrian amenities. 7 [PP-1] cont.

While the Initial Study and the DSEIR rely upon Public Resources Code section 21099 to excuse the lack of analysis of aesthetics, claiming that such impacts of a mixed-use project on an infill site within a transit priority area are not subject to CEQA review, the DSEIR acknowledges that the Mission Bay South urban design standards apply to the Event Center project. The DSEIR must still consider aesthetic impacts that are addressed and protected by the City's design review ordinances.

These impacts are significant. The height and bulk of the project, sited directly on the waterfront, will disrupt views and alter the aesthetics and community character carefully planned for Mission Bay South for many years. The City's fundamental vision for Mission Bay would be forever compromised by dropping a tall, bulky sports arena at the water's edge, destroying planned vara blocks and historic view corridors. 8 [ERP-8]

The EIR must be revised to analyze and mitigate the project's inconsistencies with plans and policies in Mission Bay South adopted for environmental protection. 9 [PP-1]

c. The Event Center Will Destroy Planned Community Character.

Development of Mission Bay South has been the subject of intensive planning for 25 years, as reflected in the 1990 EIR, the 1998 EIR, and the Mission Bay Redevelopment Plans. The character of the community revolves around medical and biotechnology development. "Because a major UCSF site would likely be a magnet for biotechnology research, an emphasis on biotechnology is anticipated." (1998 Mission Bay EIR, p. IA.89.) 10 [LU-1]

The Warriors Event Center proposes a signature disruption in the long-planned development of Mission Bay South as a biotechnology and medical hub, and EIR analysis of that planned land use change is required. In comments on the Initial Study, research-based biotechnology company FibroGen, located adjacent to the project site, raised concerns about the Event Center's likely disturbance of the company's "operations, sensitive instrumentation, laboratories, and chemicals," all highly sensitive to noise and vibration. "… [G]iven the Project's significant scope coupled with the sensitivity of FibroGen's use and ongoing operations, … it is critical that the EIR thoroughly disclose and evaluate any potential land use incompatibilities with surrounding land uses."

This major planning detour requires EIR revision and recirculation. 10 [LU-1] cont.

3. The DSEIR's Analysis of Alternatives is Inadequate

Because the Event Center has significant impacts, it *cannot be approved* if feasible alternatives could reduce impacts and still accomplish most project objectives. (Pub. Resources Code, §§ 21002, 21081.) Our Supreme Court reiterated this substantive mandate of CEQA in *Mountain Lion Foundation v. Fish and Game Commission* (1997) 16 Cal.4th 105, pp. 123-134. The Court held that "[u]nder CEQA, a public agency must also consider measures that might mitigate a project's adverse environmental impact, and adopt them if feasible," due to "CEQA's substantive mandate that public agencies refrain from approving projects for which there are feasible alternatives or mitigation measures …"

Appropriately, EIRs explore ways for a project to meet as many applicant goals as possible while protecting the environment to the extent feasible. EIRs must evaluate project alternatives that accomplish most basic project objectives. (Guidelines, § 15126.6 (a).) The courts and the Guidelines require that EIRs analyze a "range of reasonable alternatives to the project, *or to the location of the project*" sufficient "to permit a reasoned choice" of alternatives "that would avoid or substantially lessen" any of the project's environmental impacts. (Guidelines, § 15126.6 (a), (c), (f), italics added.)

The Event Center EIR primarily focuses on three alternatives:

Alternative A: No Project
Alternate B: Reduced Intensity
Alternate C: Off-site at Piers 30-32 and Seawall 330 11 [ALT-1]

The EIR identifies significant project impacts relating to "traffic; wastewater treatment capacity impacts; crowd and amplified noise; UCSF hospital helipad safety; wind hazards; construction; water quality and hazardous materials; and bird collisions." (EIR, pp. 7-9). As already noted and as will be discussed further, there are other likely areas of significant impact as well. 11 [ALT-1] cont.

a. ***The No-Project Alternative Must Comply with Land Use Plans.*** The point of an EIR's analysis of a No Project alternative is "to allow decisionmakers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project." (Guidelines, § 15126.6 (e)(1).) The DSEIR presents Alternative A as its No Project alternative, positing that the Warriors will temporarily remain at Oracle Arena in Oakland and will then likely rebuild or find another site. The EIR fairly assumes that Development at Blocks 29-32 would then occur according to the Mission Bay South Redevelopment Plan and the related Design for Development, without an arena.

However, the DSEIR's depiction of the No Project alternative assumes that without the Event Center the City would allocate most of the remaining development potential anticipated by the Mission Beach South Redevelopment Plan and Design for Development to this site at Blocks 29-32, thus prioritizing its development over other undeveloped sites in the same zone. The unsupported assumption that the site will host a second tower, among other things, overstates the No Project's environmental impacts. 12 [ALT-2]

The Design for Development dictates that three 160-foot towers can be permitted in Height Zone 5, where blocks 29 and 31 are located. (D4D, p. 23.) The No Project alternative assumes that construction of the final tower will be on Block 29. However, UCSF-owned Block 33 is also eligible. Even if the tower is appropriately-assumed to be sited on Block 29, the Design for Development requires that it not exceed 7% of developed area; to wit, 65,954 square feet. The No Project alternative assumes a tower of 208,000 square feet. Overstating impacts does not provide an adequate basis for comparing alternatives.

The No Project size is also inconsistent with other Design for Development requirements. Height Zone 5 permits a total developable area of 942,200 square feet. (D4D, p. 23.) The DSEIR assumes that the no project alternative would encompass 1,087,700 square feet. The DSEIR concedes in a footnote that its estimate of parking stalls exceeds the minimum required; another overstatement:

> Based on the requirements of the South Plan and the Design for Development, a minimum of 1,061 and maximum of 1,081 spaces would be needed for a proposed development of this size. With the inclusion of the 132 spaces at the South Street garage, the requirements for on-site parking would range from 929 to 949 spaces. Thus, the parking estimates used for the No Project Alternative exceed the requirements, though would likely be adjusted should an actual development proposal be submitted. 12 [ALT-2] cont.

(DSEIR, p. 7-21 n.2.)

By overstating its size and scope, the No Project alternative defeats the purpose of providing the public and decisionmakers with comparisons to the proposed project and other alternatives. The DSEIR must be revised to analyze a No Project alternative that complies with adopted land use plans and does not overstate the scope of development: a low-rise development using vara blocks and that does not include a new tower, does not block the views of UCSF patients, and complies with Mission Bay's development plans.

b. ***The DSEIR Must Analyze a Potentially-Feasible Alternate Site.*** In considering whether an EIR's range of project alternatives complies with the "rule of reason," CEQA anticipates consideration of an off-site alternative:

> The key question and first step in analysis is whether any of the significant effects of the project would be avoided or substantially lessened by putting the project in another location. Only locations that would avoid or substantially lessen any of the significant effects of the project need be considered for inclusion in the EIR. 13 [ALT-3]

(Guidelines, § 15126.6 (f)(2)(A).) In light of the admitted and wide-ranging significant impacts of the proposed Event Center, it is particularly critical that the DSEIR consider a potentially-feasible alternate site or sites "… capable of avoiding or substantially lessening significant impacts of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly. …" (Guidelines, § 15126.6 (b).) Indeed considering an alternate location is one of the most important tasks for this DSEIR.

Instead, the DSEIR proposes just one off-site alternative, Alternative C, at Piers 30-32 and Seawall Lot 330 — a site already proven infeasible. The Warriors pursued and after considerable investment abandoned a plan to site the Event Center at this very location. The reason no doubt related to major City-wide public opposition based on significant traffic impacts, environmental harm to the San Francisco Bay during construction, blocked views of the Bay Bridge, and inappropriate use of publicly-owned waterfront property. The required vote of the San Francisco electorate that would be required for the project's excessive height was also problematic as increased heights on the northeast waterfront have been decidedly disfavored by City voters in multiple recent elections.

The project site also triggered extensive regulatory approvals from state and federal agencies, including the State Lands Commission, the San Francisco Bay Conservation and Development Commission, the Army Corp of Engineers, the U.S. Fish and Wildlife Service, and others. (DSEIR, pp. 7-17-18). And the project costs were substantially more than initially-projected, by many many millions of dollars, due to the need to replace crumbling piers and other unanticipated costs. 13 [ALT-3] cont.

CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors." (Pub. Resources Code, § 21061.1.) The City knows that Piers 30-32 do not provide a feasible site and its selection as the sole off-site alternative fails to meet the rule of reason required for EIR alternatives. CEQA is not a game; the DSEIR must select and study another location for the Event Center to fulfill its mandate to provide good-faith analysis of a range of potentially-feasible alternatives, including an alternate location.

4. The EIR must assess Cultural Resources

The Initial Study and DSEIR contend that cultural resources were sufficiently addressed in the 1990 and 1998 Mission Bay EIRs. The Alliance disagrees. The DSEIR should be revised to provide project-specific analysis and mitigation as well as an updated investigation of resources as part of the environmental setting. The DSEIR description of the environmental setting is critical to provide a baseline of physical conditions from which to measure the significance of project impacts. (Guidelines, § 15125.)[2] 14 [CULT-1]

[2] Inadequacies in the EIR environmental setting and baseline led to inadequate analysis of environmental issues that will be addressed in other Alliance comment letters, including the jurisdictional wetlands identified on the project site.

To address impacts to paleontological and archaeological resources, the DSEIR proposes adoption of the mitigation measures recommended in the 1998 Mission Bay EIR, and concludes that environmental impacts will thereby be mitigated via standard archaeological testing, monitoring, and data recovery. (DSEIR, pp. 1-51, 1-57.)

The 1998 Mission Bay EIR relied on the 1990 Mission Bay EIR that in turn consulted a *Cultural Resources Evaluation for the Mission Bay Project* prepared in 1987 by David Chavez & Associates. (1990 EIR, p. VI.J.30, NOP/IS, p. 46.) As reflected in the prior EIRs, the shallows of Mission Bay were filled beginning in the 1860s and the Event Center site at Blocks 29-32 is on that filled land. The Initial Study references the Chavez report as stating that the filled land in Mission Bay had "no substantial potential for archaeological resources." (NOP/IS, p. 46; 1990 EIR, pp. II.64, VI.J.1-30.) However, the 1990 EIR nonetheless concluded that development could cause "significant impacts to subsurface prehistoric or historic archaeological resources … within the vicinity of Blocks 29-32," and identified mitigation measures. (*Ibid.*) 14 [CULT-1] cont.

David Chavez and historian Jan Hupman subsequently prepared an *Archaeological Resources Review* report in 1997 for the 1998 Mission Bay EIR, concluding that "[t]he entire Mission Bay project area has at least some sensitivity for the presences of unknown archeological remains. Prehistoric cultural deposits could be encountered in three identified areas and *unknown historical features, artifact caches and debris areas could be located anywhere in the project area*." (Chavez & Hupman, *Archaeological Resources Review for the Mission Bay Project Subsequent EIR*, 1997, p. 7, italics added.)

Since then, geotechnical investigations at the project site in March 2014 identified a "medium dense to very dense sand, sand with clay, clayey sand, silty sand and sand with silt, known as the Colma Formation, [] encountered below the sand and clay in portions of the site." (Langan Treadwell Rollo Preliminary Geotechnical Evaluation, p. 2-3.) The Colma Formation involved sand between 5 and 35 feet thick, more than 19 feet below the ground surface. (Ibid.) That is a greater depth than the Event Center's projected excavations, but a 2014 report by ESA Associates Cultural Resources team suggesta pre-construction boring strategy as part of an Archaeology Testing Program ("ATP"):

> The ATP will need to include a pre-construction geoarchaeological boring strategy across the project area to determine: (a) whether the upper surface of the Colma Formation is intact or was eroded away in antiquity (and therefore whether there is even the potential for archaeological materials to be present); and (b) if the upper surface of the Colma Formation is intact, whether there are, in fact, any archaeological materials present.

The actual boring strategy is not known. A firm called Archeo-Tec made a proposal, but it was criticized by the ESA team: "The Archeo-Tec proposal only specifies trenching beginning at a depth of 10-15 feet below ground surface (after mass excavation has already started)." ESA noted that the Archeo-Tec plan did "not correlate with ERO standards" and was "not in line with Planning Department requirements for the project area." Further, "trenching will not address [City archaeologist Randall Dean's] specific concerns …"

14 [CULT-1] cont.

The 1987 Chavez report had conceded that "[w]ith the exception of some limited archaeological testing in sensitive areas" the "actual areal extent, specific nature and location of historic features and artifact caches, and depositional integrity of the archaeological deposits" in South Mission Bay are unstudied. Further, "specific information of that nature is important in determining the actual significance of archaeological resources and in developing appropriate mitigation plans." (Chavez, *Cultural Resource Evaluation For the Mission Bay Project*, p. 105.)

Years later, archaeologist Dean properly criticized the Initial Study's cursory review of archaeological impacts, pointing out that:

> … [w]e know a lot more than we did 20 years ago about both buried and submerged potential horizontal and vertical locations and types of prehistoric deposits that may be present throughout SF. The project site lies within the mudflats of Mission Bay subject to shallow tidal waters but well within the paleoshorelines of 5,000 B.P. [...] the type of prehistoric deposits that might be affected would be within the Middle Holocene epoch which would make them of significant scientific value.

Incomplete information regarding cultural resources conflicts with CEQA's requirements for an adequate environmental setting/baseline to provide "special

emphasis" on "resources that are rare or unique …" (Guidelines, § 15125 (c).) Mitigation measures proposed in the Initial Study and DSEIR, including the Archaeological Testing Program, must be preceded by updated analysis of affected resources and performance standards. Since the Initial Study and the DSEIR rely on outdated information from the 1990 Mission Bay EIR, there is a higher potential for subsurface archaeological resources at the site than previously evaluated. The EIR must be revised to include a current analysis of cultural resources, potentially significant impacts, and performance-based mitigation.

14 [CULT-1] cont.

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Thank you for your attention and responses to each of these environmental issues.

Sincerely yours,

Susan Brandt-Hawley
Skyla V. Olds

CALIFORNIA PLANNING & DEVELOPMENT REPORT

Home

The Power of Grid

1 September 1998 - 12:00am
Morris Newman | Places

Restraint is rarely touted as a virtue in urban design. Often, instructors in the History of Urban Design tend to treat the subject as a series of Greatest Hits - of grand interventions by such magnificently meddlesome people as Andre LeNotre or Baron Haussman or Robert Moses. Teachers in graduate seminars rarely show slides of, say, a Midwestern town and exclaim, "Look at how well the urban designers held themselves back!"

The blockbuster mentality makes the current master plan of Mission Bay, the 300-acre redevelopment area in San Francisco, all the more remarkable. Here, after all, is a giant canvas of largely undeveloped waterfront acreage in a major U.S. city. The first impulse (at least for eternal first-year design students, like myself) is to create a miniature city with a hierarchy of major and minor roads, a radial plan with diagonal streets, major and minor axes, formal green spaces with equestrian statues and topiary plantings - in other words, the whole nine yards of Beaux Arts planning, or its poor relation, the New Urbanism.

The current master plan, which is the fifth to be done in 20 years, resists the temptation to make a grand statement, however. Instead, the plan by Johnson Fain Partners opts to impose a more-or-less regular grid over the area that corresponds, in the dimensions of the blocks, to the original 10 blocks of downtown San Francisco. And while the restraint of this plan may or may not seem intuitively like the most exciting or most elegant solution, a close examination of the program suggests that this is the most urbane and best integrates this former railyard into the cultural and business life of the larger city.

Indeed, the history of planning efforts at Mission Bay shows the tensions between the need to integrate the area into the city, while creating a memorable place in itself. The site itself is also especially tempting for planners, because it sits at the crossroads of two grids: the commercial-industrial grid, on northeast-southwest coordinates, and a residential neighborhood, on north-south coordinates, immediately south of the commercial area.

The first four of the five plans done in the past 20 years, in fact, succumb to the temptation to bring the grids together in dramatic juxtaposition. The first plan, done 20 years ago by John Carl Warnecke envisioned a set of high-rise buildings (office and hotel) on either side of the Mission Bay Channel, which conforms to the commercial-industrial grid. The same plan pulled the north-

south grid north of 16th street, to bring housing into Mission Bay. The density and height of the scheme aroused public opposition.

In the I.M. Pei/WRT scheme of 1985, the designers attempted to maximize the waterfront by carving out an oval-shaped channel south of Mission Bay Channel; ingeniously, this channel, and the resulting island at its center, are the formal devices to divide the commercial grid from the residential grid. This plan was also opposed for its density. And like the Warnecke plan before it, the Pei scheme was largely lacking in open space along the precious bay waterfront.

The third scheme by the Mission Bay Planning Team, led by EDAW and Dan Solomon, is an elegant, Beaux-Arts design that provides a clear hierarchy of streets arranged around a linear park or "common." This scheme also sets aside some bayfront land for a linear park. Pleasing as a graphic design, the plan arguably may have created some confusion on the ground, however, because streets are frequently changing in direction. Those same diagonal streets also disturb the views of the bay that could otherwise be available with streets that run straight east and west. The subsequent Skidmore Owings Merrill plan of 1989 is an inelegant truncation of the Solomon-EDAW that reflects the consensus of public hearings. This plan offers a further elongation of the bay front linear park, while providing more space for commercial construction.

New uses at Mission Bay, including a new baseball stadium immediately north of the site and a new campus for UC San Francisco, occasioned the fifth and current plan, this time by Johnson Fain Partners. The campus plan, which conforms to the larger scheme, is by the East Coast firm of Machado + Silvetti. As part of a Willie Brown-endorsed ambition to create a "synergy" between a research university and bio-tech businesses in San Francisco, landowner Catellus donated 43 acres of Mission Bay to UC San Francisco. That acreage is located smack-dab in the center of the master plan.

The great achievement of the scheme is to knit Mission Bay into the existing fabric of the city, rather than setting it apart as a separate "campus" or miniature city of its own. Faced with the difficulty of planning around a centrally located campus, the Johnson Fain team, led by principal William Fain, chose to organize most of the site with the north-south (residential) grid; the diagonal streets are limited to either side of the channel. Medium-to-high-density residential blocks (with densities averaging 110 units per acre) can be found both north and south of the channel. Happily, the plan preserves the common of the Solomon/EDAW scheme. A small traffic circle at the far west is the anti-climactic device that connects the two grids.

What is most remarkable about this scheme is how thoroughly the university campus has been integrated into the grid. This contrasts with the typical University of California campuses, which are master planned as separate cities and communicate poorly with the cities that surround them. In a competition winning scheme, Machado + Silvetti, has responded with a very urbane, non-hierarchical scheme that uses open spaces as the landmarks, rather than big buildings. Jose Begazo, O-MBA6B1

Johnson Fain's project architect, has likened the campus design to residential blocks in Paris.

Importantly, the Johnson Fain designers chose to base the new grid on the historic "vara" block, the same dimension of the first 10 blocks of the city laid out by Vioget in 1839. A vara is a Spanish linear measure equal to 2.75 feet. The vara block is 100 by 150 varas, or 275 feet by 413 feet. Johnson Fain principal William Fain argues that the vara block, beyond its historic associations, has near-ideal dimensions for an urban block.

The use of the urban Vara block, in fact, helps clarify, if clarity were needed, what precisely makes San Francisco the most walkable city in America: the dimensions of the grid. No longer an abstract issue, the dimensions of grid here become elements in the sensuous enjoyment of cities - providing the energizing sense of movement through a regular tempo of streets and blocks.

This new plan, by relying heavily on the grid rather than special effects, promises to extend the pedestrian experience of San Francisco to the newest part of the city. In a sense, the Johnson Fain/Machado Silvetti scheme could be described as the scheme that resists the temptation to be grand, and in favor of being appropriate. Whether or not college lecturers add Mission Bay to their teaching syllabi remains to be seen. Even so, the scheme is a quiet but convincing argument about the power of the grid.

O-MBA7S2

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July 26, 2015

SENT VIA EMAIL (warriors@sfgov.org)

Tiffany Bohee
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Comments on Environmental Review for Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Dear Ms. Bohee:

This firm represents the Mission Bay Alliance, an organization dedicated to preserving the environment in the Mission Bay area of San Francisco. This letter is submitted on behalf of Mission Bay Alliance regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Project"), and provides comments on the following topical areas: Greenhouse Gases, Geology and Soils, Hazardous Materials, Utilities and Service Systems, Recreation, Energy, Wind and Shadow, Project Description, and Urban Decay. These comments are supported by five subject matter expert reports, attached as Exhibits A-E, which are discussed and summarized below. In addition to responding to this letter, please provide responses to the detailed comments contained in the reports that are incorporated by reference and attachment to this letter. (CEQA Guidelines, § 15132, subd. (d), 15088.)

The comments set forth in this letter and its attachments address deficiencies contained in the DSEIR's analyses as well as subject areas where the DSEIR impermissibly failed to provide any substantive analysis. The Notice of Preparation / Initial Study ("NOP/IS") for the Project determined that nine topical areas were adequately analyzed in the 1990 and 1998 EIRs prepared for the Mission Bay Redevelopment Plan, and therefore no additional analysis was required in the present DSEIR for these specific areas. A fundamental problem with this approach is that the Mission Bay Plan was 303 acres and lacked site-specific review of the current 11-acre site. In the Mission Bay Redevelopment Plan, the four-block Project area was designated as "Commercial Industrial (Mixed Use including Retail)." (DSEIR, Figure 3-3.) This land use was then analyzed at a very general level. As described in the letter as shown in the "Land Use" section of the July 27, 2015 letter from the Brandt-Hawley Law Group, the Project is not consistent with the Mission Bay Redevelopment Plan or with the land 1 [ERP-7] use plans and zoning controls that are subordinate to the Mission Bay Redevelopment Plan.

In addition to the Project itself being different, the conditions under which the Project is undertaken, as compared to 1998, have changed substantially. Changed conditions include both changes in standards and practices for analyzing impacts, changes in overall environmental conditions, and changes to the site itself. As described in the comment letter submitted by the Mission Bay Alliance regarding tiering, all of these changes, in combination with the massive and impactful Project now being proposed, require preparation of a new EIR that examines every resource area at project-level detail. The City's strategy of relying on a very general environmental review document that is over 17 years old for topics required to be analyzed *and* mitigated in detail does not work for the public, nor is it compliant with CEQA's most basic requirements. 1 [ERP-7] cont.

1. **<u>Greenhouse Gas Emissions are Not Adequately Analyzed – DSEIR Chapter 5.5.</u>**

Under AB 900, a "Leadership Project" receives an expedited CEQA review process and other streamlining benefits. (Pub. Resources Code, § 21178 et seq.) Leadership projects are supposed to create high quality permanent jobs and innovative measures to reduce environmental impacts, including greenhouse gas ("GHG") emissions. As a result of the certification received under AB 900, the DSEIR claims that the Project will "not result in any net additional GHG emissions." (DSEIR, p. 5.5-10.)

As explained below and in the attached technical comments by SCS Engineers, dated July 20, 2015 ("SCS" attached as <u>Exhibit A</u>), the AB 900 Application process does not meet minimum standards for calculation of GHG emissions, nor does it provide a substitute for CEQA's EIR process or substantive standards. The DSEIR relies entirely on the existence of the AB 900 certification for its analysis of the Project's contribution to the cumulative impact to GHG emissions. While the AB 900 certification is not subject to judicial review (Pub. Resources Code, § 21184, subd. (b)(1)), the content of the Application for AB 900 certification does not substitute for an adequate analysis of GHG emissions in the DSEIR. As a result, the DSEIR fails to meet minimum standards of disclosure and also incorrectly concludes that GHG emissions are less than significant. These flaws in the DSEIR require revision and recirculation of the DSEIR with an adequate GHG analysis. 2 [AB-1, GHG-2]

a. The AB 900 Application Conflicts with State GHG Policies.

As explained in the SCS Memo (pp. 4-6), the AB 900 Application severely underestimated the emissions from this Project. It did so by overestimating the baseline for comparison, and then by underestimating Project emissions. The AB 900 Application made several unsupported assumptions to minimize the baseline conditions against which the Project's GHG emissions would be compared, including:

- Assuming a 76 percent reduction in baseline GHG emissions from Oracle arena due to relocation of the team to San Francisco, potentially omitting emissions that would occur if Oracle continues to emit more than 24 percent of its current GHG emissions (SCS, p. 4); and
- Overestimating, possibly by a factor of two, the trip linking benefits provided by location of the arena adjacent to other uses (SCS, p. 5).
The AB 900 Application then underestimated the Project's GHG emissions by:
- Omitting from its analysis entirely the GHG emissions for structures other than the arena that are planned as part of the Project, including the two 160 foot office towers, the gatehouse, the food hall, Warriors Headquarters, and retail uses, which comprise approximately 730,000 square feet of new uses that clearly will emit GHG (SCS, p. 5; see also NOP/IS, p. 11). 3 [AB-1]

Additionally, the GHG mitigation offered in the AB 900 Application is not effective. After miscalculating the GHG emissions of the Project, the Application simply states that "with offsets purchased, there will be no net greenhouse gas emissions from the operation of the project." (Leadership Application, p. 9.) Yet, as explained by SCS Engineers (pp. 6-8), there are several flaws with this approach, including:

- Not requiring that any GHG emissions offsets be purchased unless the Project has a 90 percent utilization rate, raising the possibility that GHG emissions offsets would not be purchased at all (SCS, p. 7);
- The failure to require that purchased GHG emissions offsets are verified by the California Air Resources Board ("CARB"), consistent with California GHG reduction policies and AB 32, to ensure that they are real, permanent, quantifiable, verifiable, enforceable, and additional and thus will actually result in GHG emissions reductions (SCS, pp. 2-3, 8; see also Health & Saf. Code, § 38562, subd. (d)(1),(2)); 4 [AB-1]

- Not requiring that the emissions offsets purchased as mitigation for the Project be retired so that the offsets cannot be reused later to allegedly mitigate other projects' GHG emissions (SCS, pp. 2, 8);

- Only requiring that GHG emissions from the Project be offset for the first 30 years, ignoring GHG emissions that the Project would continue to produce after that point (SCS, p. 7);

- Using the faulty GHG inventory to estimate total GHG emissions from the Project over a 30-year period now, and allowing the applicant to purchase 30 years of GHG emissions offsets now, rather than continuing to use updated data regarding actual Project GHG emissions (SCS, p. 6); and

- Not including ongoing monitoring to ensure that estimated Project GHG emissions are similar to actual emissions and that purchased GHG offsets are actually effective in reducing GHG emissions (SCS, pp. 7-8). 4 [AB-1] cont.

In addition to these technical flaws (described in more detail by SCS Engineers in Exhibit A), the reliance on offsets to reduce GHG emissions is inconsistent with the intent of AB 900 to promote use of innovative measures to reduce GHG emissions. (Pub. Resources Code, § 21178, subd. (g).) Design features and/or mitigation measures could actually reduce the project's GHG emissions and create other environmental benefits. Instead, the Project simply plans to write a check to an unknown entity to supposedly "offset" GHG emissions.

Further, the deduction for GHG emissions based on the assumption that Oracle will only host 21 events into the foreseeable future is unwarranted in light of the City of Oakland's express plans to turn "Coliseum City" into an economically viable sports and entertainment hub. (See pp. 10-12 of July 19, 2015 Comments Regarding Air Quality Impact Analysis and Mitigation; Event Center and Mixed-Use Development at Mission Bay Blocks 29 – 32 by Autumn Wind Associates, Inc., attached as Exhibit 1 to the July 26, 2015 letter from the Law Offices of Thomas N. Lippe regarding the Project's Air Quality Impacts.

b. The Flawed AB 900 Application Cannot Substitute for an Adequate Analysis Under CEQA in the DSEIR.

5 [GHG-2]

The DSEIR simply refers to the result of the AB 900 certification process, providing no additional analysis or disclosure in the DSEIR itself regarding the expected GHG emissions of the Project or how those impacts would be mitigated. To the extent

the DSEIR intends to incorporate the faulty AB 900 Application into the DSEIR instead of setting forth the analysis in the DSEIR, it did not follow procedures required to do so. CEQA Guidelines section 15150 requires that "the incorporated part of the referenced document shall be briefly summarized where possible or briefly described if the data or information cannot be summarized." The AB 900 Application was not summarized or described in the DSEIR, nor was it included as an appendix. If the AB 900 Application is to be offered as environmental analysis in the DSEIR, it would have to be included as an appendix to the DSEIR so that the public could review it. (CEQA Guidelines, § 15147; *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 442 (where lead agency "relied on information not actually incorporated or described and referenced in the FEIR, it failed to proceed in the manner provided in CEQA").)

Nor can the DSEIR rely on analysis in the 1998 FSEIR. Though GHG emissions are briefly mentioned in the 1998 FSEIR (DSEIR, p. 5.5-1), this Project being proposed years later was not analyzed. Moreover, the approach to GHG emissions has changed dramatically in the intervening years.

The approach to calculating GHG emissions in the AB 900 Application is also inconsistent with basic CEQA principles as well as the DSEIR's approach to analysis of other impacts of the Project. As described above, large components of the Project to which the AB 900 certification and the "no net increase in GHG emissions" allegedly apply were simply omitted from the inventory, including over 700,000 square feet of retail and office uses. (DSEIR, Figure 3-5 and Table 3-1.) While there is no discussion in the DSEIR, the AB 900 Application claims that these other uses were "fully vested legal rights" permitted by the land use plan, and therefore did not quantify the GHG emissions from that part of the Project. (Leadership Application, p. 8.) 5 [GHG-2] cont.

The Leadership Project application process does not provide any direction to exclude aspects of the project from the Leadership Application. (Pub. Resources Code, § 21183, subd. (c).) Nor does it substitute the AB 900 certification for an adequate analysis under CEQA. Certainly if the Legislature had intended that an approved Leadership application could substitute for mandated analysis in an EIR, it would have so stated; it did not. As the certification is for the entire complex, including office and retail, there is no justification to exclude part of the project from the analysis. The result is an impermissible decrease of the GHG emissions calculated to occur as a result of the Project.

The notion that having a vested right to do something affects the obligation under CEQA to disclose the impact of doing it has been squarely rejected. (*Communities For A*

Better Environment v. South Coast Air Quality Management Dist. (2010) 48 Cal.4th 310, 323-25, citing Pub. Resources Code, §§ 21002.1, subd. (b), 21081, subd. (a)(1); CEQA Guidelines, § 14, §§ 15040, 15126.4, subd. (a)(2) [lead agency ability to condition project]; § 21081; CEQA Guidelines, § 15042 [lead agency ability to deny the project].) Moreover, consistency with a plan does not preclude the need for analysis. (See *Environmental Planning & Information Council v. County of El Dorado* (1982) 131 Cal.App.3d 350, 354.) Notably, neither the air quality nor the traffic impact chapters of the DSEIR attempt to include credit for baseline development claimed as"vested." The completely different approach taken by the DSEIR with respect to analysis of GHG emissions is unsupported and must be corrected; the correct baseline is "no project."

The "mitigation" proposed for GHG emissions impacts is also contrary to CEQA's most basic requirements. Mitigation must be enforceable in order to be effective.. (CEQA Guidelines, § 15126.6, subd. (a)(2).) Here, as described above, the purchase of offsets may never occur, or if it does occur, may do nothing to reduce GHG emissions. The DSEIR's failure to identify enforceable mitigation measures is an error of law. (See *Federation of Hillside & Canyon Associations v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1260–1262*; Lincoln Place Tenants Association v. City of Los Angeles* (2005) 130 Cal.App.4th 1491, 1508 ["mitigating conditions are not mere expressions of hope. . . ."].) To the extent that the City intends to incorporate the purchase of offsets as a "design feature" or otherwise incorporate it into the project description, recent case law clarifies that this strategy violates CEQA's mandate to disclose project impacts and separately address feasible mitigation measures. (*Lotus v. Department of Transportation* (2014) 223 Cal.App.4th 645, 655-56 (incorporating mitigation measures for redwood trees into the project description violated CEQA "[b]y compressing the analysis of impacts and mitigation measures into a single issue . . ."].)

5 [GHG-2] cont.

As a result of the City's improper approach to analysis of GHG emissions from the Project, the GHG analysis is incomplete and must be rewritten. Moreover, the "less than significant" determination for the Project's GHG emissions is based on errors of law described above, including splitting the Project into smaller pieces and excluding several of these pieces from the GHG calculation and failing to identify enforceable mitigation measures. According to air quality experts versed in GHG emissions and the use of GHG offsets: "The GHG analysis provided and proposed MM I-C-GG-1 are not sufficient to demonstrate that the Project will result in no net increase in GHG emissions" and "the determination in the [DSEIR] that GHG emissions are a less than significant impact is erroneous." (SCS, p. 2.)

2. <u>The DSEIR Was Required under CEQA to Analyze Impacts Related to Hazardous Materials – 1998 FSEIR Chapter 5.J.</u>

The NOP/IS correctly identified hazards and hazardous materials as an impact area generally requiring analysis under CEQA. (NOP/IS, pp. 106-122.) However, the DSEIR did not address hazardous materials at all (DSEIR, p. 1-9) because the NOP/IS concluded that there were no new or more severe impacts within this category than addressed in the 1998 FSEIR (NOP/IS, pp. 106-107.) This approach fails under any standard of review because the currently-proposed Project is different than the project described in the 1998 FSEIR, the 1998 FSEIR relies on outdated data and methodology to analyze impacts, and conditions have changed such that the 1998 FSEIR does not even describe the present contamination at the site. The recirculated DSEIR will need to include a full analysis of this issue that includes a thorough review of the extensive history of contamination of this site, and the resulting potentially significant impacts and mitigation required in the context of this Project.

These comments are supported by expert analysis from the firm BSK Associates. BSK reviewed several documents, including the DSEIR, NOP/IS, 2006 Revised Remedial Action Plan ("2006 RRMP"), and 1998 SEIR, and prepared a report addressing the adequacy of these documents and the potentially significant impacts associated with existing contamination by hazardous materials within the Project site. The BSK HazMat Report is attached as <u>Exhibit B</u>.

6 [HAZ-1]

a. The 1998 SEIR Cannot be Relied Upon to Analyze Impacts Associated with Hazardous Materials.

The BSK HazMat Report explains that the 1998 SEIR cannot serve as a basis for any analysis of impacts associated with hazardous materials because that document relies upon long-outdated methodology for analyzing such impacts. (BSK HazMat Report, comment A1.) For example, the 1998 SEIR's analysis of risk to human health relied upon preliminary remediation goals developed by the EPA, and yet this methodology has been replaced by Environmental Screening Levels developed in 2013. Further, the 1998 SEIR relied upon averaged concentrations of chemical contaminants even though the total number of samples was too low to use such average values. (BSK HazMat Report, comment A2.) The BSK HazMat Report identifies further technical deficiencies that render the methodology followed in the 1998 SEIR inadequate for present use. (BSK HazMat Report, pp. 1-4.) It is telling that the NOP/IS never mentions the outdated methodology utilized in the 1998 SEIR, much less attempts to explain how applying current methodologies would achieve the same result.

b. Petroleum Hydrocarbon Contamination Has Always Been Just One Component of the Site's Overall Contamination.

Setting aside the issue of outdated methodology, the 1998 SEIR cannot serve as the basis for CEQA review because it does not adequately disclose current contamination at the Project site. Implicitly acknowledging that the 1998 EIR fails to disclose and analyze all contamination at the site in light of the characterization/remediation efforts following certification of the 1998 EIR, the NOP/IS purports to correct this admitted gap by providing a discussion entitled, "Actions Completed Since Publication of the Mission Bay FSEIR." (NOP/IS, p. 116.) However, this discussion misleads the public by suggesting that petroleum hydrocarbons are presently the only contaminant of concern onsite. The NOP/IS fails to adequately supplement the 1998 SEIR because it ignores contaminants other than petroleum hydrocarbons.

The NOP/IS asserts that there is no remaining soil and groundwater contamination at issue because, following the 1998 SEIR, remediation occurred in compliance with the San Francisco Bay Regional Water Quality Control Board ("RWQCB") Order R2-2005-028, which was ultimately rescinded in 2014. (NOP/IS, pp. 117-118.) What the NOP/IS fails to mention, however, is that Order R2-2005-028 and the subsequent remediation effort **solely addressed petroleum contamination, and no other contaminants onsite**. This limited scope is demonstrated with clarity in, for example, the RWQCB's subsequent Order R2-2014-0022 rescinding the prior order RS-2005-0028. Order R2-2014-0022 explained that the prior order only "address[ed] the existence of separate phase petroleum hydrocarbons products." Further, Order R2-2014-0022 explained that rescission of that prior order was appropriate because, "Post-remediation groundwater monitoring has shown that the residual petroleum products have very limited impact on the groundwater beneath the site." (Order R2-2014-0022.)

7
[HAZ-2]

The limited nature of this remediation effort is further demonstrated in the subsequently-prepared Revised Risk Management Plan dated August 2006 ("2006 RRMP"). As the BSK HazMat Report explained:

> [T]here was no discussion of the semivolatile organic chemicals that were detected in soil and groundwater at the site. Summary tables presented in Appendix A of the RMP indicate that polycyclic aromatic hydrocarbons (PAHs) were detected in the soil at various locations and in groundwater collected from MW-11. A possible source and significance of the PAHs was not presented in the RMP.

(BSK HazMat Report, comment B2.)

In other words, even though other contaminants were identified in the 1998 SEIR, the subsequent RRMP focused only on petroleum hydrocarbon remediation. While both the City and the applicant clearly understood this limited scope of the remediation efforts following the 1998 SEIR (NOP/IS, p. 118 [explaining that remediation "has effectively removed free petroleum products in the Pier 64 area . . ."]), this understanding was in no way communicated to the public in the NOP/IS. To the contrary, the NOP/IS, misrepresents the current status of contamination at the site by asserting in relevant part:

> While the completion of remedial actions described above would be considered substantial changes that have occurred at the project site, implementation of these actions has effectively removed free petroleum products in the Pier 64 area and reduced risks to human health and the environment in this area compared to conditions described in the FSEIR.

(NOP/IS, p. 118.)

7
[HAZ-2]
cont.

These statements mischaracterize the status of the Project site by ignoring the presence of other contaminants. As acknowledged in the NOP/IS, the site was previously used for "bulk fuel storage and distribution; railroad operations; a machine shop; boiler house; steel mill; well casing manufacturer; warehousing, shipping and receiving operations for a variety of products; fruit cannery, junk yards vehicle parking and maintenance facilities and a ready-mix concrete facility." (NOP/IS, p. 115.) Even the 1998 SEIR acknowledged that the Project site could contain other contaminants and that insufficient surveys at that time had been performed to characterize the contamination and resulting risk. (1998 SEIR, pp. V.J.1 – 110.) With respect to metals, for example, the 1998 SEIR stated, "All 17 metals that were included in the list of analytes tested . . . were detected in varying concentrations in soil throughout Mission Bay South." (1998 SEIR, p. V.J.36.) The same was true for asbestos and creosote as well. (1998 SEIR, pp. V.J.15 – 16.)

Thus, contaminants other than hydrocarbon were identified as early as 1998, which is not surprising based on the various historical uses of the Project site. Notwithstanding this, the only remediation identified in the NOP/IS relates to hydrocarbon contamination. The NOP/IS fails as an informational document because other contaminants that are contained in the soil have not been publicly disclosed. As discussed more fully below, these other contaminants create potentially significant impacts that must be addressed.

c. Activities Following the 1998 SEIR Have Increased the Project Site's Contamination.

The 1998 SEIR cannot be relied upon for environmental analysis of hazardous materials impacts of the Project because subsequent activities at the site have significantly altered the nature and scope of contamination. As explained in the BSK HazMat Report, a Phase II Environmental Site Assessment prepared by Langan Treadwell Rollo, dated June 2015 ("2015 Phase II Report"), identifies additional contamination following the 1998 SEIR that has been ignored in the present NOP/IS and DSEIR. (BSK HazMat Report, comments A3, A4, B3, B4.)

Based upon review of the 2015 Phase II Report, the BSK HazMat Report explains that additional hazardous waste materials were actually imported onto the Project site during petroleum hydrocarbon remediation activities in 2005. Specifically, contaminated construction debris and other hazardous waste were used as backfill in 2005 in violation of the Mission Bay remedial action plan ("RMP"). (BSK HazMat Report, comments A3, B5.) While the prior Mission Bay RMP may have allowed the movement and reuse of certain levels of contaminated soils, "DTSC's determination does not apply to building debris or waste soils or other waste materials for any necessary remediation activities." (BSK HazMat Report, comments A3.) In other words, while the occurrence of petroleum hydrocarbon contamination may have been reduced as a result of subsequent remediation activities, the occurrence and associated risk posed by other forms of contamination actually increased following the 1998 SEIR. While the 1998 SEIR could not have addressed this new contamination because it occurred in 2005, this does not excuse the omission of this critical information from the NOP/IS and DSEIR.

8 [HAZ-3]

The BSK HazMat Report also finds, based in the 2015 Phase II, that significant amounts of both previously-existing and subsequently-imported hazardous waste remain on the site today. The presence of this existing hazardous waste raises many unaddressed issues. First, it appears that this hazardous waste will need to be excavated and removed in order to construct the proposed Project. The BSK HazMat Report explains, "Significant volumes of soil classified as hazardous waste will need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase." (BSK Hazmat Report, comment C1.) According to the NOP/IS, "[T]he maximum depth of excavation on-site would be approximately 30 feet below San Francisco City Datum; this would require approximately 350,000 cubic yards of soils on-site to be excavated and removed from the site" (NOP/IS, p. 17.) It is not clear how this estimate was derived or how it relates to the actual excavation needed for purposes of removing contaminated soils. The excavation, removal, transport, and disposal of this

massive volume of contaminated soil creates potentially significant impacts that have not been disclosed. (CEQA Guidelines, Appendix G, section VIII (a), (b), (c).)

Other serious questions arise if all or even some portion of the hazardous waste is not ultimately removed from the Project site. If not removed, what is the remediation plan to reduce risk of exposure to the public? How will workers be protected during construction of the Project? Does the 350,000 cubic yards include excavation associated with stormwater and other infrastructure remediation work, or will that construction occur in the contaminated soil that remains? Will any of this contaminated soil be used to create the 3.2 acres of open space, or the additional open space located across the street at the Bayfront Park? Will an impermeable cap be used to separate contaminated soil from at-grade landscaped open space? Since much of the landscaped open space appears to be elevated, is this a design feature intended to quietly address the human health risk associated with the contaminated soil? The DSEIR fails to address these important questions.

8 [HAZ-3] cont.

The presence of contaminated soil within the Project site cannot be swept under the rug. The contamination must be quantified along with its appropriate exposure risks. These risks and adequate mitigation measures must be disclosed to the public in a revised and recirculated DSEIR that complies with CEQA.

d. The DSEIR's Treatment of Hazardous Materials Fails under Any Applicable Standard.

As established above, the City's strategy of relying on the 1998 SEIR as supplemented with updated information from the NOP/IS violates CEQA.

First, this strategy fails to provide an adequate project-level informational document because the 1998 SEIR does not describe current conditions, and the supplemental information provided in the NOP/IS misleads the public by ignoring all hazardous constituents other than hydrocarbon contamination.

9 [HAZ-1, HAZ-3]

Second, the DSEIR is inadequate because substantial evidence supports a fair argument that constructing the Project on the existing contaminated soil will result in potentially significant impacts. The information contained in the DSEIR, together with the BSK Hazmat Report and the 2015 Phase II Report, demonstrate that the present contamination poses potentially significant hazards due to proposed construction in soil containing hazardous waste, and transport and disposal of the same hazardous waste.

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Brett Bollinger
July 26, 2015

Third, even if the City were to rely on Public Resources Code section 21166, the subsequent remediation activities that increased the presence of certain hazardous waste constituents following the 1998 SEIR represents a change in circumstances that requires preparation of a supplemental EIR. The proposed site plan with several acres of landscaped open space also constitutes a change to the project that was described in 1998 (simply a land use plan for 303 acres) and significantly increases the potential public hazard by exposing people to hazardous waste in the soil even if the RMP is followed. A recirculated DSEIR must include a thorough analysis of hazardous materials using current methodologies.

9 [HAZ-1, HAZ-3] cont.

e. The City Cannot Rely on Mitigation Measures for Hazardous Materials without Analyzing the Impacts.

Seemingly in furtherance of an implicit goal to avoid substantive public disclosure of hazardous materials impacts in the DSEIR, the City takes the remarkable position in the NOP/IS that it can adopt mitigation measures without analyzing and disclosing impacts. This approach is employed with respect to risks associated with naturally occurring asbestos (NOP/IS, pp. 113-115) as well as risks associated with exposed contaminated soil prior to site development as regulated in the City by the Maher Ordinance (NOP/IS, p. 116). This approach is fundamentally flawed, however, because CEQA does not permit an agency to adopt mitigation measures in lieu of fully assessing a project's potentially significant environmental impacts. A mere acknowledgment that an impact would be significant is inadequate; the EIR must include a detailed analysis of "how adverse" the impact would be. (*Galante Vineyards v. Monterey Peninsula Water Management Dist.* (1997) 60 Cal.App.4th 1109, 1123*; Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831.)

10 [HAZ-1, HAZ-4]

The flaw in this approach is easily seen in both contexts. With respect to compliance with the Maher Ordinance, for example, section 2(b) of this letter explains that the NOP/IS fails to describe the existing heavy metals and other hazardous waste contained in the soil.[1] The DSEIR's failure to mention this contamination prevents public disclosure of its scope, its implications for future construction work onsite, and potential exposure to the public during occupancy of the Project. As a document of public information, the DSEIR cannot avoid meaningful disclosure of this information by announcing that compliance with the Maher Ordinance will fix everything. That strategy is the opposite of informed decision-making and public participation.

[1] It is noted that the NOP/IS does not attempt to make compliance with the Maher Ordinance an enforceable mitigation measure.

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Brett Bollinger
July 26, 2015

The same analysis applies to the acknowledged asbestos-containing backfill material located onsite. First, it is not at all clear that California Air Resources Control Board's ("CARB") Asbestos Airborne Toxic Control Measure ("ATCM") even applies because this is not an instance where construction is occurring in an area of naturally occurring asbestos material. (Cal. Code Regs., tit. 17, § 93105, subd. (b).) As acknowledged in the NOP/IS, the material is processed (i.e., crushed) asbestos containing rock that was imported onto the site and used as backfill material. Accordingly, CARB's Asbestos ATCM does not apply here. Consistent with this misapplication of the Asbestos ATCM in the NOP/IS, the "no visible emission at property boundary" standard (NOP/IS, p. 114) does not apply because it is inadequate for both public and worker safety. Rather, the Project must comply with BAAQMD Regulation 11, Rule 2.

Second, even if the NOP/IS had identified the proper regulatory standard, the underlying strategy of relying on promises to comply with regulatory standards does not satisfy CEQA's informational disclosure mandates. The City has the duty under CEQA to investigate and disclose the extent of the potentially significant impact prior to setting forth potential mitigation measures. (*Galante, supra,* (1997) 60 Cal.App.4th at 1123.) Considering that many other flaws will require preparation of a Recirculated DSEIR, there will be ample opportunity to include the results of further study of contamination in that forthcoming document.

10 [HAZ-1, HAZ-4] cont.

3. <u>Geology and Soils – 1998 FSEIR Chapter 5.H.</u>

According to the NOP/IS, there are no new or more severe Geology and Soils impacts associated with the Project than were analyzed in the 1998 FSEIR. (NOP/IS, pp. 85-86.) Thus, the DSEIR did not address Geology and Soils. (DSEIR, p. 1-9.) The omitted analysis fails under any standard of review because the currently-proposed Project is different than the project described in the 1998 FSEIR and conditions have changed such that the 1998 FSEIR does not adequately describe it. The 1998 FSEIR also relies on outdated data and methodology to analyze Geology and Soils impacts. Moreover, the Project has never been subject to a thorough analysis regarding Geology and Soils Impacts in any document.

11 [GEO-1]

As described in the attached reports prepared by geotechnical engineer Lawrence Karp, CE, CEG ("Karp Geotech", attached as <u>Exhibit C</u>), BSK engineering geologist Martin Cline, CEG, and hydrogeologist Kurt Balasek, PG, CHG, QSD ("BSK Geotech", attached as <u>Exhibit D</u>), the 1998 EIR fails to provide adequate analysis of impacts related to Geology and Soils. In particular, the seismic and tsunami risks associated with the site and the Project have not been analyzed or mitigated to an acceptable level. As explained below, these unanalyzed impacts put the public at unnecessary risk and require that the

DSEIR be revised and recirculated for public review. The recirculated DSEIR must include a thorough review of geotechnical conditions of this site and the resulting potentially significant impacts and mitigation required in the context of this Project. 11 [GEO-1] cont.

a. Seismic Hazards.

i. The Seismic Standards for the Site have Changed Since 1998.

The NOP/IS claims that there are "no new or more severe effects," ignoring "[s]ignificant changes to the California Building Code and the standard of practice for analyzing ground motion and liquefaction evaluation have occurred since the 1998 SEIR was published." (BSK, comment B1.) At the time the 1998 EIR was written, the San Francisco Building Code was based on different maps and seismic design standards were much less stringent. (Karp Geotech, p. 3.) Later mapping by the State delineates the site as subject to liquefaction-induced ground displacement, and no analysis of the parameters used in 1998 and those applicable today has been prepared to support the claim that there are no new or more severe impacts than discussed in the 1998 FSEIR. The ground motion parameters required of a public assembly use are also much more stringent now, as described by Dr. Karp. (Karp Geotech, pp. 3-4.) 12 [GEO-1]

ii. A Complete Geotechnical Investigation Has Not Been Completed.

The proposed Project, which is a "public assembly use" for occupancy greater than 300 requires a different and more thorough analysis with respect to seismic hazards than the "Commercial Industrial (Mixed Use including Retail)" land use designation analyzed in 1998. (Karp Geotech, p. 1; see also DSEIR, Figure 3-3.) The site has not been properly classified for a public assembly use and the prior geotechnical reports prepared for the site underestimate public response. Public assembly uses for occupancies greater than 300 require a different approach to engineering than a typical project. 13 [GEO-1]

The evaluation reports prepared for the site after the 1998 EIR do not address the Risk Category III Importance under the Building Code[2] and the data underestimates site response to strong motion. (Karp Geotech, p. 1.) Moreover, later documents, such as the

[2] According to the California Building Code, § 1604.5: Risk Category III includes those "[b]uildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300."

2011 Langan Treadwell Rollo Geotechnical Investigation, were prepared for previously-proposed office buildings, not an arena. The other more recent report by the same firm states it is "Privileged and Confidential – For Discussion Purposes Only" (BSK Geotech, comment B.2; Karp Geotech, p. 1) and is not stamped by an engineer. In any case, neither the 1998 EIR or these more recent reports classify the current site use or address Risk Level III Importance requirements. 13 [GEO-1] cont.

iii. Seismic Risk Is Underestimated.

The site is subject to two geotechnical risks, liquefaction and amplification. (Karp Geotech, p. 2.) The liquefaction risks were not adequately analyzed in 1998 EIR for this Project type, and the 1998 EIR does not analyze amplification. Liquefaction and amplification "hazards are different but related; liquefaction potential (sand) can be mitigated but the structure must be designed to resist soft ground (clay) amplification from strong motion." (Karp Geotech, p. 2.)

With respect to liquefaction, the risk can be mitigated with various ground improvement techniques. (Karp, p. 5.) Techniques include overexcavation and compaction, however the extent of excavation needed to fully address liquefaction has not yet been determined. (BSK Geotech, p. 5.) According to the NOP/IS, excavation on-site would extend approximately 30 feet, requiring approximately 350,000 cubic yards of soils on-site to be excavated and removed from the site" (NOP/IS, p. 17, 89.)[3] No explanation is provided, however, as to how this amount of excavation was determined, or how it relates to the amount of material that must be removed due to contamination, or for geotechnical purposes. (BSK Geotech, comment A5; see also *ante* section 2. regarding Hazard Impacts.) Additionally, once soils are excavated, the 1998 SEIR and the NOP/IS do not specify when or how engineered fill would be used as opposed to other types of fill. All of these details would be part of a complete seismic analysis. 14 [GEO-3]

iv. The Pile System is Not Adequately Developed and is of Limited Assistance to Protect the Public.

The 1998 EIR and the NOP/IS refer to the use of piles for structural stability. (1998 FSEIR, p. II.20, V.H.12; NOP/IS, pp. 17, 86, 87, 88-91.) Piles would be subject to 15 [GEO-4]

[3] See also comments on Air Quality submitted by Tom Lippe. The failure to accurately quantify the amount of soil excavation that will be required to address liquefaction and site contamination (see section 3. *infra*) also make the air emissions estimates and traffic impacts analysis unreliable. Additionally, availability of disposal sites cannot be analyzed without a reasoned estimate of needed excavation.

amplification, which was not studied in the 1998 DSEIR. (Karp Geotech, p. 5.) Moreover, piles are discussed only in the context of the arena structure. However, "[p]ile support systems do little to provide mitigation from liquefaction and settlement of surrounding utilities/roads and other support systems that may be damaged during a seismic event." (BSK Geotech, comment A1.) Settlement due to sand boils is a potential concern that has not yet been fully addressed in terms of impacts to supporting structures and necessary mitigation standards. (BSK Geotech, comments A10, A11.) These Project details must be studied in the context of an EIR. (See BSK Geotech, comment A4.) 15 [GEO-4] cont.

v. Impacts of Dewatering and Pile Driving Have Not Been Studied.

Dewatering necessary for construction has not yet been studied to the degree of detail needed to understand the required mitigation. A 2015 Langan Treadwell Rollo memorandum discusses dewatering, but does not address engineering effects of dewatering, such as the increase in effective stress that causes areal subsidence. (Karp Geotech, p. 6.) The NOP/IS unreasonably dismisses these risks with no analysis. (BSK Geotech, comment B6.) 16 [GEO-5] Vibrations from pile driving can also create additional risks, which have not been analyzed for this Project. (Karp Geotech, p. 6.) 17 [NOI-5] Test programs, dynamic analyses and site-specific engineering are needed, and have not yet been completed, to identify the nature and extent of the impacts and the necessary mitigation to address these impacts. (Karp Geotech, p. 6.) 16 [GEO-5] cont.

vi. Hazards of Lateral Spread and Liquefaction Induced Boils Are Not Addressed.

In 1998, mapping for lateral spread risk did not include the site. (BSK Geotech, comment B5.) Liquefaction-induced sand boils have also been identified as a hazard since 1998. (BSK Geotech, comment C4.) These hazards individually and jointly must be analyzed in the context of an EIR in order to fully inform the public regarding the potential impacts of the Project consistent with CEQA. (See generally Pub. Resources Code, § 21002.) 18 [GEO-1]

In summary, a thorough analysis of all seismic risks that utilizes the most current methodologies must be performed to adequately protect the public. Candlestick Park provides a relevant case study of the need to ensure thorough analysis and mitigation. In 1985, Lawrence Karp was involved in a study of how Candlestick Park would perform in a serious seismic event, and attended a summary meeting in City Hall with Norm Karasick, the City architect. The discussion was about the cost of rebuilding the deteriorated concrete bleachers to then-current standards. It was recognized that one or more sections could collapse in an earthquake. Mr. Karasick pointed out that the City

probably would not want to spend the money to strengthen the bleachers, stating, "What are the odds there would be an earthquake during a game?" The City ultimately decided to do the work, and on October 17, 1989 the Loma Prieta earthquake occurred during a World Series game. Nobody was injured at the game. Had the City not engaged in that updated study, and mitigated to current standards, the result might have been disastrous. The same practice must be followed here. The City must correct its outdated and deficient seismic analyses in the recirculated DSEIR. 18 [GEO-1] cont.

b. Tsunami Hazards Are Not Addressed.

According to the 1998 FSEIR, the "likelihood of tsunami inundation is very slight." (1998 FSEIR, p. II.20.) The 1975 model used in the 1998 EIR to determine potential tsunami hazards is outdated. (BSK Geotech, Comment A.6.) The current approach for assessing tsunami risk is to perform a Probabilistic Tsunami Hazard Analysis, which has not been done for this site. (BSK Geotech, comment A.6.)

Since 1998, part of the Project site was mapped as a Tsunami Hazard Zone established by the State of California (California Emergency Management Agency, June 15, 2009 Map). (BSK Geotech, comment A.2; see also Figure 1.) This updated map indicates that the tsunami hazard is now considered significant. (BSK Geotech, comment A.2.) 19 [HYD-8]

The 1998 FSEIR, NOP/IS and DSEIR do not address the tsunami hazard in the context of extreme high tides or sea level rise. (BSK Geotech, comments A7, B9, C1.) The 1998 FSEIR and the NOP/IS relied on "datum established in the 19th century," which has not been updated to reflect current sea level data. (BSK Geotech, comments A8, B8.) The 1998 FSEIR and NOP/IS minimize the tsunami hazard based on these outdated methodological approaches. Reliant upon these conclusions, the DSEIR discounts the risk of tsunami and provides no analysis of the impact. (BSK Geotech, comment C3.)

Currently, structures designated as Risk Category III <u>are specifically prohibited in a Tsunami Hazard Zone</u> under the California Building Code. (BSK Geotech, comment A9; see also Figure 1.) The NOP/IS and the DSEIR fail to mention this important fact. (BSK Geotech, comment C5.) The DSEIR must be rewritten and recirculated to address tsunami hazards.

c. Inadequate Mitigation is Provided for Geology and Soils Impacts.

i. There are No Effective Seismic Mitigation Measures.

No mitigation in the form required by CEQA is included for Geology and Soils Impacts despite the discussion of the need for mitigation measures identified in more recent site-specific geotechnical reports. (BSK Geotech, comment C2.) The NOP/IS relies on a combination of old and inadequate mitigation from the 1998 EIR, compliance with the Building Code, and future geologic and other investigations. All mitigation for the serious impacts associated with Geology and Soils has been impermissibly deferred.

While the NOP appears to point to mitigation developed in 1998 as applicable to the Project, DSEIR Appendix-MIT indicates that there are no mitigation measures listed that apply to the Project's Geology and Soils impacts. Yet the findings and conclusions of the geotechnical work completed for the site by Langan Treadwell Rollo identify numerous conditions requiring mitigation, including: "excessive static and dynamic settlements, liquefaction including sand boils, lateral spread, intense ground motion, shallow groundwater and corrosive soils." (BSK Geotech, comment C2.) 20 [GEO-1, GEO-6]

In 1998, the site's soils were identified as highly corrosive, which can damage concrete and metal used in foundation measures and other underground infrastructure. (See Karp Geotech, p. 5.) The NOP/IS states that Mitigation Measure H.7 from the 1998 FSEIR would require testing of the soil. (NOP/IS, p. 86.) Yet, Appendix MIT of the 2015 DSEIR states that this Mitigation Measure H.7 is not required. (DSEIR, MIT-22.)

With no site-specific or Project specific mitigation, the NOP/IS relies primarily on the Building Code to mitigate for seismic impacts. (NOP/IS, p. 87, 88, 90.) Yet reliance on a regulatory standard is inadequate when the underlying impacts have never been analyzed in the first place. While mitigation may properly be deferred in some instances (CEQA Guidelines, § 15126.4, subd. (a)(1)(B)), the "perfunctory listing of possible mitigation . . . [that] are non-exclusive, undefined, untested and of unknown efficacy," is inadequate. (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 74, 93.) Here, the DSEIR's lack of seismic analysis addressing this Project and this site severely compounds the problem.

According to the IS/NOP (pp. 87, 93) future geotechnical investigations will disclose the conditions and the required mitigation. Neither the future study nor the alleged future mitigation are enforceable. Moreover, to the extent these references relate to the contemporary geotechnical evaluations and investigations, such as the 2011 Langan Treadwell Rollo report for office buildings, they are inapplicable to the building

type now proposed. These more recent reports also clearly state that they are not to be used for design purposes.

According to Dr. Karp, the current documents for the Project do "not include sufficient countermeasures to liquefaction" risks. (Karp Geotech, p. 5.) For instance, ground improvement measures also need to lessen the effects of strong motion in the underlying Bay Mud during earthquakes. (Karp Geotech, p. 5.) Countermeasures could include various actions, but those actions must be compatible with a piling system that would be subject to liquefaction loads and motion amplification from Bay Mud. (Karp Geotech, p. 5.) Specific measures to address differential settlement have not yet been developed. (BSK Geotech, comment B3, B6.) Mitigation must be developed in the context of a contemporary environmental review process. A test program should also be developed to evaluate these measures. (Karp Geotech, pp. 5-6.) 20 [GEO-1, GEO-6] cont.

In addition to proper design of the Project, mitigation must address public safety concerns regarding evacuation from an earthquake or tsunami. Even if overexcavation and fill and other measures could be effective to address liquefaction at the site, surrounding utility roads and emergency support systems would not be protected by the proposed supporting piles discussed in the 1998 DSEIR and the IS/NOP. (BSK Geotech, comments A1, A10.) Additionally, adequate escape routes from the area must be available in the event of an earthquake or a tsunami. A collapse of the Third Street Bridge was previously identified as subject to damage in a major earthquake and limiting escape routes out of Mission Bay. (1988 DEIR, Vol. II, Chapter VI.D.3, 9 and 44.) 21 [HAZ-8]

ii. No Mitigation is Provided for Tsunami Risk.

While the NOP/IS discusses possible mitigation for tsunami in the text, none of those measures are included in the Mitigation Measures. (BSK Geotech, comment B10.) Additionally, it is unclear why mitigation is being provided at all if the risk is indeed less than significant. (BSK Geotech, comment C1.) Additional mitigation in the form of design parameters that could assist in reducing the risk are not specified or required. (BSK Geotech, comment B11.) And flood improvements are a feasible mitigation measure required for the portion of Mission Bay subject to Addendum 9 to the 1998 FSEIR. (FSEIR, Addendum 9, Mitigation Measure K.06.) It appears that these measures would also be appropriate for the Project. 22 [HYD-8]

In conclusion, the United States Geological Survey forecasted a 67% probability that an earthquake of magnitude 7.0 or greater will occur on the San Andreas or Hayward faults by the year 2020. (Karp Geotech, p. 2.) This Project will draw up to 18,500 people into a zone subject to many risks. A full environmental analysis, with a testing program and adequate mitigation must be included in a recirculated EIR. Risks to the public from earthquakes and tsunamis are too dire to ignore or treat lightly based on decades-old environmental review and outdated models and standards. 22 [HYD-8] cont.

4. **The DSEIR's Analysis of Utilities and Service Systems Violates CEQA – DSEIR Chapter 5.7.**

The DEIR's analysis of utilities and service systems fails to comply with CEQA's mandates. First, the DSEIR relies upon a water supply assessment for an earlier, different project, in a different location, prepared before the City had its water rights curtailed. The DSEIR also fails to address necessary stormwater infrastructure issues and relies on the prior NOP/IS that affirmatively misrepresents the capacity of that anticipated system. Finally, the DSEIR impermissibly defers virtually all substantive analysis and mitigation regarding needed wastewater infrastructure. 23 [UTIL-2]

a. **Inadequate Analysis of Water Supply and Conveyance Facilities.**

The DSEIR impermissibly fails to consider whether the Project will result in the construction or expansion of any water conveyance facilities that may result in significant environmental impacts. This approach is based on the claim that the NOP/IS establishes that there are no significant impacts. (DSEIR, p. 5.7-9.) The NOP/IS, however, fails to provide sufficient information to make any conclusion in this issue by deferring any meaningful analysis. (NOP/IS, pp. 68-69.)

More specifically, the NOP/IS acknowledges: 24 [UTIL-1]

> If the water distribution system as approved under the Mission Bay Infrastructure Plan is inadequate to meet the project's demand, the project sponsor would be responsible for funding the construction of required new water mains and appurtenances. The construction of the new water mains and appurtenances would require excavation, trenching, soil movement, and other activities typical of construction of development projects in San Francisco.

(NOP/IS, p. 69.)

This analysis is flawed in several respects. First, having acknowledged that the infrastructure may not be adequate for the Project, and that construction of an unknown scope may be necessary to install this infrastructure, the SDEIR may not simply defer analysis of whether the infrastructure is adequate. And yet that is precisely what the City

purports to do, stating in relevant part: "As part of the standard permit review process, the Mission Bay master developer, in coordination with the project sponsor, would be required to request a hydraulic analysis of the SFPUC water distribution system to confirm that the existing and planned water distribution system is adequate to meet the project's water distribution demands, including fire suppression system pressure and flow demands." (NOP/IS, p. 69.) No explanation is given as to why this assessment could not have been made prior to the release of the DSEIR, which is the intended vehicle to provide public disclosure of these very issues. As a result, the decision-makers and the public are left completely in the dark about the very matter at issue, namely whether additional infrastructure is required and, if so, the scope of construction work that may be necessary to install that infrastructure. 24 [UTIL-1] cont.

The environmental impacts of construction may not be lightly dismissed as done in the NOP/IS. (NOP/IS, p. 69.) While construction of water conveyance facilities might, generally speaking, be "typical of construction of development projects in San Francisco," the Project site includes soil and groundwater contamination that make such construction activities anything but "typical." (<u>Exhibit B</u>, comments A1, A2, A3, B1, B3, B4, B5, B6, C1.)

The DSEIR fails as an informational document because it impermissibly defers any meaningful analysis of water conveyance facilities. Moreover, there is substantial evidence of a fair argument that construction of these facilities, if required, may result in significant environmental impacts. The recirculated DSEIR needs to address this issue.

Similarly, the DSEIR dismisses the question of adequate water supply without analysis, relying on the lack of potentially significant impacts identified in the NOP/IS. (DSEIR, p. 5.7-1.) The NOP/IS states that the City is relying on a water supply assessment ("WSA") prepared in May 2013 for the then-proposed arena site located at Piers 30-32 ("2013 WSA"). The DSEIR fails as in informational document with respect to water supply issues because it may not rely on the 2013 WSA. 25 [UTIL-2]

First, the DSEIR does not address how the proposed Project is a revision of the Piers 30-32 project for purposes of Water Code section 10910. While the two projects may share some common features of an arena, there are considerable differences. The projects are at different locations. Further, the prior project proposed 208,844 square feet of residential uses and 178,406 square feet of hotel uses, that are eliminated in the current Project that proposes 580,000 square feet of commercial uses. The basic site plans are different for the two projects.

Second, even if the proposed Project could be considered a revision to the abandoned Piers 30-32 project, the DSEIR may not rely on the prior WSA because there has been a significant change in circumstances since preparation of the 2013 WSA. (Wat. Code, § 10910, subd. (h).) Water Code section 10910, subdivision (h)(2) provides that a prior WSA may not be subsequently relied upon when there are "[c]hanges in the circumstances or conditions substantially affecting the ability of the public water system . . . to provide a sufficient supply of water for the project." The ongoing drought is a major change in circumstances that substantially affects the City's ability to provide water to the Project. On June 26, 2015 the State Water Board sent the City a notice curtailing its pre-1914 water rights. With no relief to the drought in sight, it is reasonable to expect further curtailments to the City's water rights. This change in circumstances prohibits the City from relying on the 2013 WSA for the project. And the DSEIR's failure to discuss this critical water supply issue renders it inadequate as an informational document. 25 [UTIL-2] cont.

b. The DSEIR Provides a Misleading Discussion of Stormwater Treatment Facilities.

The DSEIR also fails as an informational document with respect to its analysis of stormwater treatment because it provides both inconsistent and misleading information about the facilities intended to handle stormwater runoff.

First, the DSEIR is internally inconsistent with the NOP/IS, upon which it purportedly relies. With respect to stormwater facilities, the NOP/IS asserts that the impact is potentially significant (IS, p. 64 Table 11.c) and will be analyzed in the DSEIR (IS, p. 72.) The subsequent DSEIR, however, states that it is not providing a project level analysis of the issue, asserting in relevant part: 26 [UTIL-7]

> With respect to stormwater facilities, however, the stormwater system improvements already construction and currently under construction address both the near-term and long-term needs. . . . ***A separate project impact analysis is not provided***.

(DSEIR, p. 5.7-10 (emphasis added).)

The DSEIR violates CEQA because it fails to address the potentially significant impacts of project-level stormwater infrastructure. While the DSEIR provides some analysis of cumulative stormwater impacts, it concludes that the impact is less than significant with no need for any mitigation. (DSEIR, p. 5.7-18.) Thus, the NOP/IS and the DSEIR play a shell game with respect to analysis of stormwater impacts. It is unclear

what the DSEIR's ultimate conclusion is regarding project-level stormwater infrastructure impacts, and no substantial evidence supports this unknown conclusion. 26 [UTIL-7] cont.

Setting aside the internal inconsistency, the DSEIR's ultimate conclusion of less than significant cumulative impact is based on a misleading characterization of the Project's stormwater infrastructure. The DSEIR asserts:

> The project stormwater analysis completed for the project sponsor concluded that the capacity of the separated stormwater system as built is adequate to serve the project as well as other development projects that would be constructed at full buildout of Mission Bay South.

(DSEIR, p. 5.7-18.)

This representation is inaccurate and misleading. A technical report, referenced in a footnote but not actually attached as an Appendix to the DSEIR, describes the stormwater facilities very differently. (DSEIR, p. 5.7-18, fn 20 citing "BKF, Mission Bay Blocks 29-32 – Stormwater Memorandum, January 6, 2015" ("Stormwater Memorandum").) The Stormwater Memorandum provides a more accurate description of the stormwater infrastructure, and provides in relevant part: 27 [UTIL-8, HYD-6]

> The storm drain system and pump station are designed to handle runoff from a 5-year storm event. During larger events such as a 100-year storm event, runoff is conveyed through the streets to a controlled overflow to the Bay.

(Stormwater Memorandum, p. 6.)

Thus, the Project's stormwater system can in no way handle project-level stormwater runoff, much less the Project's runoff in combination with cumulative projects. This is because the system has the capacity to handle only up to five-year storm events, which is significantly smaller than the 100-year capacity typically required. Any storm larger than a five-year event will result in flooding the streets.[4] In light of this anticipated flooding, the Project, which includes multiple levels below grade, will "be

[4] The Stormwater Memorandum asserts that use of public streets to channel storm flows in this manner was analyzed in a *Revised Summary Drainage Study for the South of Channel Watershed for Mission Bay Project*, dated December 1, 2000, yet this document was not posted on the OCII as required for the project to comply with the streamlining requirements of AB 900.

sufficiently flood proofed to prevent 100-year overland flow in perimeter streets from entering below grade structures or inundating utilities and equipment." (Stormwater Memorandum, p. 6.) The necessity to flood proof the Project due to inadequate stormwater facilities was never addressed in the DSEIR. Moreover, to the extent that increasing impervious surfaces on the Project site will result in additional flooding in the public streets that are shared by other structures, the DSEIR fails to address the need for additional flood proofing of other buildings in the area.

The analysis contained in the Stormwater Memorandum is also inconsistent with the DSEIR's analysis of flooding risks, which is based on the NOP/IS's analysis of Impact HY-4. Contrary to the information provided in the NOP/IS, the Project would result in exposing people and structures to a significant risk of loss and injury due to flooding for any event above the five-year event. (CEQA Guidelines, Appendix G, Section IX(i).) This is true for both the Project site as well as offsite. Finally, the strategy of relying on public streets as de facto spillways significantly contributes to substantial additional sources of polluted runoff. (CEQA Guidelines, Appendix G, Section IX(e).) This represents a new significant impact that was never addressed in the DSEIR. 27 [UTIL-8, HYD-6] cont.

The resulting public safety risk created by this situation cannot be overstated. The Project includes an 18,000-seat arena. In instances where arena events occur during moderate storm events (anything above a five-year event), thousands of visitors to the arena will exit onto streets that are serving as flood channels for stormflow. The combination of flooded streets, thousands of densely-packed pedestrians, at-grade transit cars and automobiles – all at night – presents a very dangerous situation that has never been discussed, analyzed, or mitigated in the DSEIR.

c. The DSEIR Deferred Analysis of Wastewater Impacts.

The DSEIR's analysis with respect to wastewater capacity and infrastructure is similarly flawed. After acknowledging that the City does not have sufficient wastewater capacity to address project-level impacts, the DSEIR very generally mentions vague "interim improvements to temporarily increase the dry-weather capacity" of the Mariposa Pump station. (DSEIR, p. 5.7-12) In failing to explain when these interim improvements will be completed or to analyze their environmental impacts, the DSEIR fails as an informational document. (*Ibid.*) 28 [UTIL-6]

The DSEIR's analysis of cumulative wastewater impacts also fails to provide necessary information to the public and decision-makers. While acknowledging that permanent improvements are necessary, the DSEIR fails to provide any information 29 [UTIL-3]

about the environmental impacts of these improvements. (DSEIR, pp. 5.7-13 – 14.) The DSEIR dismisses this deficiency because "SFPUC has not completed the planning and design of specific improvements," (DSEIR, 5.7-14), but this does not alleviate the duty of a lead agency to disclose available information. (CEQA Guidelines, § 15144.) One critical piece of information with respect to future construction activity, ignored in the DSEIR, is that a substantial amount of such construction would likely occur in areas of existing soil and groundwater contamination. (Exhibit B, comments A1, A2, A3, B1, B3, B4, B5, B6, C1.) The DSEIR's conclusory dismissal of the impacts associated with constructing necessary wastewater infrastructure fails to address that issue.[5] 29 [UTIL-3] cont.

5. The DSEIR Improperly Excluded Analysis of Impacts to Recreation – 1998 SEIR Chapter 5.M.

The DSEIR did not address the Project's impacts on recreational facilities because the NOP/IS determined that no new or more severe significant impacts would occur than previously identified in the 1998 SEIR. As set forth more fully below, the information contained in the DSEIR supports a fair argument that use of Bayfront Park by thousands of crowded arena visitors will accelerate its substantial deterioration, which will be a significant environmental impact. (CEQA Guidelines, Appendix G, section XV(a).) A fair argument exists that the Project's recreation-related construction,at Bayfront Park will result in significant environmental impacts through possible exposure to hazardous materials. Even if the Project is considered a "revision" to the project analyzed in the 1998 SEIR, the addition of a massive, 18,000-seat arena will have a significantly greater impact to Bayfront Park than disclosed in the 1998 SEIR requiring analysis in a recirculated DSEIR. 30 [REC-1, HAZ-9]

a. Crowds From the Project May Substantially Degrade Bayfront Park.

The DSEIR failed to include an analysis of impacts to recreation based on the NOP/IS's determination there would be no new or more severe impacts than identified in the 1998 SEIR. (NOP/IS, pp. 61-64.) This conclusion is in error because a fair argument exists that the Project will result in potentially significant impacts to recreation and recreational facilities.

The fundamental flaw in the NOP/IS's analysis is seen in the following statement: "The increase in demand for recreational facilities generated by the project would

[5] Further discussion regarding the City's abdication of its CEQA duties with respect to wastewater treatment is addressed in the July 26, 2015, letter submitted by Tom Lippe.

generally be consistent with that described in the Mission Bay FSEIR." (NOP/IS, p. 63.) This remarkable conclusion is unsupported by any citation or factual support. Rebutting this statement is the project description itself: an arena with a capacity of more than 18,000 seats holding up to 225 events per year. The expected huge crowds, and employees associated with the 580,000 square feet of commercial uses, would be crammed into an 11 acre parcel. The only respite to the congested arena environment would be 3.2 acres of alleged open space. While at first blush this might appear adequate, in reality this "open space" consists of small, disjointed spaces. Many of these spaces are located on the tops of buildings and unavailable to thousands of arena visitors.

In contrast to the functionally unusable "open space" within the Project site, immediately across the street from the Project is the planned Bayfront Park – a single, expansive, ground level, landscaped park of 5.5 acres. It is very likely that the near-daily crowds of congested arena visitors will use Bayfront Park to gather both before and after shows rather than the oddly disjointed "open spaces" located on top of various buildings throughout the site.

30 [REC-1, HAZ-9] cont.

These thousands of additional arena visitors are in addition to the people associated with the Project's 580,000 square feet of office space, the Project's 125,000 square feet of retail space, and all other people within the larger Mission Bay area who are anticipated to visit Bayfront Park. The open space needs of such arena crowds were nowhere contemplated in the 1998 SEIR. The Project will result in significantly accelerated physical deterioration of Bayfront Park, not disclosed in the 1998 SEIR, and is a significant impact under CEQA. (CEQA Guidelines, Appendix G, section XV(a).)

b. The Project Will Require Construction of Bayfront Park That May Have an Adverse Impact on the Environment.

The DSEIR acknowledges the development of the Project triggers development of Bayfront Park and must be completed prior to occupancy. (DSEIR, p. 3-37-38.) In other words, development of the Project requires construction of Bayfront Park. (See, e.g., CEQA Guidelines, Appendix G, section XV(b).) Accordingly, construction of Bayfront Park is a "reasonably foreseeable consequence of the initial project," and requires analysis in the DSEIR. (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal. 3d 376, 396.) It may not, as occurred here, be dismissed as a separate project for purposes of CEQA. (DSEIR, p. 3-37.) Serious questions exist about whether construction of Bayfront Park will result in adverse physical effects on the environment due to the presence of hazardous materials on that site. (*Ibid*.)

As set forth above, the NOP/IS failed to disclose the present existence of hazardous waste in the soil within the Project site. The soil underlying the future Bayfront Park is similarly contaminated. (2006 RRMP, p. 2-5.) This contamination has not been disclosed in the NOP/IS or the DSEIR. Since it appears that Bayfront Park will be constructed along with the Project, the same questions are raised about hazardous materials impacts as discussed in sections 2(b) and (c) of this letter.

The potentially significant impacts regarding hazardous materials are exacerbated because Bayfront Park will be a ground-level landscaped park. Having failed to disclose that the soil underlying Bayfront Park is contaminated, the NOP/IS also fails to explain whether such contaminated soil will be left in place and thereby expose visitors to hazardous materials. There is no discussion of whether an impermeable cap will be used to protect future park visitors from the existing contaminated soil.

30 [REC-1, HAZ-9] cont.

The failure to address these critical issues supports a fair argument that the Project will require construction of a recreational facility (i.e., Bayfront Park) that will have an adverse effect on the environment by facilitating the exposure of contaminated soils to humans and the environment. (CEQA Guidelines, Appendix G, section XV(b)). The City may not dismiss this potentially significant impact based on its own failure to conduct a reasonable analysis of the issue. (*Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 311 ("[t]he agency should not be allowed to hide behind its own failure to gather relevant data . . . . If the local agency has failed to study an area of possible environmental impact, a fair argument may be based on the limited facts in the record").) The recirculated DSEIR will need to analyze this potential significant impact.

6. <u>The DSEIR Failed to Disclose Energy Impacts.</u>

The DSEIR is fatally defective because it fails to provide information about the Project's energy requirements as mandated by Appendix F of the CEQA Guidelines ("Appendix F"). A California appellate decision recently reaffirmed the need for a detailed analysis of energy consumption and mitigation in EIRs, stating in relevant part:

31 [EN-1]

> Under CEQA, an EIR is "fatally defective" when it fails "to include a detailed statement setting forth the mitigation measures proposed to reduce wasteful, inefficient, and unnecessary consumption of energy." (*People v. County of Kern* (1976) 62 Cal.App.3d 761, 774.) The requirement to adopt energy impact mitigation measures "is substantive and not procedural in nature and was enacted for the purpose of requiring the lead agencies to focus upon the energy problem in the preparation of the final EIR." (*Ibid.)*

(*California Clean Energy Committee v. City of Woodland* (2014) 225 Cal.App.4th 173, 209 (*CCEC*).)

The City failed to comply with this mandate to prepare a detailed statement in the DSEIR. In fact, the DSEIR fails altogether to address the issue of energy consumption because the NOP/IS inaccurately determined that the issue was sufficiently addressed in the 1998 SEIR. (DSEIR, 1-9; NOP/IS, pp. 122-125.) This did not happen.

As explained in *CCEC*, Appendix F lists the information that satisfies CEQA's mandate to "assure that energy implications are considered in project decisions." (CEQA Guidelines, Appendix F; *CCEC*, *supra*, 225 Cal.App.4th at 209.) As just one example, the list includes "total energy requirements of the project by fuel type and end use." (CEQA Guidelines, Appendix F, Section II(A)(2). The 1998 SEIR failed to prove this information. With respect to construction energy requirements, the NOP/IS concedes: "The FSEIR did not estimate energy consumption specific to the development of proposed on Blocks 29-32 or the amount of water that would be used during construction.") (NOP/IS, p. 123.) With respect to operational energy requirements, the NOP/IS concedes, "The amount of fuel use attributable to development on Blocks 29-32 was not specifically calculated in the FSEIR." (NOP/IS, p. 123.) Finally, with respect to transportation energy requirements, the NOP/IS concedes: "The amount of fuel use attributable to development on Blocks 29-32 was not specifically calculated in the FSEIR." (NOP/IS, p. 123.) 31 [EN-1] cont.

The 1998 SEIR thus failed to address the issue of energy demand and mitigation for the project proposed in 1998, much less for the very different Project now proposed. Contrary to the conclusion in the NOP/IS, the 1998 SEIR cannot be relied upon to avoid providing the analysis in the DSEIR.

The NOP/IS and DSEIR make much of the proposed LEED certification for the Project. While LEED certification may be relevant to a lead agency's duties under Appendix F, referencing LEED certification alone is inadequate. The *CCEC* decision addressed this point in the context of Title 24 building energy code standards:

> Although the Building Code addresses energy savings for components of new commercial construction, it does not address many of the considerations required under appendix F of the CEQA Guidelines. These considerations include whether a building should be constructed at all, how large it should be, where it should be located, whether it should incorporate renewable energy resources, or anything else external to the building's envelope.

CCEC, *supra*, 225 Cal.App.4th at 211.)

The same analysis applies to LEED certification. While relevant, LEED certification does not end the discussion or obviate the lead agency's duty to comply with Appendix F. What is more, as explained in the context of GHG emissions a lead agency may not avoid its duty to disclose project impacts and mitigation measures by incorporating mitigation measures into the project description. To the extent that the City intends to incorporate the purchase of offsets as a "design feature" or otherwise incorporate it into the project description, recent case law clarifies that this strategy violates CEQA's mandate to separately disclose project impacts and feasible mitigation measures. (*Lotus*, *supra*, 223 Cal.App.4th 645, 655-56 (incorporating mitigation measures for redwood trees into the project description violated CEQA "[b]y compressing the analysis of impacts and mitigation measures into a single issue").) To the extent that LEED certification reduces the Project's energy demand, the DSEIR must disclose the Project's unmitigated energy consumption and show how LEED certification reduces that consumption. 31 [EN-1] cont.

In summary, the City's failure to address the Project's energy demands as required by Appendix F renders the DSEIR "fatally defective." (*CCEC*, *supra*, 225 Cal.App.4th at 209.)

7. <u>Wind and Shadow – DSEIR Chapter 5.6.</u>

a. Wind Impacts are Inadequately Analyzed.

According to the DSEIR, a wind impact would be significant if it would alter wind in a manner that would substantially affect public areas. (DSEIR, p. 5.6-6.) Thus, the wind analysis only addresses offsite areas. (DSEIR, pp. 5.6-10 to -13.) Yet, this Project is so large that it also contains publicly accessible areas within the Project. While the DSEIR includes a discussion of wind impacts in these areas, it does so only for "informational purposes." (DSEIR, p. 5.6-18.) This analysis shows that exceedances of the criteria will occur, yet no mitigation is required. Instead, the DSEIR discusses "refinements that could be incorporated into the project . . . ." (DSEIR, p. 5.6-19.) 32 [WS-1]

The City's approach to addressing wind impacts violates CEQA's mandates that an EIR identify potentially significant impacts and set forth with specificity all feasible mitigation measures. The DSEIR must identify potentially significant impacts to public spaces within the Project site, and cannot conflate public disclosure of that impact with the separate and distinct analysis of feasible mitigation measures. (*Lotus*, *supra*, 223

Cal.App.4th at 655-56.) Further, the DSEIR may not defer formulation such mitigation measures in the absence of any performance standards and explanation as to why deferral is necessary. (*Communities for a Better Environment, supra,* 184 Cal.App.4th at 93.) 32 [WS-1] cont.

b. Shadow Impacts are Undisclosed.

According to the DSEIR, the Project would have a significant shadow impact if it substantially affected a publicly-accessible open space area, such as Bayfront Park. (DSEIR, p. 5.6-6.) With respect to the methodology for assessing the Project's impacts, the DSEIR refers to the South Design for Development. (DSEIR, p. 5.6-8.) However, the land use designation in the Mission Bay Redevelopment Plan for the four-block Project area was designated as "Commercial Industrial (Mixed Use including Retail)." (DSEIR, Figure 3-3.) The proposed Project will require that the South Design for Development be modified to accommodate the arena and accompanying development, so it is not clear that the standards developed for the 1998 land use plan apply in this circumstance. Moreover, conditions have likely changed such that the South Design for development, which did not require any analysis of shadow for the months from October to February, no longer reflects current practices and values. Especially with the increased visitors to the area as a result of the Project throughout the year, shadow impacts on the very parks those people will use should be fully analyzed. 33 [WS-2]

The DSEIR's approach of ignoring the generally-applicable City standard is also inconsistent with the DSEIR's approach to analysis of wind impacts. With respect to wind, the DSEIR relies on Planning Code section 148 to determine what level of wind would constitute a substantial alteration, even though it is superseded by the South Design for Development Standards. (DSEIR, p. 5.6-6.) Yet the DSEIR does not mention the typically applicable standard – Section 295 of the Planning Code, also known as "Proposition K" and "the Sunlight Ordinance." The absence of a substantive standard for shadow is all the more reason to refer to Section 295 for purposes of analyzing shadow impacts.

> Section 295 mandates that new structures above 40 feet in height that would cast additional shadows on properties under the jurisdiction of, or designated to be acquired by the Recreation and Parks Department can only be approved by the Planning Commission if the shadow is determined to be insignificant or not adverse to the use of the park. Also, a recommendation from the Recreation and Parks Commission is required prior to the Planning Commission hearing.

(S.F. Planning Department Application Packet for Shadow Analysis, available at: http://www.sf-planning.org/Modules/ShowDocument.aspx?documentid=539.) Impacts to Bayfront Park should be analyzed according to Section 295 to ensure that shadow impacts are disclosed and mitigated.

In conclusion, the analysis in the DSEIR fails to adequately address the wind and shadow impacts of the Project under current conditions, using standards developed by the City to ensure public spaces are comfortable and enjoyable. The DSEIR should be revised and recirculated to provide a thorough analysis and incorporate all feasible mitigation. Such mitigation may include changes to the structures to address wind and shadow impacts both on and off the Project site. 33 [WS-2] cont.

8. <u>The DSEIR's Project Description is Inconsistent.</u>

The DSEIR is fundamentally flawed because the project description is internally inconsistent, thwarting intelligent public participation relating to the Project and its impacts. (*County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 197.) As described more fully below, the DSEIR appears to variously include and exclude the departure of the Warriors from the existing Oracle Arena. 34 [PD-2]

DSEIR section 1.1.2 (Project Objectives) provides in relevant part:

> The Golden State Warriors currently play their home games at Oracle Arena, located at 7000 Coliseum Way in Oakland, California and lease their management offices and practice facility at the Oakland Convention Center at 1011 Broadway in downtown Oakland. The proposed project would consolidate these facilities in one location.

(DSEIR, p. 1-3.)

Consistent with this approach, the Project's AB 900 Application expressly incorporates into the project description reduced events at the existing Oracle Arena in order to reduce the Project's greenhouse gas emissions. This strategy is depicted both textually and graphically in the AB 900 Application: 35 [AB-1]

> Though the Oracle Arena will no longer host GSW games, it is assumed that approximately 50% of the non-game events will still occur at the Oracle Arena, or 24% of a typical year's game and non-game events will still occur at the Oracle Arena. Thus, emissions calculations for the

remaining non-game events at Oracle Arena use a 24% scaling factor to account for this reduction in number of events.

(AB 900 Application, p. 63.)

Table 1. Project Description

Element	Oracle Arena and GSW Oakland Headquarters	Event Center Project
First Operational Year Considered	2017	2017
Oracle Arena	500 KSF	500 KSF
GSW Games [1]	100%, 47 games	No games
Non-game Events [2]	100%, 42 events	50%, 21 events
Mission Bay Event Center	-	750 KSF
GSW Games [1]	-	100%, 47 games
Non-game Events [3]	-	100%, 161 events
GSW Headquarters	Oakland	Mission Bay, 25 KSF

1. Number of GSW games in both scenarios is based on the 2013-2014 season. Averages for the previous years were skewed by the 2011 NBA lockout.
2. Number of non-game events at Oracle Arena is based on the schedule from recent years. In the Event Center Project scenario, half of the non-game events are assumed to remain at Oracle Arena while the other half are transferred to the Mission Bay Event Center.
3. Number of non-game events at Mission Bay Event Center is based on the Notice of Preparation dated 11/19/2014.

Consistent with the DSEIR's discussion of project objectives on page 1-3 as well as in the AB 900 Application, the DSEIR's analysis of greenhouse gas emissions incorporated event reductions at Oracle Arena for purposes of decreasing the Project's carbon footprint. (DSEIR, p. 5.5-11.) Page 5.5-11 of the DSEIR provides in relevant part:

As part of the AB 900 application, the project sponsor has committed to purchase carbon credits from a qualified GHG emissions broker in an amount sufficient to offset all GHG emissions from project construction and operations, as reiterated in Improvement Measure I-C-GG-1, Purchase Voluntary Carbon Credits. Net additional GHG emissions would be

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[AB-1]
cont.

calculated in accordance with the methodology agreed upon by CARB in connection with the AB 900 certification of the project.[6]

Thus, while not expressly stated in the text of the DSEIR's analysis of GHG emissions, the analysis nonetheless incorporates reduced events at Oracle Arena for purposes of calculating the project's net GHG emissions.

35
[AB-1]
cont.

While taking the environmental "benefit" of lower mobile-source GHG emissions resulting from reduced events at Oracle Arena, the DSEIR deftly avoids analysis of the environmental consequences of this component of the overall Project. For example, the project description includes continued operation of Oracle Arena even though it is predicted to host merely 21 events per year. (AB 900 Application, pp. 63, 81 of 155.) As explained by Ph.D. economist Philip King, it would be unreasonable for Oracle Arena to continue to operate with so few events. Dr. King concludes that one likely scenario is that Oracle Arena would need to close as a result of the reduced demand, which in turn creates the potential for urban decay at the Oracle Arena site. The DSEIR never analyzed the resultant potential for urban decay. Nor did the DSEIR analyze the impacts associated with demolition of the existing Oracle Arena as a result of its shuttering.

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[PD-2]

37
[GEN-4,
IO-1]

The DSEIR is thus flawed because the project description is internally inconsistent. The project description includes reduced events at Oracle Arena when doing so helps to minimize the Project's environmental impacts, but excludes operation of Oracle Arena in order to avoid addressing its problematic environmental impacts. This inconsistency misleads the public about the Project and its impacts. (See, e.g., *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 655-656 ("By giving such conflicting signals to decision makers and the public about the nature and scope of the activity being proposed, the Project description was fundamentally inadequate and misleading").)

The same analysis applies to the DSEIR's inconsistent treatment of the construction of Bayfront Park and realignment of Terry Francois Blvd. The DSEIR notes, consistent with the redevelopment plan, that both the Bayfront Park and realignment are triggered by the Project, which makes them "reasonably foreseeable consequence[s] of the initial project" requiring analysis in the DSEIR. (*Laurel Heights, supra,* 47 Cal. 3d at 396.) Even though these are components of the Project as a matter of law, the DSEIR purports to characterize Bayfront Park and the roadway alignment as

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PD-2

6 Curiously absent from the DSEIR's discussion is any reference that the "net additional GHG emissions" from the AB 900 certification expressly relies upon credits from reduced events at Oracle Arena.

separate projects for purposes of CEQA. (DSEIR, p. 3-37.) As a result of this inconsistent project description, the DSEIR fails to address potentially significant hazardous materials impacts associated with construction and occupancy of Bayfront Park.

38 [PD-2] cont.

In summary, a lead agency may not concurrently expand and contract the described scope of a proposed project – and may certainly not do so when the result is to avoid analysis of potentially significant impacts. The recirculated DSEIR will need to provide a stable and consistent project description.

9. <u>The DSEIR Fails to Analyze Possible Urban Decay in Oakland.</u>

"Under CEQA, a lead agency must address the issue of urban decay in an EIR when a fair argument can be made that the proposed project will adversely affect the physical environment." (*CCEC*, *supra*, 225 Cal.App.4th at 188.) An EIR is to disclose and analyze the direct and the reasonably foreseeable indirect environmental impacts of a proposed project if they are significant. (CEQA Guidelines, §§ 15126.2, 15064, subd. (d)(3).) Economic and social impacts of proposed projects are outside CEQA's purview. (Guidelines, § 15131.) However, when there is evidence that economic and social effects caused by a project could result in a reasonably foreseeable indirect environmental impact, such as urban decay or deterioration, then the CEQA lead agency is obligated to assess this indirect environmental impact. (*CCEC*, *supra*, 225 Cal.App.4th at 188; *Anderson First Coalition v. City of Anderson* (2005) 130 Cal.App.4th 1173, 1182; *Citizens for Quality Growth v. City of Mt. Shasta* (1988) 198 Cal.App.3d 433, 446 ("The potential economic problems caused by the proposed project could conceivably result in business closures and physical deterioration of the downtown area").)

39 [GEN-4]

Here, substantial evidence supports a fair argument that the Project will result in economic impacts that would foreseeably lead to urban decay in Oakland. The DSEIR explains that the project include relocating the Warriors home games from the existing Oracle Arena in Oakland to San Francisco. (DSEIR, p. 1-3.) In addition to relocating all NBA games from Oakland to San Francisco, the Project description also includes relocating half of all existing non-NBA games from Oakland to San Francisco. (AB 900 Application; DSEIR, p. 5.5-11.) Thus, a direct economic impact of the Project is to reduce Oracle Arena events from 89 to 21 per year. As explained by economist Philip King, this is a severe direct economic impact from the Project. (See <u>Exhibit E</u>, a memorandum from Philip King, Ph.D., dated July 13, 2015 ("King Report"), pp. 6-7.)

Such a dramatic economic impact may reasonably be expected to have indirect impacts. Dr. King explains that revenues from a mere 21 events per year will not likely

justify the ongoing operational costs of maintaining such a facility. (King Report, pp. 7-8.) Accordingly, a likely indirect impact is the ultimate shuttering of Oracle Arena. Repurposing such a massive facility is difficult to impossible, and so it is very likely that the facility will likely stand dormant and invite the physical deterioration that is characteristic of urban decay. (King Report, pp. 8-9; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 184, 1212 [urban decay characteristic of "long-term vacancies that deteriorate and encourage graffiti and other unsightly conditions"].)

39 [GEN-4] cont.

Despite acknowledging that the Project would have significant detrimental economic impacts in Oakland, which in turn may result in physical deterioration, the DSEIR ignores the issue of urban decay. It thus fails as an informational document on this issue. The recirculated DSEIR will need to provide an analysis of the economic impacts in Oakland resulting from the predicted reduction of events at Oracle Arena, the potential for physical deterioration to result, and feasible mitigation measures to address these potentially significant impacts. (*CCEC*, *supra*, 225 Cal.App.4th at 188-190.)

* * *

Thank you for the opportunity to provide comments on the Project. For the reasons discussed above, and in the attached expert reports, the Mission Bay Alliance objects to certification of this EIR and approval of this Project.

Very truly yours,

SOLURI MESERVE
A Law Corporation

By: Patrick M. Soluri

By: Osha R. Meserve

PMS/mre

Cc (via email): Bruce Spaulding, Mission Bay Alliance (spauldingbw@gmail.com)

Tiffany Bohee
Brett Bollinger
July 26, 2015

Attachments:

Exhibit A: July 20, 2015 letter report authored by air quality professionals Patrick Sullivan, CPP, REPA, and John Henkelman, regarding Greenhouse Gas Emissions

Exhibit B: July 22, 2015 letter report authored by geotechnical engineer Martin Cline, GEG and Kurt Balasek, PG, CHG, QSD, regarding Hazardous Materials

Exhibit C: July 21, 2015 letter report authored by geotechnical engineer Lawrence Karp, CE, CEG, regarding Geology and Soils impacts

Exhibit D: July 20, 2015 letter report authored by engineering geologist Marin Cline, CEG, and hydrogeologist Kurt Balasek, PG, CHG, QSD, regarding Geology and Soils impacts

Exhibit E: July 13, 2015 letter report authored by economist Philp King, Ph.D., regarding Urban Decay

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July 20, 2015
File No. 01215159.00

MEMORANDUM

TO: Osha Meserve, Soluri Meserve

FROM: Patrick S. Sullivan, SCS Engineers
John Henkelman, SCS Engineers

SUBJECT: Greenhouse Gas Analysis for Golden State Warriors Event Center

SCS Engineers (SCS) has reviewed the greenhouse gas (GHG) analysis prepared for the proposed Golden State Warriors (GSW) Event Center (Project). The GHG analysis was performed to demonstrate that the GHG emissions from the proposed Event Center would meet the requirements under Assembly Bill 900 (AB900), including that it would result in "no net increase" in GHG emissions. SCS has performed many GHG analyses for purposes of permitting, mandatory reporting, verification, CEQA and other requirements. The resumes of Patrick Sullivan and John Henkelman are provided as an attachment.

The documents reviewed include the following:

- *Application for CEQA Streamlining: GHG Emissions Methodology and Documentation*, Environ 2015
- *Application for Environmental Leadership Development Project, Golden State Warriors, Event Center and Mixed-Use Development at Mission Bay Blocks 29-32*, Golden State Warriors 2015
- *ARB Staff Evaluation for Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32*, ARB Staff 2015
- *Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Draft Subsequent EIR*, Office of Community Investment and Infrastructure 2015

SCS does not agree with the conclusion of the AB900 determination letter from the California Air Resources Board (CARB) dated April 20, 2015 stating that the Project would not result in any net additional GHG emissions for purposes of certification under AB900. The methodology used to conclude there would be no increase in GHG emissions is inconsistent CARB GHG policies such as the *First Update to the Climate Change Scoping Plan* (CARB 2014) and furthermore does not substitute for an adequate analysis of GHG under CEQA. 40 [AB-1]

The Project quantified the expected GHG emissions for the construction and operating phases of the Project. The construction emissions were quantified using the California Emissions Estimator Model (CalEEMod) with some site-specific inputs. Operational emissions analysis includes the emissions from the existing Oracle Arena, the existing GSW headquarters, and the proposed

Event Center in the analysis. The emissions from the Oracle Arena were quantified using some site-specific values and some intensity factors obtained from CalEEMod and projected electricity intensity factors from CalEEMod. GHG emissions for the proposed Event Center were calculated using a similar methodology, but all electricity and utility use must be projected using CalEEMod factors. The GHG emission calculations for the Event Center also include GHG reductions for energy efficiency and trip linking.

The Project proposes to achieve GHG neutrality through the acquisition of GHG emission offsets equal to the projected GHG emissions from the Project over a 30-year Project life. The Project includes Mitigation Measure (MM) I-C-GG-1, which requires offsets for GHG emissions from construction and operation of the proposed Event Center.

The GHG analysis provided and proposed MM I-C-GG-1 are not sufficient to demonstrate that the Project will result in no net increase in GHG emissions for the following reasons:

- GHG methodology includes inappropriate Project operational emission baseline
- Monitoring of GHG emissions is not sufficient to demonstrate that GHG emissions are net zero
- MM I-C-GG-1 does not require use of offsets consistent with California GHG policy

As a result, the determination in the Draft Subsequent Environmental Impact Report (DSEIR) that GHG emissions are a less than significant impact is erroneous.

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[AB-1]
cont.

GHG OFFSETS BACKGROUND

GHG offsets are a critical element of the MM I-C-GG-1, which the GHG evaluation indicates would result in net zero GHG emissions from the Project. The concept behind a GHG offset is that a project developer creates GHG emission reductions above and beyond what is considered to be "business as usual" (BAU), meaning that the GHG reduction would not have occurred in the absence of the GHG reduction project. For a GHG reduction offset to be generated for use in the CARB Cap and Trade (C&T) program, the reduction must be *real, additional, quantifiable, permanent, verifiable, and enforceable*. The GHG reduction registries that may create GHG offsets under the C&T program, Climate Action Reserve[1] (CAR), the American Carbon Registry[2] (ACR), and the Verified Carbon Standard[3] (VCS), also adhere to similar principles when creating their GHG offset protocols.

The "Real" requirement for eligible offset sources means that reductions must result from demonstrable action and the methodology used to quantify that reduction must account for appropriate GHG emission sources, sinks, and reservoirs. "Real" assures that GHG generated by

[1] Climate Action Reserve Program Manual (CAR October 2011)
[2] American Carbon Registry Standard v4.0 (ACR January 2015)
[3] VCS Program Guide (October 2013)

GHG offset projects is accounted for and that projects emitting more GHG than they reduce do not generate offsets.

Offset "additionality" means that the GHG reduction activity must produce a result better than BAU. The activity cannot be the normal practice. For example, destruction of ozone depleting substances (ODS) by governments is common practice but that destruction is not commonplace for commercial or industrial facilities. Thus, destruction of ODS is not additional when the ODS is sourced from a government but it is additional when the ODS comes from a company facility.

Quantifiable, verifiable, and enforceable assure that the GHG reduction can be measured, that a third party can confirm the quantification, and that CARB can hold a party liable for performing the GHG offset activity if necessary. These principles provide assurance that GHG reductions are calculated accurately and the supporting data have been reviewed by CARB and a third party verifier.

The principles of real, additional, quantifiable, permanent, verifiable, and enforceable are critical to achieving the goal of reducing GHG in the atmosphere. The need for these assurances is shown by problems with some markets and programs, such as the Clean Development Mechanism (CDM) and Chicago Carbon Exchange (CCX), which have suffered from a lack of confidence in the legitimacy of the generated GHG reduction offsets.

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[AB-1]
cont.

CARB currently allows GHG reduction credits for forest projects, livestock projects, ozone depleting substance (ODS) projects, and mine methane capture (MMC). CARB has proposed the adoption of a rice cultivation project type. The livestock, ODS, and MMC projects achieve GHG reduction through the destruction of gases with a high potential for global warming (methane or ODS). For forest projects, the carbon reduction occurs by setting aside forested land where trees remove carbon from the atmosphere and store it as wood and plant material.

When the GHG offset developer wishes make the offsets available for purchase on the market, the developer uses a third-party verifier to confirm that the project meets program requirements and that reductions have been accurately quantified. The offset registry (CAR, ACR, or VCS) then issues the offsets to the developer. If the protocol was one of those eligible under the C&T regulation, those offsets are traded in the CARB offset market and used for regulatory compliance under the C&T regulation. If those GHG offsets are not generated under a C&T protocol, as apparently intended with the Warriors Arena, they are traded through environmental offset brokers. Non-C&T GHG offsets can be retired at the request of the offset holder to remove those offsets from the market, thereby finalizing the GHG reduction.

FLAWS IN PROJECT OPERATIONAL EMISSIONS CALCULATION

The GHG analysis in the AB900 Certification by CARB and the *Application for CEQA Streamlining: GHG Emissions Methodology and Documentation* makes several assumptions about the Project operational emissions that are not appropriate, including an assumption that the number of events at the Oracle Arena will be limited to 21 and in the reduction of emissions from the Oracle Arena by a factor of 76 percent.

Unsupported Oracle Arena Emission Reductions

The GHG analysis underestimates GHG emissions from the Project by using the operation of the Oracle Arena as the baseline emissions (*Application for CEQA Streamlining: GHG Emissions Methodology and Documentation*, Environ 2015). The new arena Project emissions are then calculated by subtracting the projected Oracle Arena emissions from the proposed Project emissions. Operational emissions for the Oracle Arena in the Project scenario assume that all GSW games plus 50 percent of all non-GSW events that occur at the Oracle Arena will be held at the new arena location in San Francisco. This assumption results in a reduction of emissions from Oracle Arena by 76 percent (based on the current 47 GSW games and non-GSW 42 events per year).

No basis for the validity of this assumption is provided in the GHG analysis. The GHG analysis includes the Oracle Arena in the baseline condition then limits the number of events at the Oracle Arena in the Project scenario, providing the Project with a large and unenforceable GHG credit at the outset of the calculation.

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[AB-1]
cont.

When assumptions are made that limit impacts from a Project, those assumptions must be the result of enforceable conditions. In this case, MM I-C-GG-1 does not limit the events at the Oracle Arena to a maximum of 21. With no enforceable condition limiting the number of events at the Oracle Arena, it is not appropriate to assume that the number of events will decrease. The GHG analysis has already assumed that arena events will be generated by the Project based on the 89 events at Oracle Arena in the baseline scenario and 229 events in the Project scenario (21 at Oracle Arena, 47 GSW games at the Event Center, 161 non-GSW events at the Event Center). The GHG Analysis provides no justification for the reduced number of events at the Oracle Arena while assuming that the total number of events will increase.

If an enforceable condition were to be added to limit the number of events at Oracle Arena to only 21, it would be appropriate to reduce GHG emissions in the Project scenario. However, the methodology used to calculate the reduction in emissions associated with the reduced number of events at the Oracle Arena is not appropriate.

The emissions from the Oracle Arena are also directly scaled using the 76 percent reduction factor based on the number of events. This is unreasonable because it assumes that no emissions occur when events are not scheduled. It is unlikely that the Oracle Arena will cease all energy and utility use while not holding an event. It is even more unlikely that the emissions from area sources (e.g. landscaping equipment) will directly scale with the number of events.

Application Omits GHG Non-Arena Buildings

The AB900 Application does not include any GHG emissions from the non-Arena buildings that are included in the Project. Only the GHG emissions from the proposed Event Center were

included in the AB900 Analysis. Emissions from other structures, including the two 160-foot office towers, the gatehouse, the food hall, GSW headquarters and retail uses for instance, are not included in the analysis, which are 730,000 square feet of space. (DSEIR, p. 2-18 to 2-19, Figure 3-5 and Table 3-1.) This omitted square footage is comparable to the square footage of the Event Center (750,000 square feet), and the emissions could equal or exceed the emissions from the Event Center. The AB900 analysis for the Project scenario omits any GHG emissions from these structures because they are assumed to be "fully vested legal rights" in the Project scenario. (Application, pp. 2, 8.)

This approach of omitting the GHG emissions from non-Arena facilities in the Project scenario because it is a "fully vested legal right" is inappropriate because those buildings have been included in the Project Description and they do not already exist. Excluding those buildings because of "fully vested legal rights" is inconsistent with CEQA requirements that impacts be evaluated based on the actual (i.e. existing) baseline condition, not a possible (i.e. permitted) condition. Also, since the AB900 certification is for the entire Project, GHG emissions from all project components must be included for the inventory to be complete.

Double Counting of Emission Reductions from Trip Linking

The Project includes a significant GHG emission reduction (7 percent of total before reductions) from trip linking. This GHG reduction accounts for some trips which would combine retail trips and trips to the arena. Some of the project operational GHG emissions were calculated with CalEEMod, and CalEEMod already includes factors for trip linking in its emission calculations for mobile sources. The GHG analysis offers no justification for why the trip linking described in the GHG analysis is not already accounted for in the CalEEMod emission calculation. This error overestimates the benefits of trip linking.

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[AB-1]
cont.

Project Methodology is Not Rigorous and is Poorly Defined

The description of the Project in the AB900 Application performed by Environ and relied upon in the GSW AB900 Application is internally inconsistent. The Environ document describes the Project as "development of a new arena." (Application p. 1.) The Environ Project Description shows the proposed land uses near the proposed Event Center, but does not clearly include the buildings in the Project. The Environ AB900 Application then proceeds with the GHG analysis from only the proposed Event Center, omitting emissions from all other buildings and implying that the Project consists of only the Event Center. That Project described in the Environ Application does not discuss the two office buildings, a gatehouse, food hall, GSW headquarters, and retail uses, and consequently uses inappropriate boundaries when analyzing the GHG emissions from the Project.

The Project described in the DSEIR consists of the proposed event center as well as two office buildings, a gatehouse, food hall, GSW headquarters, and retail uses.

, That Project Description is consistent with the Project description in the CARB Analysis, and the GSW Application, which includes the Event Center plus several other buildings including the two office buildings, the gatehouse, food hall, and retail uses; however, no emissions from these other sources are included in the evaluation.

Throughout the AB900 Analysis, the boundaries of the analysis are poorly defined and no justification for the boundaries is provided. The CARB Analysis confirmed the GHG calculations are accurate but failed to analyze the appropriateness of the boundaries or the concept of "vested legal rights" used in the AB900 Analysis.

The baseline scenario includes the Oracle Arena, though the Project itself involves no modifications to the Oracle Arena. The Project scenario assumes a 76 percent reduction in the emissions from Oracle Arena without proposing modifications to the facility or limiting activity at the Oracle Arena. The Project excludes GHG emissions from towers included in the Project Description from the Project GHG emission calculation. All of these inconsistencies serve to increase the baseline scenario GHG emissions while reducing the Project scenario GHG emissions, resulting in an artificially small increase in GHG emissions from the Project. The actual GHG emissions increase is likely to be significantly larger than the projected increase due to these inconsistent boundaries.

THE ALLEGED PROJECT EMISSIONS REDUCTIONS LACK MONITORING AND ENFORCEABILITY

40 [AB-1] cont.

The AB900 Application and the 2015 DSEIR refer to mitigation in the form of the acquisition of GHG offsets. MM I-C-GG-1 requires that the Project acquire GHG offsets for the GHG emissions for a 30-year period. As described above, the GHG emissions methodology utilized relied on CalEEMod and projected emissions forward for 30 years. This mitigation is insufficient because it is based on modeled emissions rather than actual emissions, and GHG emissions are projected well into the future with no confirmation that predicted emissions are accurate.

30-Year Evaluation Period

The evaluation of the Project's operational emissions for purposes of offset purchases is for a 30-year period, which is too long to be consistent with California's GHG policy. Evaluating the GHG emissions for such a long period is not reasonable and not consistent with California's GHG offset program. GHG offsets generated for use in California's C&T program only have a ten year crediting period, with the exception of forestry offsets. This ten year accounting period is consistent with other GHG evaluation programs such as the CAR, ACR, and VCS. Similarly, the California GHG Scoping Plan requires updates every five years. Projecting GHG emissions 30 years into the Project lifetime, and then purchasing offsets for 30 years into the future from an unverified source is unreasonable and will certainly be inaccurate in terms of matching the actual GHG emissions of the Project.

While the 30-year evaluation period is too long to be consistent with accepted GHG accounting periods, there is no reason to arbitrarily end the Project's GHG emissions after the 30-year period. Oracle Arena opened in 1966, 49 years ago. The proposed Event Center should have a

similar operating lifespan of 49 or more years. The analysis of GHG emissions after 30 years is unaccounted for in the GHG evaluation. The conclusion that the Project results in no net GHG emissions is based on MM I-C-GG-1, which requires that the Project acquire GHG offsets for the GHG emissions for a 30-year period. Any GHG emissions after this 30-year period would not be offset, resulting in emissions greater than zero from the Project. The Project must include enforceable conditions to require offsetting of emissions beyond the 30-year period or require cessation of emission after that period.

Operational Mitigation Trigger Requirement too Lenient

As discussed above, MM I-C-GG-1 requires that operational GHG emissions be offset. The offset requirement is triggered when the Event Center reaches 90 percent utilization. Thus, it is possible that the offset requirement is never triggered. Oracle Arena currently holds 89 events per year. Even if every one of these events were moved to the proposed Event Center, it would be at only 42 percent of the number of events in the Project GHG evaluation. There is no mechanism in the Project or mitigation measures that would require that offsets from the Project be offset if the Project does not reach 90 percent utilization.

No GHG Monitoring Plan

40 [AB-1] cont.

Monitoring of the mitigation for GHG emissions is inadequate. It has been the experience of SCS that Projects that result in GHG emissions prior to mitigation should be required to submit GHG monitoring plans for relatively small periods of time, typically three to five years. Such periodic reevaluation of GHG emissions is consistent with the California Scoping Plan, which must be updated every five years. Such a plan must require quantification of GHG emissions since the previous GHG monitoring plan and a projection of GHG emissions until the next GHG monitoring plan. The quantification of historical GHG emissions in each plan must rely on as much site-specific data as feasible. At a minimum, those data must include the electricity use, natural gas use, other utility and fuel use, the number of events, and the event attendance or trip count.

Such monitoring is also needed to confirm that the energy efficiency assumed in the GHG evaluation due to the Leadership in Energy and Environmental Design (LEED) gold certification is accurate. By using actual measured electricity use to calculate GHG emissions, uncertainties in the actual energy efficiency of the structures would be removed. This monitoring is critical due to the failure of many LEED certified buildings to achieve expected energy use reduction predictions.

The GHG monitoring plan must also include all facilities included in the GHG emission calculations, including the Oracle Arena. If the Oracle Arena is included in the GHG monitoring plan, GHG emissions resulting from more than 21 events in a year would be then captured by the evaluation. An ongoing GHG monitoring plan would also resolve the issue of GHG emissions after the 30-year evaluation period.

MITIGATION APPROACH INCONSISTENT WITH STATE GHG POLICIES

The AB900 Application and MM I-C-GG-1 require that the Project proponents obtain GHG emission offsets for the GHG emissions resulting from the Project. However, there is no assurance that the GHG offsets will be consistent with CARB GHG reduction goals.

The Project is only required to purchase GHG offsets from a "qualified GHG emissions broker." To be consistent with state GHG policy, the offsets should meet California GHG reduction goals and be required to be real, additional, quantifiable, permanent, verifiable, and enforceable. The offsets purchased to meet mitigation requirements should also be thereafter retired and removed from circulation. As written, this "mitigation" allows the credits to be sold again, allowing those same offsets to be used again as mitigation on other projects. 40 [AB-1] cont.

Because neither the AB900 Document nor MM I-C-GG-1 require that the GHG offsets be obtained from a registry that demonstrates that the offset will result in real, additional, quantifiable, permanent, verifiable, and enforceable GHG offsets, and the language allows the GHG offsets to be sold after acquisition, the measure does not provide any assurance that the Project GHG emissions will be net zero or less than significant.

CONCLUSIONS

The GHG analysis used to support the determination that the Project met the requirements of AB900 is insufficient to demonstrate that the GHG emissions from the Project will be net zero and less than significant under CEQA for the following reasons:

- The GHG analysis makes unsupported assumptions about Oracle Arena, trip linkage, and energy use which artificially lower the expected GHG emissions from the Project and do not provide an accurate evaluation of the GHG emissions that can be expected to result from the Project. 41 [AB-1, GHG-2]
- The GHG analysis does not require project monitoring and periodic GHG reporting to assure the accuracy of the projected emissions.
- The GHG offsets proposed as a mitigation measure are not required to be consistent with California GHG reduction goals and policies, could be used for other projects, and may not ever be required for the operational emissions.

Attachment:
Resumes

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Via U.S. Mail and Email (Osha Meserve osha@semlawyers.com)

July 22, 2015 BSK Project Number E0906601S

Soluri Meserve
1010 F Street, Suite 100
Sacramento, CA 95814

Subject: Draft Review
Hazardous Materials
Mission Bay Project
San Francisco, California

Dear Ms. Meserve:

At the request of Soluri Meserve, BSK Associates (BSK) reviewed the following documents:

A. **Mission Bay Subsequent Environmental Impact Report, Dated September 17, 1998, Sections:**
   - Chapter V.J.1 to V.J.109, Environmental Setting and Impacts, Contaminated Soils and Groundwater
B. **Risk Management Plan (RMP), Mission Bay Area San Francisco, California, Dated May 11, 1999, Prepared by Environ Corporation and Revised Risk Management Plan, August 2006 Prepared by BBL Environmental Services, Inc.**
C. **Notice of Preparation of an Environmental Impact Report, Event Center and Mixed-Use Development at Mission Bay Blocks 29-32, Dated November 19, 2014**
   - Pages 106 to 122
D. **Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015**
   - Pages 1-60 to 1-62, Summary of Impacts and Mitigation Measures, Hazards and Hazardous Materials
   - Page 5-1
   - Page 6-5

The following section (A1 to A4) presents our comments based on a review of the Mission Bay Subsequent Environmental Impact Report, Dated September 17, 1998

A1. Section V.J.42, Under Existing Human Health Risks, states " ENVIRON compared the maximum concentration of chemicals detected in the soil anywhere in the Project Area to the risk-based preliminary remediation goals (PRGs) developed by U.S. EPA Region IX for the protection of industrial land uses (Region IX Industrial PRGs)." EPA PRGs are currently not considered appropriate for use in the San Francisco Bay Area as site screening levels. PRGs have been replaced by Environmental Screening Levels (ESLs) developed by the San Francisco Bay Regional Water Quality Control Board in 2013 (SFBRWQCB, 2013). The ESL user guide (SFBRWQCB, 2013) identified significant differences between EPA PRGs and SFBRWQCB ESLs, listed below:

"The U.S. EPA Regional Screening Levels or RSLs (formerly PRGs; U.S. EPA, 2013d) address human health concerns associated with direct exposure to chemicals in soil, but do not address ecological concerns. Exposure routes and receptors not addressed by the RSLs, but included in the ESLs are listed below:

- direct-exposure screening levels for construction and trench workers' exposure to subsurface soils;
- groundwater screening levels for vapor intrusion;
- groundwater screening levels for the protection of aquatic habitats/surface water quality
- soil screening levels for urban area ecological concerns;
- soil and groundwater ceiling levels to address potential presence of Non-Aqueous Phase Liquids (NAPL) and nuisance odor concerns
- soil and groundwater screening levels for Total Petroleum Hydrocarbons (TPH)."

Using PRGs would lead to significant gaps in determining the risks from impacts with respect to vapor intrusion, of aquatic habitats/surface water quality and urban area ecological concerns.

A2. Section V.J.43 first paragraph states: "The upper numerical limit of a calculated statistical average of the concentration of each COPIC in the exposed soils was compared with Region IX Industrial PRGs to determine if any PRGs were exceeded." The appropriate use of an averaged concentration typically involves a robust statistical analysis based on a statistically sufficient number of samples with respect to the area size and requires normally distributed values. The number of samples utilized in the analysis appears to be insufficient considering the large area of the project.

42 [HAZ-1]

A3. Section V.J.53 last paragraphs states: As discussed in more detail in "General Soil Movement and Transport During Construction," below, DTSC has determined that soils excavated during construction in the Mission Bay Project Area can be moved around and reused in the Project Area without triggering hazardous waste management requirements, provided the soils are managed in accordance with RMP measures. However, DTSC's determination does not apply to building demolition debris or waste soils or other waste materials from any necessary remediation activities. In the event these wastes contain levels of constituents that would result

43 [HAZ-5]

in their classification as hazardous waste, the hazardous waste regulations described above would apply to those materials."

Based on our review of the boring logs recent Phase II Environmental Site Assessment (Langan, 2015), it appears that soil with construction debris was used as fill during the 2005 remediation effort for the Pier 64 clean-up. Our review of the Langan 2015 report boring log soil descriptions indicates that near surface soils at boring locations LB-8, LB-12, LB-26 and LB-29 contain brick fragments. These borings were completed in the area of the Pier 64 clean-up that reportedly removed petroleum impacted soil to a depth of 9 feet and filled in the area (Langan 2015). Furthermore, as stated in B7 below, the area of fill from the Pier 64 clean-up may contain soil impacted with soluble lead that would classify it as a California Hazardous Waste.

The presence of brick, that is probably demotion debris, and soluble lead in the fill material placed during the Pier 64 clean-up effort, indicates that the Risk Management Plan (RMP) or implementation of the RMP, was ineffective and did not comply with the DTSC determination listed above.

43 [HAZ-5] cont.

A4. Section V.J.83 under Human Health Risk Assessment states: "The SSTLs were developed using methods consistent with the Risk-Based Corrective Action (RBCA) methodology, as developed by the American Society for Testing and Materials (ASTM) and described in ASTM E-1739, 'Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, 1995'."

Use of the RBCA methodology may be valid for areas impacted with petroleum hydrocarbon related releases. In other non-petroleum release areas, chemicals-of-concern, such as metals and PAHs not related to petroleum hydrocarbons were detected in soil or groundwater. Use of SSTLs developed for petroleum site based RBCA for non-petroleum related constituents may not be a valid approach. Furthermore, 1995 ASTM E 1739-95 standard under Section 1.1 Scope states: "Ecological risk assessment, as discussed in this guide, is a qualitative evaluation of the actual or potential impacts to environmental (nonhuman) receptors."

44 [HAZ-1]

Summary of Review 1998 - Mission Bay Subsequent Environmental Impact Report

The Mission Bay Subsequent Environmental Impact Report (SEIR), dated September 17, 1998 utilized screening level methods (EPA PRGs) that would not be adequate for current site clean-up standards and would not be appropriate for use on non-petroleum related constituents. The number of samples utilized in the analysis appears to be insufficient considering the large area of the project. Risk Management Plan (RMP) or implementation of the RMP, was ineffective and did not comply with the DTSC determination. Furthermore, the methodology used to develop site risk screening values did not properly incorporate ecological receptors. Given these changes and deficiencies, with consideration of current site conditions, a re-evaluation using current methods and standards of the environmental impacts and risks is required.

45 [HAZ-1]

The following section (B1 to B7) presents our comments based on a review of the Risk Management Plan (RMP), Dated May 11, 1999 and Revised RMP dated August 2006. 46 [HAZ-1]

B1. Page 2-1, there was no discussion of the semivolatile organic chemicals that were detected in soil and groundwater at the site. Summary tables presented in Appendix A of the RMP indicate that polycyclic aromatic hydrocarbons (PAHs) were detected in the soil at various locations and in groundwater collected from MW-11. A possible source and significance of the PAHs was not presented in the RMP.

B2. Page 2-2, the RMP states "No chemicals were detected at concentrations that would pose a threat to human health or the aquatic ecosystem following the completion of the planned development, with the potential exception of the Free Product Area." Based on our review of the receptors presented in Appendix E, Tables E-1, E-2. E-3 and E-4, it appears that ecologic receptors were not included in the risk assessment.

46 [HAZ-1] cont.

B3. Page 3-2, Section 3.2 states: "In addition, mean chemical concentrations in surface soil (estimated by calculating the 95 percent upper confidence limit (UCL) of the arithmetic mean) were below the ITLs developed under assumptions of long-term (i.e., 25 to 30 years) direct contact pathways (i.e., soil ingestion and dermal contact)." The use of mean concentrations typically involves a robust statistical analysis based on a statistically sufficient number of samples with respect to the area size. The number of samples utilized in the analysis appears to be insufficient considering the large area of the project. Furthermore, the depth of soil sampling was limited to samples collected at less than five feet below the ground surface (bgs). Proposed developments may require excavating soil to depths significantly deeper than 5 feet bgs. This may expose receptors to soils that have not been adequately characterized. The recent Phase II Environmental Site Assessment (Langan, 2015) performed additional soil sampling at Blocks 29 to 32 and found "The fill unit was characterized as either a State of California Class I hazardous material based on soluble chromium, lead, and nickel concentrations or a Class II non-hazardous material, likely related to debris from the 1906 earthquake and resulting fire." Designation of the site soils as California Class I hazardous waste is a significant change from what was presented in the 1998 RMP. Additional impacts that would result from excavating and transportation of a large volume of soil for off-site disposal at a Class I disposal site were not evaluated in the 1998 Subsequent Environmental Impact Report (SEIR).

B4. Page 4-1, Section 4.1 states: "As described below in Section 4.3.11, additional sampling may be required on individual development parcels in order to comply with the Ordinance Requirements for Analyzing the Soil for Hazardous Wastes in Appendix F. Depending on the results obtained during any additional sampling, supplemental management measures, in addition to the management measures identified below, may be required on a parcel-by-parcel basis." The RMP specified a deferred sample and analysis protocol to a later date and as stated in section A4 above, deferred analysis may produce dramatically different results. Significant volumes of soil classified as hazardous waste will need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase.

47 [HAZ-3]

B5. Section 4.3.5.3 indicates that excavated soil may be re-used as fill on-site. There is no contingency for the handling of excavated wooden piles or railroad ties that may be treated with wood preservatives (creosote) that may be classified as a RCRA hazardous waste. Creosote

48 [HAZ-6]

BSK

often contains polycyclic aromatic hydrocarbons (PAHs), some of which are listed RCRA hazardous waste constituents.

48 [HAZ-6] cont.

B6. Section 4.3.5.3 allows for re-use of soils that may potentially be hazardous waste as fill inside the RMP. Based on our review of the recent Phase II Environmental Site Assessment (Langan, 2015), it appears that soil with elevated lead levels were used as fill during the 2005 remediation effort for the Pier 64 clean-up. Shallow soil samples collected from Langan Treadwell Rollo borings LB-12, LB-13, LB-26, LB-27, LB-28, LB-29 and LB-30 had results of soluble lead (California Waste Extraction Test) above the California Soluble Threshold Limit Concentration (STLC) that would classify the soil as hazardous waste. These soil samples were collected in the Pier 64 clean-up fill area (See Figure 2 of Langan 2015 report) at depths of less than 9 feet below the ground surface (bgs). The Pier 64 clean-up reportedly removed petroleum impacted soil to a depth of 9 feet and filled in the area (Langan 2015). The re-use of soil that is classified as hazard waste resulted in a significant volume of soil that, if excavated and removed from the RMP area will need to be transported off-site and disposed at an appropriate facility. These are new and additional impacts not previously incorporated into the impact analysis. These additional impacts must be incorporated into additional risks to receptors outside the RMP as well as additional traffic, noise, and air contaminants.

49 [HAZ-3]

B7. Page 4-22 states "If the levels are below the relevant health-based Site Specific Target Levels (SSTLs), and the RWQCB concludes that the potential for ecological impacts is insignificant and does not require mitigation, then soil removal activities will not be required and the soil may be temporarily stored elsewhere pending reuse in the RMP Area." Based on our review of the receptors presented in Appendix E, Tables E-1, E-2. E-3 and E-4, it appears that ecologic receptors were not included in the risk assessment.

50 [HAZ-1]

Summary of Review 1999 - Risk Management Plan

The Risk Management Plan (RMP), dated May 11, 1999 and Revised RMP dated August 2006 failed to properly identify possible sources and significance of the PAHs and did not have disposal protocols for PAH containing wastes. The site specific target levels developed for the site did not include ecological receptors. The RMP utilized an insufficient number of samples and questionable statistical analysis techniques considering the large area of the project. The RMP did not have developed protocols for addressing off-site disposal of large volumes of soil that is currently classified as California Class I Hazardous Waste.

51 [HAZ-1]

The following section (C1 to C2) presents our comments based on a review of Notice of Preparation of an Environmental Impact Report/Initial Study (NOP/IS), Dated November 19, 2014.

C1. Page 106 under Topics: 16. Hazards and Hazardous Material – Would the project: a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? Is listed as "No New or More Severe Significant Effects." As stated in A4 above this is in direct conflict with the findings of the recent Phase II Environmental Site Assessment (Langan 2015). Significant volumes of soil classified as hazardous waste will

52 [HAZ-3]

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need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase. The transportation of hazardous waste off-site will increase the potential for items b) and c) on page 106. Excavation and transportation of soil to a Class I hazardous waste disposal site would significantly increase the potential for release of hazardous materials during the loading, excavation and transportation process. The additional trucking will cause additional exposures to exhaust fumes, traffic and noise. The additional impacts related to off-site transportation of hazardous waste will require further evaluation. 52 [HAZ-3] cont.

C2. Page 114 introduces Mitigation Measure M-HZ-1b: "Geologic Investigation and Dust Mitigation Plan for Naturally Occurring Asbestos." M-HZ-1b is a new mitigation measure for an impact that was not addressed in the 1998 SEIR. The new hazards associated with Naturally Occurring Asbestos (NOA) conflicts with the designation of "No New or More Severe Significant Effects" on items 16 a), 16 b) and 16 c) listed on page 106 of the NOP. 53 [HAZ-4]

Summary of Review 2014 Notice of Preparation of an Environmental Impact Report (NOP)

The Notice of Preparation (NOP), dated Novemeber 19, 2014 failed to identify new or more severe significant effects with respect to the large volume of soil classified as Class I hazardous waste that will require off-site disposal at a Class I Hazardous Waste Disposal Facility. New mitigation measures for naturally occurring asbestos were not properly identified as new or more severe significant effects. 54 [HAZ-4]

The following section (D1 to C4) presents our comments based on a review of the Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015.

D1. Page 1-61 under Hazards and Hazardous Materials, Initial Study Section E16, does not include the findings in the recent Phase II Environmental Site Assessment (Langan, 2015) with respect to significant volumes of soil classified as hazardous waste that will need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase. These additional impacts were not previously included in the impact analysis. 55 [HAZ-3]

D2. Page 1-61 Impact HZ-2, under Mission Bay FSEIR Mitigation Measure J.2, the RWQCB is listed as the agency responsible for reviewing risk evaluations for a public school or child care facility. The Department of Toxics Substances Control (DTSC) School Property Evaluation and Cleanup Division is the responsible agency for assessing, investigating and cleaning up proposed school sites (DTSC, 2015). 56 [HAZ-7]

D3. Page 5.1-1 under 5.1.1 Scope of Analysis, Issues Scoped Out in the Initial Study, states "The Initial Study determined that the following topics were adequately analyzed in the Mission Bay FSEIR such that the proposed project would have no new significant impacts or no substantially more severe significant impacts than those previously found significant on these resources:… Hazards and Hazardous Materials;…" As stated in C1 above significant volumes of soil classified as hazardous waste will need to be transported off-site and disposed at an appropriate facility 57 [HAZ-3]

causing significant additional impacts during the construction phase. These additional impacts were not previously included in the impact analysis. 57 [HAZ-3] cont.

D4. Page 6-5 under Section 6.3 Effects Found Not to be Significant under Hazards and Hazardous Materials states "The project would not cause risk of upset and accident conditions involving release of hazardous materials; emit hazardous materials within 0.25 mile of a school; be located on a site listed on a hazardous materials database; be located on airport or air strip land use areas; impair implementation of emergency response or evacuation plan; expose people or structures to fire risk; or create construction related hazards and hazardous materials impacts. As stated in C1 above significant volumes of soil classified as hazardous waste will need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase. These additional impacts were not previously included in the impact analysis. 58 [HAZ-3]

Summary of Review 2015 – Draft Subsequent Environmental Impact Report

The Draft Subsequent Environmental Impact Report (DSEIR), dated June 5, 2015 failed to identify new or more severe significant effects with respect to the large volume of soil classified as Class I hazardous waste that will require off-site disposal at a Class I Hazardous Waste Disposal Facility. The DEIR is inadequate by not accounting for additional impacts that from additional transportation of soil off-site that will cause additional exposures to exhaust fumes, traffic and noise. 59 [HAZ-3]

We appreciate the opportunity to be of service to Soluri Meserve and trust that this correspondence provides you with the information necessary at this time. Please contact us with questions regarding the review comments presented this letter.

Respectfully submitted,
BSK Associates

PROFESSIONAL GEOLOGIST · MARTIN B. CLINE · No. 2084 · CERTIFIED ENGINEERING GEOLOGIST · STATE OF CALIFORNIA

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Senior Engineering Geologist

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Senior Hydrogeologist

References:

BBL Environmental Services, June 2006, Pier 64 Phase II Completion Report Former Petroleum Terminals and Related Pipelines Located at Pier 64 and the Vicinity City and County of San Francisco, California

Langan Treadwell Rollo, June 2015, Phase II Environmental Site Assessment Golden State Warriors Arena, Blocks 29-32, Mission Bay, San Francisco, California

DTSC Evaluating & Cleaning-Up School Sites, https://www.dtsc.ca.gov/Schools/ accessed July 2015

SFBRWQCB, 2013, User's Guide: Derivation and Application of Environmental Screening Levels

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Exh C

LAWRENCE B. KARP
CONSULTING GEOTECHNICAL ENGINEER

FOUNDATIONS, WALLS, PILES
UNDERPINNING, TIEBACKS
DEEP RETAINED EXCAVATIONS
SHORING & BULKHEADS
EARTHWORK, & SLOPES
CAISSONS, COFFERDAMS
COASTAL & MARINE STRUCTURES

SOIL MECHANICS, GEOLOGY
GROUNDWATER HYDROLOGY
CONCRETE TECHNOLOGY

July 21, 2015

Osha Meserve
Soluri Meserve, A Law Corp.
1010 F Street, Suite 100
Sacramento, CA 95814

Subject: Proposed Golden State Warriors Arena
Mission Bay, Blocks 29-32, San Francisco
Geotechnical Engineering Review

Dear Ms. Meserve:

As authorized, this review is based on information necessary to update a 1998 EIR for a current project proposed within an area bordered by 3rd, South, and 16th Streets, and Terry Francois Boulevard located on Mission Bay fills over Bay Mud. The four blocks are mapped within a seismic hazard area (CDM&G 2000*a*) requiring investigation (CDM&G 2000*b*) and mitigation of potential liquefaction hazards (CGS 2008). The site is also subject to amplification of strong motion due to soft ground (2013 SFBC, ASCE 2013). None of the geotechnical engineering reports for the property classify the site as required by current codes and standards. The data in the existing geotechnical reports underestimates site response to strong motion required for risk to a structure whose primary occupancy will be public assembly with an occupant load greater than 300.

Proposed Project

The project considered, on Blocks 29, 30, 31 and 32, is an event center and parking for the Golden State Warriors basketball team. The project includes two 160 foot office towers, gatehouse, food hall, and retail spaces. 17 years ago an EIR for another project was prepared (C&CSF 1998) based on information for an unspecified location in Mission Bay as no subsurface investigation for the proposed arena site had been undertaken. Later, the four blocks were investigated and reported (Treadwell & Rollo 2007, 2008*a*, 2008*b*) for other projects. Composite reports for four commercial buildings for the four blocks was produced for Alexandraa (Treadwell & Rollo 2008*a*) and salesforce.com (Langan Treadwell Rollo 2011). Subsequent evaluation reports for the arena (LTR 2014*a*, 2014*b*), marked "...privileged...confidential...", have been issued but they do not classify the site nor do they address the Risk III Importance (ASCE 2013, 2013 SFBC) for a known project primarily intended for public assembly. The recent draft EIR (C&CSF 2015) does not address these issues and the current California requirements for mitigation of seismic hazards have not been followed.

Ground Conditions

Several years after the 1998 EIR was prepared, California's seismic hazard mapping program delineated the area of the proposed project (CMD&G 2000*a*) as being subject to liquefaction-induced ground displacement resulting from the shaking of saturated granular sediments that comprise the sands and other artificial fills placed in Mission Bay 100 to 150 years ago.

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[GEO-1]

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Exh C

The property, which was not the subject of a subsurface exploration program when the 1998 EIR was prepared, also includes deposits of Bay Mud of varying thicknesses under the fills that will produce ground amplification from strong motion generated by earthquakes. These hazards are different but related; liquefaction potential (sand) can be mitigated but the structure must be designed to resist soft ground (clay) amplification from strong motion. The data (exploratory boring logs showing materials, sampling, and testing) in the composite reports for the four block area (Treadwell & Rollo 2008a, Langan Treadwell Rollo 2011) verify that both potential hazards exist at the proposed project site.

Seismic Environment

The site is located in the earthquake active San Francisco Bay Area which is seismically dominated by the presence of the San Andreas Fault System. In the theory of plate tectonics, the San Andreas is the boundary between the northward moving Pacific Plate (west of the fault) and North American Plate (east of the fault) which is manifested by the San Andreas system. The faults in the system produce dextral horizontal shear movements resulting from the relative motion of the Pacific and North American plates. Based on history and theory, the land of the proposed project site (sand and rubble fill over Bay Mud)[1] will be subjected to strong shaking from earthquakes generated along both the active San Andreas (8 miles to the west) and Hayward (10 miles to the east) faults.

The northwestward movement of the Pacific Plate relative to the North American Plate persistently causes right-lateral slip across the major faults and deformation between the faults. In the Bay Area, this movement is distributed across a complex system of strike-slip, right lateral parallel and subparallel faults. The San Andreas fault ruptured on 4/18/1906 (estimated M = 8.0) and last severely shook the area on 10/17/89; other earthquakes that epicentered relatively recently along the San Andreas fault occurred on 10/1/69 (Santa Rosa, M = 5.7) and 3/22/57 (Daly City, M = 5.3). Maximum moment magnitudes (scaled size of earthquakes in terms of energy released)[2] are San Andreas $M_W = 7.9$, and Hayward $M_W = 6.9$.

The U. S. Geological Survey forecasted a 67% probability that one or more earthquakes of M = 7.0 (0.20 to 0.45g) or greater will occur on the San Andreas or Hayward faults by the year 2020 (Peterson 1996). Shortly afterwards, the Working Group on California Earthquake Probabilities concluded that the Hayward - Rogers Creek fault system has a 32% probability of generating a large earthquake (M = 6.7 to 7.4) by the year 2030. The average earthquake recurrence interval for the East Bay is roughly 220 years, give or take 100 years As for ground rupturing, there has been a quiescent period of seismic activity after the great 1906 earthquake on the San Andreas fault and there has been no rupturing along the Hayward fault for more than 100 years. The 1998 EIR does not cogently explain the seismic environment of the site.

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[GEO-1]
cont.

[1] A layered sequence of soft, plastic, expansive sediments forming the bottom of San Francisco Bay (often referred to as "Younger Bay Mud"). Bay mud is a very weak, compressible soil, consisting of clay-sized and silt-sized particles interspersed with stringers and pockets of peat, fine sand, and minor amounts of gravel, and having a water content ranging from 30 to 92% (commonly 50 to 60% in the uppermost 50 to 100 feet of the deposit).

[2] The moment magnitude scale is used to measure earthquake magnitude M_W taking into account the size of the fault rupture, the stiffness of rock, and the amount of the movement of the fault using values that can be estimated from the size of several types of seismic waves; while the older Richter scale is a numerical scale used to measure the magnitude M of an earthquake using values based on the size of the earthquake's largest seismic waves.

Research, including trenching by the USGS at the Mira Vista Country Club in the Berkeley Hills, indicates that the northern segment of the Hayward fault is overdue for a characteristic major earthquake (Schwartz & Lettis 1998). On 8/24/14, in not unusual ground conditions, a damaging M = 6.0 earthquake occurred off the northern segment in Napa.

Liquefaction (cyclic mobility, which occurs when loose granular soils that are saturated undergo a rapid loss in shear strength as a consequence of ground shaking, and movement amplification of the Bay Mud due to strong motion, will occur at the proposed project site (and nearby sites) during significant earthquakes. This is the reason why California mapped the seismic hazard zones in the state in 2000 and requires mitigation of the seismic hazards.

Ground Motion Parameters

The National Earthquake Hazards Reduction Program ("2009 NEHRP") document "Recommended Provisions for Seismic Regulations for New Buildings and Other Structures" (FEMA 450-1) feeds into the ASCE (American Society of Civil Engineers) 7-10 "Minimum Design Loads for Buildings & Other Structures" (ASCE 2013) development process, and ASCE 7 in turn serves as the primary referenced standard in the 2012 International Building Code (2012 IBC). The 2013 San Francisco Building Code (2013 SFBC) is the City's iteration and adoption of the 2013 California Building Code, which is the State's iteration and adoption of the 2012 IBC. At the time the 1998 EIR was written the San Francisco Building Code was based on superficial maps in the Uniform Building Code (ICBO 1998) when seismic design standards were much less stringent than those of today.

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[GEO-1]
cont.

Ground motion parameters, for this review of data in reports of subsurface investigation for the project site, all of which were gathered and presented after the 1998 EIR, were determined for the site using USGS ASCE 7 (2013) based calculation tools derived from published ground motion maps. Seismic ground motion values for use in characterizing and classifying the site for the current project are as follows:

General:

Site Location (USGS):	Latitude 37.7678°N Longitude -122.3875°W
Risk Category (2013 SFBC Table 1604.5)[3]:	III
Seismic Importance Factor I_e (ASCE 7 Table 1.5-2):	1.25

Mapped Acceleration Parameters (2013 CBC §1613.3.1):

Determination of Maximum Considered Earthquake (MCE) spectral response accelerations, mapped at short (0.2 second) period S_s and at a full second (1.0 second) period S_1, for the site:

Determined Site Classification (input Latitude/Longitude):	E
Short period (0.20 second) mapped spectral acceleration S_s:	1.500g
Site Coefficient F_a (2013 SFBC Table 1613.3.3(1); function/Site Class E & S_s):	0.900
Adjusted MCE 0.20 second period spectral response acceleration $S_{MS\text{-}B} = F_a S_s$:	1.350g

[3] "Buildings and other structures that represent a substantial hazard to human life in the event of failure."

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Exh C

One second period mapped spectral acceleration S_1:	0.600g
Site Coefficient F_v (2013 SFBC Table 1613.3.3(2); function/Site Class E & S_1):	2.400
Adjusted MCE one second period spectral response acceleration $S_{M1\text{-}B} = F_v S_1$:	1.440g

Design Spectral Response Acceleration Parameters (2013 SFBC §1613.3.3):

Site Classification definitions are dependent on geotechnical data (2013 SFBC §1613.2.1; ASCE 7 §§20.3.2, 20.3.3(3) [softer soil category to be used due to differing criteria][4]).

Defined Site Classification (2013 SFBC §1613.3.2 & ASCE 7 Table 20.3-1):	E
Site Coefficient F_a (2013 SFBC Table 1613.3.3(1); function/Site Class E & S_s):	0.900
Adjusted MCE 0.20 second period spectral response acceleration $S_{MS\text{-}D} = F_a S_s$:	1.350g
5% damped short period design spectral acceleration $S_{DS} = 0.67 S_{MS\text{-}D} = 0.67(1.350)$:	0.905g
Site Coefficient F_v (2013 SFBC Table 1613.3.3(2); function/Site Class E & S_1):	2.400
Adjusted MCE one second period spectral response acceleration $S_{M1\text{-}D} = F_v S_1$:	1.440g
5% damped one sec. period design spectral acceleration $S_{D1} = 0.67 S_{M1\text{-}D} = 0.67(1.440)$:	0.965g

60
[GEO-1]
cont.

Seismic Design Categories (SDC); Risk Category III, $S_1 \geq 0.75$ (2013 SFBC §1613.3.5, ASCE 7 §11.6):

Determination of Seismic Design Category (SDC) is based on occupancy or use and level of expected soil/rock-modified seismic ground motion at the site (adjusted per ASCE 7 §11.6).

Short period response acceleration SDC_{DS} (2013 SFBC Table 1613.3.5(1) adjusted):	E
One second period response accel. SDC_{D1} (2013 SFBC Table 1613.3.5(2) adjusted):	E

Mapped MCE Geometric Mean Peak Ground Acceleration PGA (ASCE 7 §11.8.3, 2013 SFBC §1805.5.12(2)):

PGA (USGS output):	0.523
Site Coefficient F_{PGA} (Site Class E, ASCE Table 11.8-1, PGA ≥ 0.50):	0.900
Peak Ground Acceleration adjusted for site class effects $PGA_M = F_{PGA} PGA$:	0.471g

The above ground motion parameters, reporting just recently required per ASCE 7 (ASCE 2013) where applicable under 2013 SFBC §1805.5.12, and calculated for a structure having an occupant load greater than 300, must be used for analysis in a new EIR. Lateral force resisting systems must meet seismic detailing requirements and limitations set forth in ASCE 7 (2013 SFBC §1604.10).

[4] Langan Treadwell Rollo 2011 (ASCE 7 Table 20.3-1):
B 29-8 8/31/11 Bay Mud, soft-wet 12-35' (21'>10')
B 32-1 5/1/07 Bay Mud, soft-wet 11-42' (31'>10'), MC=57% (>40%)
B 30-4 5/5/07 Bay Mud, soft-wet 25-50' (25'>10'), MC=63-74% (>40%)
B 31-4 9/1/11 Bay Mud, soft-wet 12-35' (23'>10'), s_u=400 psf (<500 psf)
Treadwell & Rollo 2008*a* (ASCE 7 Table 20.3-1):
1030 (AGS) 3/1/00 Bay Mud, moist-soft 22-51' (29'>10'), PI=58% (>20%)
1031 (AGS) 2/29/00 Bay Mud, moist-soft 16-55' (39'>10'), PI=38-62% (>20%)

Mitigation of Seismic Hazards

California's Special Publication 117A (CDM&G 2008) mandates countermeasures to liquefaction because liquefaction has been a major source of damage during past earthquakes where deposits of saturated sands were present. The risk of liquefaction and associated ground deformation can be reduced by various ground-improvement techniques, but consideration of also lessening the effects of strong motion in the underlying Bay Mud (from transient porewater pressure increases) during earthquakes must also be part of mitigation. The EIR of 17 years ago (C&CSF 1998) contains no mitigation measures, and the newest draft EIR (C&CSF 2015) does not include sufficient countermeasures. 61 [GEO-3]

The latest composite report for the site (Langan Treadwell Rollo 2011) anticipated four buildings. Alternative mitigation measures were recommended in the report for those buildings including "rapid impact compaction" ("RIC") "stone columns" and "compaction grouting". A more appropriate countermeasure, deep soil mixing of slurry at depth, has been suggested (Langan Treadwell Rollo 2014*a*). Gravel drains in backfilled bored holes to dissipate pore pressures are an effective counter-measure to liquefaction (Seed & Booker 1977). However, the proposed arena would probably be supported by piles arranged in concentric circular or elliptical patterns, and those piles will be subject to not only liquefaction loads from saturated relatively loose granular materials in the sand and rubble fill but from strong motion amplification of the relatively soft cohesive materials of the Bay Mud. 62 [GEO-1]

By embedding the piles into a mat capping the piles, and strengthening the liquefiable sand in the fill (not by "compaction grouting" but by permeation grouting using microfine cement or Portland cement slurry mixed with the sand), and socketing the piles into the Colma (or bedrock near the south end of the site), the effective length of the prestressed concrete piles will be reduced considerably by fixing end conditions and shortening the effective lengths of piles within the Bay Mud. The undersigned believes a program of combination of techniques should be modeled and tested before project approval. 63 [GEO-1]

Arena Foundation System

The latest composite report for the site (Langan Treadwell Rollo 2011) was for four separate buildings, one on each of the four lots. The proposed arena (Langan Treadwell Rollo 2014*a*) will be the principal structure in a complex that includes other structures. The 2011 report provides foundation alternatives for each building mainly because the Colma formation (dense to very dense sand, silty sand, clayey sand) is thin at the southeastern part of the site. Structural steel piles should not be used as the Bay Mud is highly corrosive and cathodic protection systems are problematical (Karp 1977).

If the proposed arena project were to proceed, it is more than likely that the foundation system, arranged in a pattern of concentric circles or ellipses. would be comprised of either precast prestressed concrete piles or cast-in-place concrete piles that are drilled through casing that is part of the machinery with the piles concreted as the casing is withdrawn. Piles would derive their support from the Colma formation, except at the southern part of the site bedrock would be the supporting medium. For embedment in the Colma formation or very stiff to hard clay and bedrock where the Colma formation is not present, depth-limited augered piles could penetrate dense materials or precast prestressed concrete piles could be driven with steel stingers and where the Colma formation is not present, the piles could be piloted into the very stiff to hard clay or bedrock. Although various deep foundation alternatives are theoretically possible, the proposed current project, which is particularly sensitive due to its public assembly nature, should have a testing program instituted to test alternatives. 64 [GEO-4]

Vibrations During Construction

Driving displacement piles causes noise and vibrations from impact that are transferred though dense subgrade materials to nearby structures. As the configuration of the proposed arena will likely be circular or elliptical and vibrations, particularly driving those at the western side of the project, would likely affect the UCSF Medical Center building at 1650 3rd Street. Prior to project approval, an indicator pile test program must be implemented to monitor vibrations and verify the suitability of the intended foundation system for the area.

Drilling and casting-in-place reinforced concrete shafts, if feasible to required depths, may be an appropriate suitable alternative to driven piles. As noted below for shoring, shafts are augered and spoils removed through casing contained in the rig that is withdrawn as concrete is placed. Using tremie methods, concrete displaces water in the hole so it rises and is pumped out with low ground-water loss. Before the project is approved, a test program should be implemented to ascertain the feasibility of using cast-in-place piles or where appropriate, a combination of drilled and driven piles. 65 [NOI-5]

Shoring & Groundwater

As an underground parking garage would be part of the project, secant piles, drilled in a circular or elliptical pattern to form a tension ring, would likely be the shoring, but drilling/concreting operations will encounter and displace groundwater that would have to be continuously tested for contaminants and otherwise managed under an advance plan. A Memorandum (Langan Treadwell Rollo 2015) suggests "Construction Dewatering Discharge Options" which may be helpful for that problem but the actual engineering effects of dewatering (increase in effective stress that causes areal subsidence) was not addressed. The effects upon surface improvements from dewatering in the area of the project must be studied before project approval.

Shoring of the excavations for the intended subgrade portions of the proposed current project, the appropriate method would be, as noted above, secant piles. Secant piles are sequentially drilled shafts that intersect each other to form a solid wall. Primaries (soft piles) are drilled apart in rows (or curves) closer together than the pile diameter. Primary shafts are augered and spoils removed with low water loss. Secondary shafts (hard piles) are augered between and arched into both of adjacent primaries, and wet-set reinforced with steel. In the saturated sand, it would be at this stage (casing/augering, and reinforcing) and afterwards (tolerance deviation from verticality, joints between overlapping piles, and movement) when groundwater and sand will be lost. 66 [GEO-5]

Depending on depth below groundwater level, hydrostatic pressures (head) are about one-half psi which will allow water and sand to migrate into the excavation. Pressure is only reduced if groundwater level drops outside the wall. When water is lost, increases in effective stress with vibrations from hard pile installations will densify the sand with differential settlement of improvements. The only methods to minimize water and sand flowing into the excavation with simultaneous drawdown of the groundwater level is to recharge outside the wall or construct the shoring in a circular pattern with large overlaps acting in ring compression.

Under current codes and standards, below grade walls for the proposed underground structures will require dynamic analysis (2013 SFBC §1803.5.12(1)) as well as engineered design to protect surface improvements, wall backdrainage, groundwater collection, piping, and discharge facilities.

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Contamination

Although it is understood that others will discuss contamination, the subject is a very important environmental and geotechnical engineering concern for reasons that include intended subgrade excavation and construction. Mission Bay was used for many years as a dump and then a railroad yard. Bayward of the site there were fuel terminals that included tanks and pipelines which are known contributors to contamination. The Pier 64 area has received past attention under the auspices of developers (Langan Treadwell Rollo 2014*b*) but the extent and sufficiency of actual clean-up is not really known from second hand information. The report of geotechnical investigation produced for salesforce.com (Langan Treadwell Rollo 2011), 327 pages, contains no contaminant sampling, testing, or even recognition of the potential problem.

Contamination seems to have been dismissed as a thing of the past, but contaminants in groundwater do not simply go away without complete ground remediation. The 1998 environmental document is vague so "change" from then to now cannot be quantified. For instance, the "2001 Phase I Remedial Excavation" resulted in a record that "Soil containing residual oil below the target zone was left in place." (Langan Treadwell Rollo 2014*b*, pg 9). The observance of living birds congregating where water has ponded is not a reliable yardstick for declaring a site free of contamination. Hands-on testing by an independent laboratory would be appropriate measures that should be undertaken before a public assembly project at this site is approved.

67
[HYD-1,
HAZ-1]

Yours truly,

Lawrence B. Karp

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California, State of - Division of Mines and Geology [CDM&G], 2000*b*; "Seismic Hazard Zone Report for the City and County of San Francisco, California", Report 043, 52 pages.

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Exh D

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July 20, 2015 BSK Project Number E0906601S

Soluri Meserve
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Subject: Review
Mission Bay Subsequent Environmental Impact Report (September 17, 1998)
Notice of Preparation of an Environmental Impact Report (November 19, 2014)
Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015
Mission Bay Project
San Francisco, California

Dear Ms. Meserve:

At the request of Soluri Meserve, BSK Associates (BSK) reviewed the following documents:

A. Mission Bay Subsequent Environmental Impact Report (SEIR), Dated September 17, 1998, Sections:
- Chapter II.20 to II.21, Summary
- Chapter V.H.1 to V.H.24, Seismicity
- Chapter VI.37 to VI.39, Mitigation Measures, Seismicity
- Chapter VI.87 to VI.93 Mitigation Measures, Geology
- Chapter IX.2 to IX.3, Irreversible Environmental Changes
- Chapter XII.187 to XII.188, Public Comments, Seismicity
- Appendices A.49 to A.54, Initial Study, Geology
- Appendices G.1 to G.4, Seismicity

B. Notice of Preparation of an Environmental Impact Report/Initial Study, Event Center and Mixed-Use Development at Mission Bay Blocks 29-32, Dated November 19, 2014
- Pages 84 to 105

C. Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015
- Pages 1-47 to 1-48, Summary of Impacts and Mitigation Measures, Hydrology and Water Quality
- Pages 1-59 to 1-60, Summary of Impacts and Mitigation Measures, Geology and Soils
- Pages 5.9-9 to 5.9-29, Flooding
- Page 6-5, Effects Found Not to be Significant

Our review was limited to Geology, Engineering Geology and Seismic related aspects of the subject documents. The following section (A1 to A14) presents our comments based on a review of the Mission Bay Subsequent Environmental Impact Report (SEIR), Dated September 17, 1998.

A1. Section II.20 Summary-Seismicity, fourth paragraph indicates that structures would be supported on piles between 30 and 200 feet deep to reduce the effects of groundshaking and liquefaction. This type of structural support may provide mitigation of liquefaction hazard of the main building structure, however pile support systems do little to provide mitigation from liquefaction and settlement of surrounding utilities/roads and other support systems that may be damaged during a seismic event. Due to the shallow occurrence of the liquefiable layers, sand boils may develop during a seismic event. Ground settlements due to development of sand boils can be large and unpredictable. Design of these surrounding systems, not proposed to be supported on piles, cannot withstand the effects of sand boils and can lead to excessive and differential settlement without further technical analysis, and mitigation measures such as recompaction. 68 [GEO-2, GEO-3]

A2. Section II.20 states "the likelihood of tsunami inundation is very slight." The fact that portions of the proposed facility are located in a Tsunami Hazard Zone established by the State of California (California Emergency Management Agency, June 15, 2009 Map) indicates that the tsunami hazard is significant. 69 [HYD-8]

A3. Section V.H.12 states that "To reduce potential effects in the Liquefaction Hazard Zone, Catellus has committed to construction of major structures in the Project Area on foundations supported by piles driven into dense sands, stiff clays, or bedrock in areas where such materials are too deeply buried by unengineered fill and/or Bay mud to provide adequate support for foundations." The conditions that trigger use of piles and areas where they are needed were not delineated and the method for determining the requirement criteria was not provided. Futhermore, as stated in section A1 above, piles alone may not provide sufficient mitigation for areas surrounding the building structures.

A4. Section V.H.13 states that "If not mitigated as described in Chapter VI of this SEIR, the above-described risks to people posed by seismically induced groundshaking and liquefaction would be significant impacts of the project." Many risks described in Section V.H.13 are from structures/facilities located outside the project area. The mitigation measures presented in Chapter VI of the SEIR are for structures/facilities located in the project area. It is not possible to mitigate hazards to structures located outside the project area by mitigation measures that were developed for structures located inside the project area. 70 [GEO-2]

A5. Section V.H.16 states "Some grading of the Project Area, including the excavation of some potentially liquefiable materials and replacement with engineered fill, would occur prior to the construction of underground infrastructure to ensure that the systems could be designed to accommodate expected settlement along their specific routes, and to prevent liquefaction damage." This is vague with respect to which areas will require regrading and how deep the fill replacement extends. The technical criteria that is to be used to determine if an area requires replacement was not provided.

A6. Section V.H.17 first paragraph utilizes U.S. Army Corp of Engineers (ACOE) 1975 run-up model for 100-year and 500-year events to estimate potential tsunami hazards. The indented use for ACOE 1975 report was for determining 100-year and 500-year flood levels for the purpose of requiring flood insurance. The ACOE report considered the probabilities of tsunami sources from Alaska and the Aleutian trench alone, assuming that the 100-year and 500-year events are not strongly affected by events from other regions of the Pacific. They did not address the possibility of locally generated tsunamis (Borrero. et al, 2006). More recent studies used to develop the 2009 Tsunami Inundation Map uses multiple seismic sources including local faults (Point Reyes Thrust Fault, Rodgers Creek-Hayward Fault and San Gregorio Fault) and other distant sources such as the Cascadia Subduction Zone.

It should be noted that for designing structures against structural collapse the 2013 California Building Code uses a ground motion values from a Risk-Targeted Maximum Considered Earthquake (MCEr). The MCEr is defined as the ground motion from an earthquake at the 1% in 50 years (4975 year return interval) hazard level.

The most technically accurate method for assessing tsunami risk to a site is to perform a Probabilistic Tsunami Hazard Analysis (PTHA). The computational method in PTHA generally follows the Probabilistic Seismic Hazard Analysis (PSHA) method that is widely used in assessing seismic hazards (Geist, 2006). Given that the tsunamis are caused by earthquake events, the analysis should use the same standard hazard level as earthquakes (1% in 50 years), not the flood insurance risk return interval. Using an analysis based on 100-year or 500-year return intervals may not capture the controlling seismic event that may cause the maximum Tsunami run-up. 71 [HYD-8]

A7. Section V.H.17 first paragraph references an "extreme high tide crest condition" of an additional 2.95 feet above mean sea level. The reference source for the "extreme high tide crest condition" was not provided. Our review of the nearest tide station (Yerba Buena Island Tide Station 914782, NOAA Website) station information data sheet indicates that the Mean High Water (MHW [1]) level is 2.31 feet above mean sea level (msl) and the Mean Higher-High Water (MHHW[2]) is 2.91 feet above msl. The proponent assumes that the "extreme high tide" is a rare event with low probability of occurrence. The 2.95 feet above msl that is assigned to the assumed low probability event is not significantly different from the average event, Mean High Water of 2.31 feet above msl. The difference between what the proponent assumes is a low probability event value based on an "extreme high tide" and the Mean High Water value is probably less that the uncertainty in the model that was used. The analysis provided in the DSEIR attempts to minimize the apparent risk from a tsunami that occurs during a high tide through confusing and unsubstantiated statistical analysis.

[1] MHW - Mean High Water: The average of all the high water heights observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.
[2] MHHW - Mean Higher High Water: The average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.

The tsunami run-up analysis presented in the SEIR also failed to account for future sea level rise due to climatic change. Estimate of future sea level rise in the San Francisco Bay Area range from 3.1 feet to 5.5 feet in next the 90 years (Nation Research Council, 2015). Tsunami run-up elevation analyses should incorporate future sea level rise.

A8. Section V.H.17 utilized the local San Francisco City Datum (SFCD) for the analysis. Page V.H.20 defines the SFCD as "For surveying purposes in San Francisco, a local datum was established, in the 19th century, at 8.66 above mean sea level, approximately higher high tide at the time." It is not clear what national datum the SFCD is related to since there is no citation. The proponent asserts the SCFD is the 8.66 above MSL in the 19th century, however, they fail to identify how this elevation relates to the current datum, used in other parts of their analysis. Current mean sea level data is referenced to the North American Vertical Datum of 1988 (NAVD88) that was established in 1991. NAVD88 replaced the National Geodetic Vertical Datum of 1929 (NGVD29). Tidal datums such as the Mean Sea Level (MSL), Mean High Water (MHW) and Mean Higher High Water (MHHW) are referenced to Geodetic Datums such as NAVD88 or prior to 1991, NAVD29 (NOAA 2015). To calculate flood levels, data that uses a consistent Geodetic Datum must be used (FEMA 2015). For example, MSL using NAVD88 is not the same as MSL using NAVD29. Using a local datum such as the SFCD, that uses an unknown Geodetic Datum and relating to tidal data that uses a known Geodetic Datum such as NAVD88 would produce erroneous results. 71 [HYD-8] cont.

A9. Section V.H.17 last paragraph attempts to minimize the tsunami hazard. As shown on the attached Figure 1, portions of the site are located in a California State Designated Tsunami Hazard Zone. According to Appendix M, Section M101.4 of the 2013 California Building Code (CBC): "Construction within the Tsunami Hazard Zone - Construction of structures designated Risk Category III and IV as specified under 2013 CBC Section 1604.5 shall be prohibited within a Tsunami Hazard Zone."

Category III Risk Category includes: "Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:

- Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
- Buildings and other structures containing elementary school, secondary school or day care facilities with an occupant load greater than 250.
- Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500.
- Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities.
- Group I-3 occupancies.
- Any other occupancy with an occupant load greater than 5,000.
- Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV.
- Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area

as given in Table 307.1 (1) or 307.1 (2) or per outdoor control area in accordance with the California Fire Code; and Are sufficient to pose a threat to the public if released."

The proposed structures are probably located in an area that conflicts with the requirements specified in Appendix M, Section M101.4 of the 2013 California Building Code. 71 [HYD-8] cont.

A10. Section VI.88, Table VI.8, K.2b refers to designing connections between pile-supported structures and unsupported sidewalks and driveways to reduce the likelihood of separation due to settlement. This analysis identifies unknown, but high settlements that may occur due to liquefaction and development of surface sand boils. Sand boils occur when liquefied units reach the ground surface and sand is ejected from the ground surface. Settlements due to sand boils can be large and unpredictable and greater than what was presented in the report. Without adequate mitigation for these high unknown settlements, the impacts would be significant.

A11. Section VI.89, Table VI.8, K.2c refers to using flexible connections for utilities serving pile-supported buildings to accommodate the settlement expected. This analysis identifies unknown, but high settlements that may occur due to liquefaction and development of surface sand boils. Without adequate mitigation, the impacts would be significant. 72 [GEO-2]

A12. Section VI.89, Table VI.8, K.4 indicates that leveling jacks should be used on buildings with shallow foundations. This measure would not be effective to mitigate differential settlements due to liquefaction or dry seismic shaking settlements. High differential seismic settlements may cause building collapse or the over-turning of structures rendering leveling jacks useless.

A13. Section VI.91, Table VI.8, K.15 states that "As deemed necessary by geotechnical studies, make sandy materials more dense to reduce the potential for liquefaction." This appears to conflict with the requirement of pile-supported foundations. The requirement is vague with respect to criteria to be used to determine how deep the densification should extend and is not adequate to mitigate a significant impact. Furthermore, the densification methods are not identified nor how this unknown process would work as mitigation.

A14. Appendices Section A.49 under Tsunami and Seiche states "Although the Project Area is relatively close to sea level, historical records indicate little likelihood of inundation by tsunami or seiche." In the next sentence it is stated that the portions of the project area would be below the level of inundation predicted by the U.S. Army Corps of Engineers computer models. It was also stated that techniques for reducing the inundation, tsunami and seiche hazards would be presented in the SEIR. The only mitigation measure against tsunami hazards presented was a vague reference to setbacks from the Bay and Channel made in Section V.H.17. As stated above in A9, the type of proposed structure would not be allowed according to Appendix M, Section M101.4 of the 2013 CBC. 73 [HYD-8]

Summary of Review 1998 - Mission Bay Subsequent Environmental Impact Report

The Mission Bay Subsequent Environmental Impact Report (SEIR), dated September 17, 1998 relied on an inadequate Tsunami hazard analysis, relied on out dated methodology and failed to provide adequate mitigation measures for Tsunami Hazard impacts. 74 [HYD-8] The SEIR failed to fully address high ground settlements and provide mitigation measures for impacts from sand boils. The SEIR failed to properly 75 [GEO-3] identify impacts and provide mitigation measures for areas of the project that may be impacted from liquefaction induced lateral spread hazards. The mitigation measures presented to address the impacts from high settlements due to liquefaction would not be effective in all areas of development, in particular with respect to impacted areas located outside building footprints. 75 [GEO-3] cont.

The following section (B1 to B11) presents our comments based on a review of the Notice of Preparation of an Environmental Impact Report/Initial Study (IS), Event Center and Mixed-Use Development at Mission Bay Blocks 29-32, Dated November 19, 2014.

B1. Page 84 Topics: 14 Geology and Soils - lists the impacts for all subsections of the Geology and Soils Impacts as "No New or More Severe Significant Effects." Significant changes to the California Building Code and the standard of practice for analyzing ground motion and liquefaction evaluation have occurred since the 1998 SEIR was published. Geotechnical reports showing details of older analysis versus analysis based on newer ground motion criteria were not available for review. Without a comparison of the two analyses, it cannot be concluded that there are no new or more severe significant effects. 76 [GEO-1]

B2. Page 86 last paragraph: identifies the Langan Treadwell Rollo, Preliminary Geotechnical Evaluation Report, dated March 28, 2014 as the preliminary geotechnical evaluation for the project. Our review of that report indicates that the letter report carries the stamp "Privileged and Confidential – For Discussion Purposes Only" Furthermore, the geotechnical evaluation report states in the last paragraph "The conclusions and recommendations presented herein are preliminary and should not be relied upon for design." Other detailed geotechnical reports providing data and analysis were not referenced in the IS or available to review. 77 [GEO-1]

B3. Page 87 second paragraph states "On the basis of the preliminary geotechnical evaluation for the project, recommended measures for addressing these effects include improving the soil to resist liquefaction and lateral spreading as well as use of flexible utility connections, utility hangers, and hinged slabs to address differential settlement." As stated above in Section A10, high settlements may occur due to liquefaction and development of surface sand boils. Without adequate mitigation for these high unknown settlements, the impacts would be significant. 78 [GEO-3]

B4. Page 87 third paragraph states "As indicated by the project-specific geotechnical evaluation, no substantial changes have occurred nor has new information become available that would result in new or more severe project impacts related to seismic hazards including fault rupture, seismic groundshaking, seismically induced ground failures, or landslides." The referenced 2014 geotechnical report is insufficient in content and analysis to support this statement. A comparison of current and the 1998 derived ground motion design criteria, static and dynamic settlement values was not provided in the geotechnical report or the IS. 79 [GEO-1]

B5. The 2014 Langan Treadwell Rollo report also identified the potential hazard from lateral spread as high. The 1998 SEIR presented lateral spread as a hazard within several hundred feet of China Basin Channel. Due to the distance of the Site from from China Basin Channel (>2,000 feet), the lateral spread hazard identified in the 1998 SEIR would not have included blocks 29-32. This new hazard was not identified or acknowledged in the IS. A mitigation measure for the impact of lateral spread in the area between the proposed structure and San Francisco Bay was not presented in the IS or in the 2015 DSEIR. 80 [GEO-3]

B6. Page 88 under Settlement states "The Mission Bay FSEIR addressed settlement issues related to differential settlement of the underlying geologic materials that are relevant to the project site, but it did not address impacts related to settlement associated with excavation or dewatering. 81 [GEO-5]

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However, these impacts would all be less than significant, as described below." As stated above in Section A10, high settlements may occur due to liquefaction and development of surface sand boils for which mitigation has not been provided. 81 [GEO-5] cont.

B7. Page 90 third paragraph states: "In addition, noise and vibration concerns could limit the use of driven piles." The structure foundation mitigation measures specify the use of driven piles and no other foundation mitigation method alternative was provided. 82 [GEO-5]

B8. Page 98 under Mission Bay Plan Effects Related to Tsunami and Seiche. As stated in A6 above, the U.S. Army Corp of Engineers model is outdated and has been replaced with other modern methods of analysis.

B9. Page 103 under Inundation by Seiche or Tsunami. This section provides conflicting values. The older values from the FSEIR and newer values from the 2011 Tsunami Response Annex report by the City and County of San Francisco. It should be noted that on page 24 of the 2011 Tsunami Response Annex report states: "The map is intended for use as evacuation planning tools (Attachment B). The Tsunami run-up zone information are approximations due to limitations in modeling and baseline coastal data." The IS provides a tsunami and seiche run-up values of "approximately 6 feet" based on the 2011 Tsunami Response Annex report. Our review of the report indicates that that value is referenced to mean sea level. The 6 foot value does not account for diurnal high tides that may reach approximately 7 feet and sea level rise due to climatic change that may reach approximately 5 feet. To estimate Tsunami run-up elevations, the maximum run-up is calculated as a sum of the Tsunami run-up (6 feet), the tide level at the time of the Tsunami (may be as high as 7 feet) and sea level rise (may reach 5 feet). Not accounting for all the ocean level variables may cause a significant underestimation of Tsunami run-up. 83 [HYD-8]

B10. Page 104 under Inundation by Seiche or Tsunami. This section provides mitigation measures such as 1) Set Back, although no distance is given 2) Raise occupied portions, no elevation is given and 3) Tsunami Warning System, for hazards that were determined to be less than significant. If the hazard is less than significant, then mitigation measures would not be required. This presents an improper analysis by providing mitigation measures for an impact that was previously identified to be less than significant.

B11. Page 104 under Structures states: "Although some damage to the structures could occur, the improvements constructed under the proposed project would be resilient to tsunamis or seiches." A reference to the building code that provides design parameters for tsunamis resilient structure needs to be provided.

Summary of Review - 2014 the Notice of Preparation/Initial Study

The Notice of Preparation (NOP) of an Environmental Impact Report/Initial Study (IS), dated June 5, 2015 did not fully analyze the Tsunami hazard, relied on out dated methodology and failed to provide adequate mitigation measures for the area that is located in a State Tsunami Hazard Zone. The mitigation measures for Tsunami impacts provided in the IS were developed without performing a proper Tsunami hazard analysis. The IS failed to properly analyze, identify and address new or more severe significant effects. Recent Geotechnical reports (Langan 2014) identified new and significant impacts (lateral spread for example) that were not addressed in the IS. 84 [GEO-1]

The following section (C1 to C5) presents our comments based on a review of the Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015.

BSK

C1. Pages 1-47, Table 1-2 Summary of Impacts and Mitigation Measures, Hydrology and Water Quality list Impact HY-5 "The project would not expose people or structures to a significant risk of loss, injury or death involving inundation by seiche or tsunami" as LS or Less-Than-Significant Impact (no mitigation required). Portions of the site are located in a State Identified Tsunami Hazard Zone, furthermore as stated in A6 and B9 above, the Tsunami hazard has not been adequately analyzed using current standards. The designation of LS or Less-Than-Significant Impact (no mitigation required) conflicts with the IS listing Tsunami mitigation measures, see B10 above. 85 [HYD-8]

C2. Pages 1-59 to 1-60, Table 1-2 Summary of Impacts and Mitigation Measures, Geology and Soils lists Impacts GE-1 through GE-5 and C-GE-1 with significance determinations of LS or Less-Than-Significant Impact (no mitigation required). This is contrary to the findings, conclusions and recommendations found in previous geotechnical evaluations (Langan 2014 and Langan 2011). The Langan geotechnical evaluations identified numerous conditions at the site requiring mitigation measures. The items included excessive static and dynamic settlements, liquefaction including sand boils, lateral spread, intense ground motion, shallow groundwater and corrosive soils. The Langan 2011 report presented numerous mitigation measures requiring extensive ground improvement modifications, specialized foundation design, dewatering and excavation shoring. 86 [GEO-1]

C3. Page 5.9-29 states " … and flooding as a result of failure of a levee or dam; and inundation by seiche, tsunami, or mudflow (Impact HY-5). Therefore, no further analysis of these subjects is presented in this section." As stated in A6 above, the Tsunami hazard methodology presented in the 1998 SEIR is dated and requires and updated analysis and evaluation. 87 [HYD-8]

C4. Page 6-5 under Section 6.3 Effects Found Not to be Significant in the Geology and Soils states "The project would not expose people or structures to geologic hazards; cause soil erosion or loss of topsoil; be affected by the presence of unstable soils or geologic units; be affected by the presence of expansive soils or soils incapable of adequately supporting wastewater disposal systems; or cause a substantial change of topography." This is in conflict with the newly identified hazards (Lateral Spread) and inadequately analyzed hazards (liquefaction induced sand boils). 88 [GEO-3]

C5. Page 6-5 under Section 6.3 Effects Found Not to be Significant in the Hydrology and Water Quality states: "The project would not deplete groundwater supplies; alter drainage patterns, resulting in erosion; place housing and/or structures within a 100- year flood zone; expose people and structures to hazards associated with flooding, failure of a levee or dam, seiche, tsunami, or mudflow; or cause construction-related water quality impacts." The portions of the site are located in a State-Identified Tsunami Hazard Zone and as stated above in Section A6 and B9, the Tsunami hazard was evaluated in the 1998 SEIR and 2014 IS using dated and/or inappropriate methodologies. 89 [HYD-8]

Summary of Review - 2015 Draft Subsequent Environmental Impact Report

The Draft Subsequent Environmental Impact Report (SDEIR), dated June 5, 2015 did not fully analyze the Tsunami hazard, relied on out-dated methodology and failed to provide adequate mitigation for portion of the site that are in a State Tsunami Hazard Zone. The SDEIR failed to address and provide mitigation for newly identified significant hazards such as lateral spread. Much of the SDEIR relies on analysis from the IS and 1998 SEIR without fully addressing newly identified hazards, data gaps and the need to apply current methodologies to analyze project impacts. 90 [GEO-3]

BSK

Our review was limited to the Geology, Engineering Geology and Seismic related aspects as they relate to the development as described in the reports made available for review.

We appreciate the opportunity to be of service to Soluri Meserve and trust that this correspondence provides you with the information necessary at this time. Please contact us with questions regarding the review comments presented this letter.

Respectfully submitted,
BSK Associates

PROFESSIONAL GEOLOGIST · MARTIN B. CLINE · No. 2084 · CERTIFIED ENGINEERING GEOLOGIST · STATE OF CALIFORNIA

Martin B. Cline, CEG
Senior Engineering Geologist

Kurt Balasek
Senior Hydrogeolgist

Attachment: Figure 1, Tsunami Inundation Map

References:

Borrero, J., Dengler, L., Uslu, B., Synolakis, C., June 8, 2006, Numerical Modeling of Tsunami Effects at Marine Oil Terminals in San Francisco Bay, Report Prepared for: Marine Facilities Division of The California State Lands Commission

California Emergency Management Agency, California Geologic Survey and University of Southern California, (June 15, 2009) Tsunami Inundation Map for Emergency Planning, San Francisco North Quadrangle/San Francisco South Quadrangle

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Geist, E.L., Parsons, T., 2006 Probabilistic Analysis of Tsunami Hazards, Natural Hazards (2006) 37: 277–314, DOI 10.1007/s11069-005-4646-z, March 14, 2005

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Langan Treadwell Rollo, December 21, 2011, Geotechnical Investigation, Salesforce Buildings, Block 29-32 Mission Bay, San Francisco, California,

National Research Council of the National Academies, 2012, Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future

NOAA Website, http://tidesandcurrents.noaa.gov/datums.html?id=9414782 accessed June 2015
NOAA Vertical Datums http://www.ngs.noaa.gov/datums/vertical/ accessed June 2015
FEMA Vertical Datum http://www.fema.gov/media-library-data/20130726-1615-20490-4828/vertical_datum_letter.pdf accessed June 2015

BSK

July 13, 2015

Memo

To: Patrick Soluri, Attorney at Law

From: Philip King, Ph.D.

Re: Urban Decay Analysis of Proposed Relocation of Golden State Warriors from Oakland to San Francisco

Upon your request I examined the Environmental Review[1] prepared in conjunction for the proposed relocation of the NBA franchise Golden State Warriors from Oracle Arena in Oakland to San Francisco. The project description for the AB900 Application included significantly reduced events at Oracle Arena in order to take advantage of GHG reductions. However, the project's EIR took an inconsistent approach to the scope of the project, and did not analyze the potential for urban decay resulting from these significant event reductions, which has been recognized as an environmental impact that should be analyzed under the California Environmental Quality Act (CEQA).

My analysis (Table A below and described in more detail in this memo) indicates that the move from Oakland to San Francisco would lead to a direct loss of $44.9 million and 494 jobs. When one also includes the indirect and induced impacts, this impact increases to $86.6 million and 805 jobs.

91 [GEN-4]

Although Oakland has benefited from the recent economic recovery, it's well known that the City suffers from high crime rates as well as high levels of blight and urban decay. Indeed, the Oracle Arena is located in a former Redevelopment Area (RDA) that the City declared blighted. Removing these jobs and this economic activity will exacerbate existing urban decay and seriously impact the City's ability to respond to this decay.

[1] See Application for Environmental Leadership Development Project Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 ("AB900 Application").

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Table A: Economic Impact of the Golden State Warriors in Alameda County

Economic Impact in Alameda County

Impact Type	Employment	Labor Income	Output
Direct Effect	494.3	$28,490,621	$43,900,000
Indirect Effect	110.8	$6,084,031	$13,153,869
Induced Effect	200.6	$10,746,179	$29,546,005
Total Effect	**805.6**	**$45,320,831**	**$86,599,874**

The Economics of Moving a Basketball Team

A convenient starting point to examine the economic impact of the Golden State Warriors' relocation to San Francisco from Oakland is the Seattle Supersonics' relocation to Oklahoma City. An economic report prepared in conjunction with the move indicated that the departure of the team would result in the loss of 1,200 – 1,300 jobs and $188 million in economic activity, slightly larger than the $170 million that the City of Oklahoma projected it would gain from the arrival of the team. Contrary to both of these projections, a sports economist for the Supersonics testified to the broad consensus within the economics literature that the departure or arrival of a professional sports team has no significant economic impact whatsoever upon the larger metropolitan area as a whole. When pressed by the city's legal team, this economist did, however, concede that the arrival, departure or relocation of a professional sports team can have a measureable effect upon the *distribution* of economic activity within the larger metropolitan area.[2]

91 [GEN-4] cont.

There are two primary reasons given within the sports economics literature for why the presence of a professional sports team within a metropolitan area has no significant economic impact: substitution and leakage.

> "Promotional impact studies ignore or underestimate the effects of consumer substitution and leakages from the local economy connected to sports facilities… These studies rely largely on the assumption that all (or much of the) spending on sports teams is new to the local economy and that this spending has a similar effect on the local economy as spending on other consumption goods and services. Both of these assumptions are false." [3]

When a sports team relocates to a city, the money that is spent at its games does not come from outside the metropolitan area, but instead generally comes from money that is already being spent on leisure activity within that same metropolitan area. Similarly, when the team departs, the money that was previously being spent at the games will

[2] http://sports.espn.go.com/nba/news/story?id=3452509
http://www.seattletimes.com/sports/nba/sonics-argue-team-has-little-economic-impact-on-seattle/
http://www.forbes.com/2008/06/25/seattle-supersonics-nba-biz-sports-cx_mw_0625seattle.html
[3] Siegfried, John and Zimbalist, Andrew, "A Note on the Local Economic Impact of Sports Expenditures" Journal of Sports Economics, Vol. 3 No. 4, November 2002, 361-366, http://web.centre.edu/johnsonb/eco406/Apr%2021/seigfried.pdf

now be spent on other leisurely activities within the same area. The amount of money that people spend on leisurely activity is relatively fixed and spending at a sports venue only comes as a substitute for and thus at the expense other venues within the area. "The net effect on spending within the metropolitan area then is zero, or very close to zero. While sports teams may rearrange the spending and economic activity in an urban area, they are not likely to add much to it." [4]

In addition to the high degree of substitution associated with spending on professional sports, a high degree of economic leakage is also cited as a reason for the low impact that a professional sports team has upon a metropolitan area. The professional sports industry involves almost always involves the large transfer of money from local spectators to highly paid athletes and investors whose households typically do not reside and thus do not frequent businesses within the same metropolitan area. This outward flow of money typically cancels out whatever economic activity the team might bring from outside the metropolitan area.

91 [GEN-4] cont.

The high degrees of economic substitution and leakage associated with the professional sports industry are responsible for the negligible economic impact that results from the relocation of a professional team from one metropolitan to another. **However, the same cannot be said for the relocation of a professional sports team within the same metropolitan area as in the case of the Golden State Warriors.**

> "Even though it is difficult to justify new stadium construction on economic growth grounds, it is possible that such construction would facilitate efforts to redevelop an urban core… [I]t is possible for sports facilities to reposition economic activity within a metropolitan area." [5]

Since the Warriors are relocating *within* the larger San Francisco/Oakland metropolitan area we can reasonably assume both substitution and leakage will remain constant before and after the move. Whereas we could not say that Oklahoma City was taking economic activity from the City of Seattle since the same fans would no longer be attending Supersonic games, we can, however, say that the City of San Francisco will take economic activity from the City of Oakland since the same fans will continue to attend Warriors games.

[4] Siegfried, John and Zimbalist, Andrew, "The Economics of Sports Facilities and Their Communities", The Journal of Economic Perspectives, Vol. 14, No. 3, (Summer 2000), 95-114, http://www.csus.edu/indiv/h/howellj/econ145_s2009/Assignments/SportsStadiumFunding.pdf See also: http://www.forbes.com/2008/06/25/seattle-supersonics-nba-biz-sports-cx_mw_0625seattle.html

[5] Siegfried, John and Zimbalist, Andrew, "The Economics of Sports Facilities and Their Communities", The Journal of Economic Perspectives, Vol. 14, No. 3, (Summer 2000), 95-114, http://www.csus.edu/indiv/h/howellj/econ145_s2009/Assignments/SportsStadiumFunding.pdf

Reversing Directions across the Bay Bridge

After the relocation of the Warriors from Oakland to San Francisco, spectators from the East Bay will then choose between finding a local substitute within the East Bay and traveling to the West Bay to watch the Warriors games. While it is the case that leisured spending has a high substitution effect over a large community such as a metropolitan area, the same cannot be said for more narrowly deigned areas, such as the East Bay industrial area.

> "A stadium or arena will have more added effects on a very narrowly defined community than on a largely encompassing community. The reason for this is that the more narrowly the host community is defined, the more of the spending at the stadium and the nearby restaurants, bars, and hotels will come from outside the community. However, that spending will come largely at the expense of the home communities of the fans that travel into the stadium from outlying areas. The substitution effect for the broadly defined area is quite large, but for the narrowly defined stadium community it is much smaller. What this points out is that stadiums and sports teams may be a tool for redistributing income in which the people from suburbs subsidize businesses in the city."[6]

91 [GEN-4] cont.

Consequently, we can expect that most Warriors fans will continue attending games after the relocation rather than seeking local substitutes. The relocation of the Warriors, then, constitutes a significant redistribution of economic activity within the larger Bay Area.

During the Warriors' 2014/15 season 803,436 fans attended home games in Oakland (34% more than the Supersonic their last season in Seattle) and took in $168 million dollars in total revenue.[7] Table 1 (below) shows that, assuming that the distribution of Warriors spectators is proportionate to the distribution of residents within the larger metropolitan area, $99 million in Warriors revenue came from the East Bay while $69 million came from San Francisco and the Peninsula. It is worth emphasizing, however, that the Warriors relocation to San Francisco does not merely entail that the $69 million will cease coming into the East Bay from the West, but that the additional $99 million that was being spent by local East Bay residents will be lost to San Francisco. Spending in Oakland will decrease by $168 million regardless of where the fans actually reside.

[6] Coates, Dennis and Humphreys, Brad R., "The Stadium Gambit and Local Economic Development" Regulation, Volume 23, No. 2, July 2000, 15-20, http://object.cato.org/sites/cato.org/files/serials/files/regulation/2000/7/coates.pdf

[7] http://www.forbes.com/teams/golden-state-warriors/
http://www.census.gov/popest/data/counties/totals/2013/CO-EST2013-01.html

Table 1. Attendance and Revenue for Warriors' 2014/15 Season

Attendance and Revenue for Golden State Warriors Home Games (2014/15 Reg. Season)			
	Total	East Bay (59%)	West Bay (41%)
Attendance	803,436	475,538	327,898
Spending	$168,000,000	$99,435,935	$68,564,065

Leakage

In the last section we discussed where the money that is spent on Warriors games comes from within the larger Bay Area. In this section we will briefly consider where the money goes after these games, as well as the effect of economic leakage.

Table 2. The Redistribution of Economic Activity due to the Warriors' Relocation

The Redistribution of Economic Activity due to the Golden State Warriors' Relocation			
	Total (millions)	**Percent**	**Redistributed** (millions)
Operating Income:	$44.9	0%	$0.0
Players' Salary:	$78.0	10%	$7.8
Other Expenses:	$45.1	80%	$36.1
Total:	**$168.0**	**26%**	**$43.9**

Table 2 (above) divides up the Warriors' $168 million in total revenue into three categories: operating income, players' salary and other expenses. $44.9 million in operating income is the money that goes to the owners and investors of the Warriors. Since we have little reason to assume that these people live within the larger metropolitan area, let alone the East Bay, we can assume that relocating the team will not redistribute this money to any significant degree. Similarly, only 29% of NBA players live within the same larger metropolitan area as the team they play for[8]. We can also expect a large amount of the $78.0 in Warriors players' salary to be spent outside of, and thus "leak" from the larger San Francisco/Oakland metropolitan area leaving 10%, or $7.8 million to be redistributed within the Bay Area. This leaves $45.1 million that went to other expenses (wages, inventory, etc.) during the 2014/15 season. We assume that 80%, or $36.1 million, was spent within the larger metropolitan area.

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[GEN-4]
cont.

[8] Siegfried, John and Zimbalist, Andrew, "A Note on the Local Economic Impact of Sports Expenditures" Journal of Sports Economics, Vol. 3 No. 4, November 2002, 361-366, http://web.centre.edu/johnsonb/eco406/Apr%2021/seigfried.pdf

While $168 million was spent by fans within the Bay Area on Warriors games, we estimate that only 26% or $43.9 million stayed within the area. It is this $43.9 million that will be redistributed from the Easy Bay to the West with the Warriors' relocation. Table 3 (below) lists the most popular professions among the 3,432 Bay Area residents that are employed within the sports spectator industry and gives a general idea regarding how a professional sports team such as the Warriors spend their money[9].

Table 3. Occupations within the Sports Spectator Industry

Employed	Sports Spectator Industry within the San Francisco/Oakland Metropolitan Area	Hourly Wage	Annual Salary
878	Personal Care and Service Occupations	$12.06	$25,080
572	Arts, Design, Entertainment, Sports, and Media Occupations	$31.60	$65,730
559	Entertainment Attendants and Related Workers	$11.32	$23,540
455	Entertainers and Performers, Sports and Related Workers	$33.10	$68,850
402	Athletes, Coaches, Umpires, and Related Workers	*	$72,060
324	Sales and Related Occupations	$15.70	$32,660
285	Office and Administrative Support Occupations	$16.91	$35,170
258	Protective Service Occupations	$15.76	$32,790
251	Food Preparation and Serving Related Occupations	$10.28	$21,380
243	Other Protective Service Workers	$15.26	$31,730
243	Animal Care and Service Workers	$12.49	$25,980
233	Ushers, Lobby Attendants, and Ticket Takers	$10.21	$21,230
3,432	**Industry Total**	**$20.45**	**$42,540**

Economic Impact

In addition to the direct loss of $43.9 million in economic activity to the City of Oakland, there are also indirect and induced effects which are associated with this loss. However, in addition to this direct spending, there are indirect and induced impacts, often referred to as "multiplier effects" –since arena and team spending also generate other jobs and economic activities in the region, and without the Warriors' spending other economic sectors of the Alameda County would shrink as well.

IMPLAN is standard Input/Output software specifically design to project the indirect and induced multiplier effects associated with the Warriors' direct spending in Alameda County. Table 4 (below) lists the economic impact of the Golden State Warriors within Alameda County by impact type. With indirect and induced impacts included, the Warriors generate 805 jobs and $86.6 million in economic activity. Table 5 (below) lists 10 most impacted industries within the county. In addition to the 547 jobs and $48.6 million in economic activity created within spectator sports industry, food and drinking

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[GEN-4]
cont.

[9] http://www.bls.gov/opub/ted/2014/ted_20140131.htm

places, real estate establishments, private hospitals and other physicians are significantly affected by the East Bay presence of the Warriors.

Table 4. Economic Impact of the Golden State Warriors in Alameda County

Economic Impact in Alameda County			
Impact Type	**Employment**	**Labor Income**	**Output**
Direct Effect	494.3	$28,490,621	$43,900,000
Indirect Effect	110.8	$6,084,031	$13,153,869
Induced Effect	200.6	$10,746,179	$29,546,005
Total Effect	**805.6**	**$45,320,831**	**$86,599,874**

Table 5. Industries in Alameda County Impacted by the Golden State Warriors

Industries in Alameda County Impacted by the Golden State Warriors			
Description	**Employment**	**Labor Income**	**Output**
Spectator sports companies	547.3	$31,541,779	$48,601,401
Food services and drinking places	25	$617,563	$1,701,992
Real estate establishments	13.1	$299,013	$2,820,104
Promoters and agents for public figures	12.9	$133,694	$717,837
Private hospitals	11.6	$1,363,445	$2,336,587
Physicians and other health practitioners	10.4	$886,704	$1,498,858
Employment services	7.2	$287,482	$370,425
Retail Stores - Food and beverage	7.2	$290,137	$520,763
Nursing and residential care facilities	6.5	$274,706	$490,435
Private household operations	6.5	$77,727	$82,572
All Industries	**805.6**	**$45,320,831**	**$86,599,874**

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[GEN-4]
cont.

Urban Decay

Although the EIR ignores the issue in the context of urban decay impacts, the EIR and AB900 Application conclude that that Oracle Arena will continue to operate with approximately 21 events per year. This is an impractical assumption from an economic perspective. As a practical matter, one of two outcomes will occur. The first possible outcome is that the Oracle Arena will continue to operate by attracting more than 21 non-NBA events per year.

The second possible outcome is that Oracle Arena will close without the Golden State Warriors. I spoke with Alexander Michael, an expert on the business and financing of

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sporting arenas. Based on that information, a strong argument exists that the Oracle Arena (or indeed any similar venue in a similar situation) will not be viable without the Golden State Warriors and there are no other sports teams in the offing for this venue. A similar case is the IZOD center located in East Rutherford, New Jersey. The IZOD center housed the New Jersey Devils hockey team Nets NBA basketball team until they left in 2007. The IZOD arena also hosted the New Jersey Nets basketball team, who left in 2010. The State of New Jersey attempted to keep the Izod arena open for many years. However, the demand for other events such as concerts, ice shows, etc., was insufficient. As with the Oracle arena in Oakland, the Izod arena is located near a number of other sports venues and near Manhattan, which offers a wide variety of venues. The Izod arena shutdown earlier this year after an official forecast that the center would lose $8.5 million a year.[10]

It is difficult to determine which outcome is more likely since the EIR ignored the issue of potential urban decay associated with reduced events at Oracle Arena. The EIR should have included an economic impacts analysis that would have provided more information about the ultimate fate of Oracle Arena and, by extension, impacts to the physical environment.

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[GEN-4]
cont.

Once the Oracle arena has been shutdown, it would be extremely difficult and expensive to repurpose the arena for other activities and thus it will almost certainly be shuttered and perhaps demolished at some future date. A closed arena will be a magnet for graffiti, crime, drug deals and other signs of urban decay. The City of Oakland can mitigate for this urban decay, but it would involve a costly increase in police and other public safety officials.

The City of Oakland and Alameda County are obligated to a $79.7 million dollar Lease Revenue Bond that must be paid or default. Without revenues from the Oracle Arena the bond would either go into default or the City/County would have to pay the principal and interest on the bond. If the City County pay out of their General Fund dollars, it will reduce their ability to fund other needed public services. If the default it could damage their credit rating and make it more difficult to finance other future (non-sports) projects which could enhance the welfare of the City and County

Oakland was rated the third most dangerous City in the Country in 2012.[11] According to the FBI, Oakland had the highest crime rate of any major City in California[12] and this year (2015) homicides in Oakland are on track to exceed 2014.[13]

[10] See http://www.nytimes.com/2015/01/16/nyregion/deserted-by-devils-nets-and-profits-izod-center-in-north-jersey-is-to-close.html?_r=0.
[11] See http://www.forbes.com/sites/danielfisher/2012/10/18/detroit-tops-the-2012-list-of-americas-most-dangerous-cities/.
[12] See https://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2013/crime-in-the-u.s.-2013/tables/table-8/table-8-state-cuts/table_8_offenses_known_to_law_enforcement_california_by_city_2013.xls.
[13] See https://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2013/crime-in-the-u.s.-2013/tables/table-8/table-8-state-cuts/table_8_offenses_known_to_law_enforcement_california_by_city_2013.xls.

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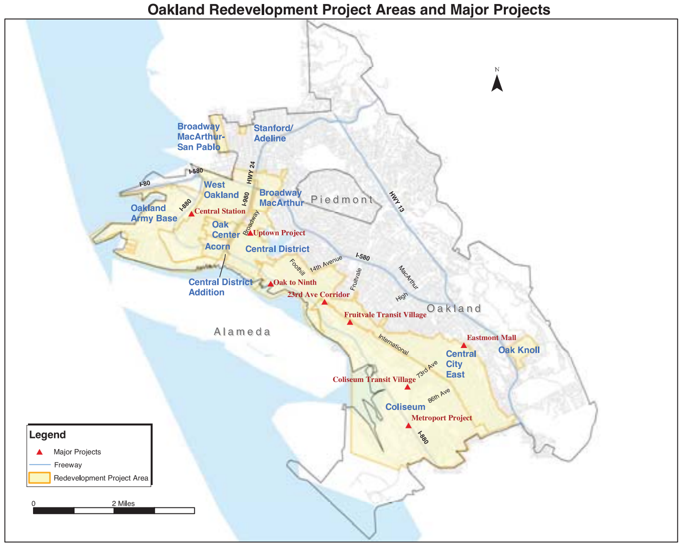
The City declared the area blighted and formed a redevelopment area (see Figure 1 below). Although Redevelopment Areas have been disbanded, the blight issues remain. Indeed, the suspension of RDAs eliminates a funding stream for the City to help ameliorate urban decay and blight.

The reduction in economic activity also significantly reduces the tax base for the City that reduces its ability to mitigate for urban decay and provide police and other public safety officials.

In my professional opinion, this issue (urban decay) should have been identified in any environmental analysis and mitigated where possible. A number of mitigation options are available including: (1) paying a mitigation fee to the City of Oakland, (2) preserving some of the jobs for Oakland residents; (3) shifting some of the taxes/fees to the City of Oakland. Without any kind of urban decay analysis none of these mitigation options are possible.

91 [GEN-4] cont.

Oakland Redevelopment Project Areas and Major Projects



Source: City of Oakland, Community Economic Development Agency
Map produced by the Urban Strategies Council, June 2004

Figure 1: Oakland Redevelopment Area

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July 26, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: **Air Quality Impacts** - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter. 1 [GEN-5]

This letter incorporates by reference, as comments on the DSEIR, all of the comments on the DSEIR contained in the July 19, 2015, letter report authored by Greg Gilbert (attached as Exhibit 1) and the July 20, 2015, letter report authored by Paul Rosenfeld and Jessie Jaeger (attached as Exhibit 2).

I. The DSEIR Is Not Sufficient as an Informational Document with Respect to Air Quality Impacts.

A. Dust: the DSEIR's impact assessment for construction-related dust pollution is based on legal errors and not supported by substantial evidence. 2 [AQ-2]

Regarding dust pollution, the DSEIR states:

The site-specific Dust Control Plan would require the project sponsor to: submit a map to the Director of Public Health showing all sensitive receptors within 1,000 feet of the site; wet down areas of soil at least three times per day; provide an analysis of

> wind direction and install upwind and downwind particulate dust monitors; record particulate monitoring results; hire an independent, third-party to conduct inspections and keep a record of those inspections; establish shut-down conditions based on wind, soil migration, etc.; establish a hotline for surrounding community members who may be potentially affected by project-related dust; limit the area subject to construction activities at any one time; install dust curtains and windbreaks on the property lines, as necessary; limit the amount of soil in hauling trucks to the size of the truck bed and securing with a tarpaulin; enforce a 15 mph speed limit for vehicles entering and exiting construction areas; sweep affected streets with water sweepers at the end of the day; install and utilize wheel washers to clean truck tires; terminate construction activities when winds exceed 25 mph; apply soil stabilizers to inactive areas; and sweep off adjacent streets to reduce particulate emissions. The project sponsor would be required to designate an individual to monitor compliance with these dust control requirements.

(DSEIR, p. 5.4-30.)

The Dust Control Plan is either part of the project description, or a mitigation measure, or both. Either way, what the Project Sponsor is actually going to do to control dust - on the ground - must be described. Otherwise, the DSEIR violates CEQA.

2
[AQ-2]
cont.

If the Dust Control Plan is part of the project description, the DSEIR fails to present a complete project description, making it impossible for the public or other agencies to comment on the potential environmental impacts of this part of the project.

If the Dust Control Plan is a mitigation measure, the DSEIR defers the development of this mitigation measure until after Project approval, without meeting CEQA requirements for doing so, because (1) Article 22 B specifies a suite of measures but does not require the adoption of any in particular, (2) the DSEIR does not specify a performance standard by which the success of the Dust Control Plan can be judged, and (3) there is no evidence it is impracticable to develop and include the Dust Control Plan in the DSEIR, before project approval. (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 95 (*CBE*); *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; 1394 (*Gentry*).

Also, by failing to identify the Dust Control Plan as a CEQA mitigation measure, the DSEIR throws the enforceability of the Plan under CEQA into doubt. (See *Federation of Hillside & Canyon Associations v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1260-1262; *Lincoln Place Tenants Association v. City of Los Angeles* (2005) 130 Cal.App.4th 1491, 1508 ["mitigating conditions are not mere expressions of hope..."].)

B. Criteria air pollutants: the DSEIR's impact assessment for construction and operational criteria air pollutants is based on legal errors and not supported by substantial evidence.

1. The City cannot use the DSEIR's thresholds of significance for criteria air pollutants until it formally adopts them in a rule--making procedure.

The DSEIR's thresholds of significance are:

> For the impacts analyzed in this section, the project would have a significant impact related to air quality if it were to:
> - Conflict with or obstruct implementation of the applicable air quality plan;
> - Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
> - Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
> - Expose sensitive receptors to substantial pollutant concentrations; or
> - Result in a cumulative air quality impact in combination with past, present and reasonably foreseeable future projects in the vicinity.

3
[AQ-1a]

(DSEIR 5.4-23.)

For criteria pollutants, the DSEIR uses numerical thresholds of significance borrowed from the Bay Area Air Quality Management District ("BAAQMD") for ROG (54 lbs/day); NOx (54 lbs/day); Exhaust PM10 (82 lbs/day); Exhaust PM2.5 (54 lbs/day).

> The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants that may contribute to an existing or projected air quality violation is based on the State and federal Clean Air Acts emissions limits for stationary sources. To ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors ROG and NOx, the offset emissions level is an annual average of 10 tons per year (or 54 pounds (lbs.) per day). These levels represent emissions below which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants that could result in increased health effects.

(DSEIR p. 5.4-25; see also p. 5.4-31.)

The City uses these numerical thresholds of significance for virtually all land use development projects in the city that require CEQA review. This is shown by the following sample of excerpts from recent Environmental Impacts Reports and Negative Declarations attached hereto as Exhibits 4 through 16. All of them use the BAAQMD numbers as the thresholds of significance for these pollutants.

Therefore, the City is required to undertake its own rule-making proceeding to adopt these thresholds as its own and determine in a public process that they are supported by substantial evidence.

> (b) Thresholds of significance to be adopted for general use as part of the lead agency's environmental review process must be adopted by ordinance, resolution, rule, or regulation, and developed through a public review process and be supported by substantial evidence.
> (c) When adopting thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence.

(CEQA Guideline, § 15064.7.) Since the City has not formally adopted the air quality significance thresholds in a public process supported by substantial evidence, it cannot use these thresholds on an ad hoc basis as it has done in this EIR.

3 [AQ-1a] cont.

2. The DSEIR's numerical thresholds of significance for criteria pollutants (ozone precursors, PM10, PM2.5) borrowed from the BAAQMD are invalid.

As noted above, for its impact assessment and mitigation strategy for criteria pollutants, the DSEIR uses numerical thresholds of significance borrowed from the BAAQMD. But the DSEIR cannot merely reference a project's compliance with another agency's regulations. Lead agencies must conduct their own fact-based analysis of project impacts, regardless of whether the project complies with other regulatory standards.

The result of using these thresholds is a deeply misleading impact assessment and mitigation strategy because using these invalid thresholds allows the DSEIR to avoid finding impacts are significant, and it allows the DSEIR to understate the severity of impacts deemed "significant" because it implies that most of the quantity of emissions below the thresholds are not "significant." Also, using these invalid thresholds underestimates the degree of mitigation required to reduce significant impacts to less then significant, and therefore, the DSEIR curtails its consideration of the feasibility of additional mitigation measures that could further substantially reduce emissions.

The numerical thresholds borrowed from the BAAQMD are logically and legally invalid, and

4 [AQ-1b]

O-MBA8L2

they are not supported by substantial evidence. The thresholds are contained in the BAAQMD's "CEQA Air Quality Guidelines."[1] But neither the DSEIR or the BAAQMD CEQA Air Quality Guidelines describe any evidence that might support the use of these thresholds. The same is true of BAAQMD's other publications relating to these thresholds, i.e., Appendix D of the BAAQMD CEQA Air Quality Guidelines, BAAQMD's Revised Draft Options and Justification Report, (October 2009), and the Bay Area AQMD Proposed Air Quality CEQA Thresholds of Significance, published May 3, 2010.

While these BAAQMD publications purport to include substantial evidence supporting the use of these thresholds for all criteria air pollutants for which the Bay Area is in non-attainment, they do not. Instead, the BAAQMD CEQA Air Quality Guidelines merely provide policy rationales for why it is a good idea to have thresholds of significance. Nowhere does the document actually provide evidence for why any number of pounds per day below, for example, 54 for NOx or ROG, is not "cumulatively considerable."

The BAAQMD's Revised Draft Options and Justification Report (October 2009) states the thresholds "are based on the trigger levels for the federal New Source Review (NSR) Program and BAAQMD's Regulation 2, Rule 2 for new or modified sources." (See page 2.) These New Source Review Program rules provides that any new source that will emit pollutants above the levels stated in the left hand column of Table 4 (e.g., 10 lbs/day of NOx and ROG) must impose "Best Available Control Technology ("BACT")." (Id. pp. 16-17.) These rules also provide that any new source emitting pollutants above the levels stated in the right hand column of Table 4 (e.g., 54 lbs/day of NOx and ROG) must offset all emissions. (Id. pp. 16-17.)

In addition to the inherent flaws in the NSR rules described above, it is inappropriate to base the EIR's significance determination for purposes of CEQA on the Air District's "triggers" for an entirely different regulatory program, i.e., New Source Review under the Clean Air Act ("CAA").[2] One of CEQA key purposes is to require "disclosure" of significant impact, and it allows agencies to approve projects where emissions exceed its thresholds of significance after feasible mitigations are first adopted and as long as the project's benefits outweigh the environmental harm. The CAA, in contrast, is not primarily concerned with public disclosure, and it provides absolute limits on emissions (i.e., the offset triggers in Table 4) that cannot be exceeded under any circumstances. A

4 [AQ-1b] cont.

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[1] The BAAQMD CEQA Air Quality Guidelines were published May 2010, and updated May 3, 2011.

[2] The CAA establishes health-based ambient air quality standards and ranks air districts nationwide based on their level of attainment of those standards. The CAA also establishes a timetable for air districts to reach attainment, and authorizes specific penalties where a deadline is not met. CEQA, on the other hand, requires lead agencies to analyze and discuss significant impacts on air quality, and to continue to mitigate those impacts so long as they remain significant or no additional mitigation is feasible.

standard that shuts down economic activity (i.e., the CAA offset standard) is necessarily and appropriately different than a standard (i.e. a CEQA threshold of significance) that requires disclosure of the impact to the public and the adoption of feasible mitigation measures.

Indeed, if it is possible to borrow any CAA NSR standard for use as a CEQA threshold of significance, it would be the BACT triggers in Table 4 (i.e., when ROG or NOx emissions exceed only 10 lbs/day), because those standards force the adoption of feasible mitigation measures, similar to CEQA's thresholds of significance. 4 [AQ-1b] cont.

NSR Regulation 2, Rule 2 for new or modified sources requires that if ozone precursor emissions exceed 54 lbs per day (i.e., 10 tpy), the polluter must offset *all* emissions. In contrast, the DSEIR Mitigation Measure M-AQ-2b only requires offsetting emissions above 54 lbs per day (i.e., 10 tpy). This BACT standard is much lower than the NSR offset standard and the DSEIR's threshold of significance of 54 lbs/day. But, there is no parallel requirement in the DSEIR for imposing anything like BACT to this Project's construction or operational emissions that exceed 10 lbs/day.

Regarding NSR Regulation 2, Rule 2's offset standards (i.e., 54 lbs/day for ROG or NOx), the BAAQMD's Revised Draft Options and Justification Report (October 2009) observes: "These levels represent a cumulatively considerable contribution."[3] But there is no evidence that emissions below these thresholds are not also "cumulatively considerable."

Moreover, regardless of any evidence included in these other BAAQMD documents, no such evidence can overcome a fundamental logical and legal flaw in the EIR's assumption that these thresholds are appropriate for the purpose for which the DSEIR uses them. Using the DSEIR's logic, if the City finds that one project will add 53 lbs/day of ozone precursors, it is considered a less-than-significant impact, but if that project will add 55 lbs/day of ozone precursors, it is considered significant. Yet, if the City approved two new large projects in the area in the same 2- or 3-year period, or where operational impacts cause increased emissions, each emitting 53 lbs/day of ozone precursors, it is considered a less-than-significant impact even though the total of the two added together equals 106 lbs/day of ozone precursors! 5 [AQ-1b]

This scenario is not hypothetical; it is unfolding in San Francisco, and in the Mission Bay area now. (See Table 3, July 21, 2015, letter report by traffic engineer Larry Wymer, attached as Exhibit 2 to the July 27, 2015, letter from this office regarding impacts on Transportation for a list of project undergoing or about to undergo construction in this area of San Francisco.) As a result, the thresholds violate a fundamental CEQA principal that regardless of whether projects' incremental impacts are deemed insignificant in isolation, they may be cumulatively significant.

[3]Exhibit 4, p. 2.

The significance of a cumulative impact depends on the environmental setting in which it occurs, especially the severity of existing environmental harm. (*Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120 ("*CBE*") ["[T]he relevant question"... is not how the effect of the project at issue compares to the preexisting cumulative effect, but whether "any additional amount" of effect should be considered significant in the context of the existing cumulative effect. [footnote omitted] In the end, the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant. [footnote omitted]"]; *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 720-721.)

This area is in "non-attainment" status under federal and state clean air laws for these criteria pollutants; and this project, along with many others, will substantially contribute to that existing significant adverse impact. There is no evidence to the contrary. The City's untenable position is that public agencies in the Air Basin can approve project after project, each emitting (in the case of ozone precursors) up to 54 lbs/day of new and additional ozone precursors, without ever causing a cumulatively considerable increase in air pollution. This approach runs counter to the reason for conducting cumulative impact analysis. If the City (and other agencies in the Air Basin) continues to find that projects that make air quality worse - when it is already significantly degraded - do not have a significant adverse cumulative impact on air quality, then the City will have no legal obligation to adopt feasible mitigation measures to reduce the significant cumulative impact. 5 [AQ-1b] cont.

Here, the BAAQMD CEQA Guidelines present ample evidence that the Bay Area's air quality is degraded and has been for a very long time. Therefore, the idea that agencies can forever approve multiple projects that each add 53 lbs of ROG and NOx to the air every day and never be deemed cumulatively considerable is absurd. Rather than explain why this is not true, the BAAQMD documents simply ignore the issue.

The DSEIR's use of the BAAQMD thresholds of significance is erroneous as a matter of law for several other reasons.[4] The DSEIR cannot merely reference a project's compliance with another agency's regulations. Lead agencies must conduct their own fact-based analysis of project impacts, regardless of whether the project complies with other regulatory standards. The DSEIR uses BAAQMD's thresholds of significance uncritically, without any factual analysis of its own, in violation of CEQA.[5] This uncritical application of the BAAQMD's thresholds of significance 6 [AQ-1a]

[4] *Endangered Habitats League v County of Orange* (2005) 131 Cal.App.4th 777, 793 ("The use of an erroneous legal standard [for the threshold of significance in an EIR] is a failure to proceed in the manner required by law that requires reversal.").

[5] *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1109 [underscore emphasis added], citing *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 114 ("*CBE*"); accord *Mejia v. City of Los Angeles*

represents a failure of the City to exercise its independent judgment in preparing the DSEIR.[6] Just as disagreement from another agency does not deprive a lead agency of discretion under CEQA to judge whether substantial evidence supports its conclusions,[7] agreement from another agency does not relieve a lead agency of separately discharging its obligations under CEQA. The BAAQMD CEQA Guidelines do not provide any factual explanation as to why the 54 lbs. per day standard represents an appropriate threshold for judging the significance of project-level ozone pollution impacts. More importantly, the DSEIR also fails to include any such explanation, and is therefore inadequate as a matter of law.[8] It is well-settled that compliance with other regulatory standards cannot be used under CEQA as a basis for finding that a project's effects are insignificant, nor can it substitute for a fact-based analysis of those effects.[9] 6 [AQ-1a] cont.

Also, the DSEIR's reliance on information not contained in the DSEIR for purposes of showing these thresholds are supported by substantial evidence violates CEQA's informational requirements. (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 405 ["whatever is required to be considered in an EIR must be in that formal report; what any official might have known from other writings or oral presentations cannot supply what

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(2005) 130 Cal.App.4th 322, 342 ["A threshold of significance is not conclusive...and does not relieve a public agency of the duty to consider the evidence under the fair argument standard."].)

[6] *Friends of La Vina v. County of Los Angeles* (1991) 232 Cal.App.3d 1446.

[7] *California Native Plant Society v. City of Rancho Cordova* (2009) 172 Cal.App.4th 603, 626.

[8] *Santiago County Water Dist. v. County of Orange*, *supra*, 118 Cal.App.3d 818.

[9] *See*, e.g., *Californians for Alternatives to Toxics v. Department of Food & Agriculture* (2005) 136 Cal.App.4th 1, 16 (lead agencies must review the site-specific impacts of pesticide applications under their jurisdiction, because "DPR's [Department of Pesticide Regulation] registration does not and cannot account for specific uses of pesticides..., such as the specific chemicals used, their amounts and frequency of use, specific sensitive areas targeted for application, and the like"); *Citizens for Non-Toxic Pest Control v. Department of Food & Agriculture (*1986) 187 Cal.App.3d 1575, 1587-1588 (state agency applying pesticides cannot rely on pesticide registration status to avoid further environmental review under CEQA); *Oro Fino Gold Mining Corporation v. County of El Dorado* (1990) 225 Cal.App.3d 872, 881-882 (rejects contention that project noise level would be insignificant simply by being consistent with general plan standards for the zone in question). *See also City of Antioch v. City Council of the City of Pittsburg* (1986) 187 Cal.App.3d 1325, 1331-1332 (EIR required for construction of road and sewer lines even though these were shown on city general plan); *Kings County Farm Bureau v. City of Hanford*, *supra*, 221 Cal.App.3d at pp. 712-718 (agency erred by "wrongly assum[ing] that, simply because the smokestack emissions would comply with applicable regulations from other agencies regulating air quality, the overall project would not cause significant effects to air quality.").

is lacking in the report"]; *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 442 ["[I]nformation 'scattered here and there in EIR appendices' or a report 'buried in an appendix,' is not a substitute for 'a good faith reasoned analysis'"], 443 ["The audience to whom an EIR must communicate is not the reviewing court but the public and the government officials deciding on the project. That a party's briefs to the court may explain or supplement matters that are obscure or incomplete in the EIR, for example, is irrelevant ... The question is therefore not whether the project's significant environmental effects *can* be clearly explained, but whether they *were*"] (emphasis in original).)

Finally, the attached report by Greg Gilbert and Paul Rosenfeld and Jessie Jaeger detail additional reasons why the DSEIR has not adequately supported its use of these thresholds.

3. The DSEIR's impact assessments for construction related criteria pollutants (ozone precursors, PM10, PM2.5) and TAC emissions are invalid.

DSEIR Table 5.4-8 shows construction-related daily emissions of the ozone precursor ROG at 47 lbs/day (mitigated by Tier 2 and NOx VDECS engines) or 49 lbs/day (mitigated by Tier 4 engines) and of the ozone precursor NOx at 144 lbs/day (mitigated by Tier 2 and NOx VDECS engines) or 73 lbs/day (mitigated by Tier 4 engines). 6 [AQ-1a] cont.

The DSEIR's impact assessments for construction-related ozone precursor emissions are invalid because the DSEIR uses the invalid thresholds of significance discussed above.

Because NOx construction-related emissions are reported as higher than the applicable (but invalid) threshold of significance for ROG (i.e., 54 lbs/day), the DSEIR concludes the Project's impact on ozone pollution is significant. While this conclusion is correct, it is also misleading because it understates the severity of the impact deemed "significant." The DSEIR implies that the only fraction of the Project's NOx emissions that are "significant" is the fraction above 54 lbs/day. But as discussed above, this threshold of significance is invalid. Using this invalid threshold implies that most of the quantity of emissions below the threshold are not "significant." (*Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831 ["The conclusion that one of the unavoidable adverse impacts of the project will be the 'increased demand upon water available from the Santiago County Water District' is only stating the obvious. What is needed is some information about how adverse the adverse impact will be"].)

The DSEIR assumes that adoption of Mitigation Measure M-AQ-1, requiring use of off-road equipment with engines meeting Tier 2 or Tier 4 standards, will reduce construction-related ROG emissions to 47 or 49 pounds per day, respectively, which are both below the applicable (but invalid) threshold of significance for ROG (i.e., 54 lbs/day). (DSEIR, p. 5.4-33, Table 5.4-8.) But equipment meeting Tier 2 or Tier 4 standards are not sufficiently available to meet either requirement. (See Exhibit 2.) Therefore, the impact assessment must be recalculated to more realistically estimate the 7 [AQ-6a] percentage of construction equipment that will meet Tier 2 or 4 standards. 7 [AQ-6a] cont.

Also, the DSEIR incorrectly utilizes a default hauling trip length of 20-miles, provided by the California Emissions Estimator Model ("CalEEMod"), to determine the on-road hauling emissions that would occur during construction. Using this default value, rather than a site-specific trip length to the actual haul destination, results in an underestimation of the Project's construction emissions. Therefore, the impact assessment must be recalculated to realistically account for the actual haul destination of the excavation spoils. (See Exhibit 2.) 8 [AQ-3]

a. Mitigation Measure M-AQ-1 does not comply with CEQA's legal requirements.

Mitigation Measure M-AQ-1 (at DSEIR, p. 5.4-35) does not comply with CEQA's legal requirements. As discussed above, the requirement that off-road equipment meet Tier 2 standards is illusory, and therefore ineffective, because the Project Sponsor will not be able to obtain enough equipment meeting this standard. 9 [AQ-6a, AQ-6b, AQ-6c]

M-AQ-1 includes a limit on idling time of two minutes, and provides exceptions to this limit as provided in state law (DSEIR, p. 5.4-36), but utterly fails to describe what these exceptions are. The DSEIR must fully describe this measure in order for the public and City decision makers to assess its effectiveness.

M-AQ-1 requires the Project Sponsor prepare a Construction Emissions Minimization Plan, and the Project Sponsor must certify compliance with the Plan. (DSEIR, p. 5.4-36.) This is asking the fox to guard the henhouse. (See Exhibit 1.)

4. The DSEIR's impact assessments for operational criteria pollutants (ozone precursors, PM10, PM2.5) and TAC emissions are invalid.

The operational impact assessment for ozone precursor, PM10, PM2.5 and TAC emissions is invalid for many reasons.

DSEIR Table 5.4-9 shows operational daily emissions of criteria pollutants as follows: 10 [AQ-1b, AQ-4a]

ROG:	79 lbs/day [14 tpy]
NOx:	124 lbs/day [23 tpy]
PM10:	80 lbs/day [14.6 tpy]
PM2.5:	25 lbs/day [4.5 tpy]

(DSEIR, p. 5.4-39.)

The DSEIR's impact assessments for these criteria pollutants emissions are invalid because

they are based on the invalid thresholds of significance discussed above.

Because construction-related emissions of ROG and NOx are higher than the applicable (but invalid) threshold of significance for these pollutants, the DSEIR concludes the Project's impact on ozone pollution is significant. As discussed above, while correct, this conclusion is misleading because it understates the severity of the impact deemed "significant" by implying that the only fraction of the Project's NOx emissions is are "significant" is the fraction above 54 lbs/day.

The DSEIR's impact assessment for operational ozone precursor emissions is also misleading because it omits from its quantitative tally of criteria pollutants the emissions the Project will generate in San Francisco and the Mission Bay neighborhood from basketball game-associated "vehicle miles traveled" (DSEIR, p. 5-37.) The DSEIR's rationale for this startling omission is that moving the Warriors games from Oakland to San Francisco will reduce the same number of "vehicle miles traveled" in Oakland that the Project will generate in San Francisco and the Mission Bay neighborhood.

This rationale is based on the unstated, but incorrect, assumption that the environmental setting at Oracle Arena and the Mission Bay site are identical. These settings are very different, in many crucial respects. First and foremost, the Mission Bay neighborhood and the surrounding areas of San Francisco are populated by San Franciscans, not Oaklanders. The residents, citizens, and registered voters of San Francisco are entitled to know what the Project's air quality impacts will be *on them*, regardless of whether the residents, citizens, and registered voters of Oakland will experience an air quality benefit as a result of the move. 10 [AQ-1b, AQ-4a] cont.

Second, Oracle Arena sits in the middle of a vast parking lot. To the west is I-880, various commercial properties, wetlands, and the Bay. To the east is the Coliseum, railroad tracks, ABC Supply (provider of industrial equipment), East Bay Truck and Auto Repair, BART tracks and the Coliseum BART Station, and then, over 2,000 feet away to the northeast there is a group of apartment buildings. To the north and south stretch commercial properties for well over a mile without any residences. This stands in stark contrast to the dense residential population surrounding the Mission Bay site.

The DSEIR's suggestion that respiratory disease, heart disease, and cancer-causing air pollution is fungible and transferable, without regard to the location or environmental setting in which it occurs, is unsupported.

a. Mitigation Measure M-AQ-2b does not comply with CEQA's legal requirements.

Mitigation Measure M-AQ-2b requires the Project Sponsor pay a fee to the BAAQMD that the BAAQMD will use to purchase ozone precursor offsets. The purpose is to offset the amount by which the project's ozone precursors emissions exceed the numerical thresholds discussed in the 11 [AQ-7] previous section of this letter.

Therefore, to the extent the thresholds are invalid, as argued above, M-AQ-2b fails to reduce ozone precursor emissions to less-than-significant levels. Further, the DSEIR does not even consider the feasibility or effectiveness of more robust mitigation strategies that could reduce ozone precursor emissions further below the (invalid) thresholds. (See DSEIR, p. 5.4-39, Table 5.4-9, "Estimated Emissions Reduction Required".)

The amount of the offset fee required by M-AQ-2b is calculated by multiplying the total amount of *annual* criteria pollutant emissions exceeding the annual (invalid) thresholds by $18,030 per weighted ton of criteria pollutant emissions; then adding 5% of that product for BAAQMD's administrative fees, as follows:[10]

ROG tons	4.4
NOx tons	12.6
PM tons x 20	0
Subtotal	17
Fee per ton	$18,030.00
Subtotal	$306,510.00
Admin fee 5%	0.05
Admin fee	$15,325.50
Total Fee	$321,835.50

11 [AQ-7] cont.

The DSEIR indicates M-AQ-2b requires the Project Sponsor to pay only $321,835.50, which is the amount required to offset one year's worth of the Project's operational criteria pollutant emissions. (See DSEIR, p. 5.4-41.) But the sports and entertainment arena portion of this Project has an operational life of at least 50 years, probably much longer,[11] and the office towers will last even longer. In contrast, the life spans of offset credit sources are much shorter than the expected life span of this Project. (See Exhibit 1.) Therefore, the actual amount required to offset the Project's above-threshold ozone precursor emissions is much higher than $321,835.50. Therefore, the DSEIR's premise that M-AQ-2b will achieve a complete offset of the Project's above threshold construction and operational criteria pollutant emissions is misleading and false.[12]

To address this deficiency, M-AQ-2b must be amended. The DSEIR must disclose the

[10] 54 lbs per day of ROG emissions equals 10 tons per year.

[11] Oracle Arena was built in 1966, 49 years ago, and is still functional.

[12] The DSEIR indicates that construction-related criteria pollutant emissions are mitigated by including them in the operational period emission mitigation strategy. (DSEIR, p. 5.4-34.)

average life span of the offset credit sources the BAAQMD typically buys, then amend M-AQ-2b to require recalculation of the offset fee or other offset requirement after the average life span of such offset credit sources to account for their limited life span, changes in emissions, changes in attainment status, etc. In addition, M-AQ-2b must be amended to include a mechanism, in the event that BAAQMD does not spend the offset fee and returns it, to ensure the required offsets are purchased through another bona fide, verifiable offset program.

Accepting, *arguendo*, the validity of the 17 ton offset requirement, the DSEIR's discussion of Mitigation Measure M-AQ-2b leaves many questions unanswered regarding BAAQMD's offset program. For example, the effectiveness of the measure depends directly on the validity of numerous assumptions, including: (1) the assumption that $18,030 is enough to purchase a ton of criteria pollutant emissions; (2) the assumption that the offset market has 17 tons of criteria pollutant emissions that can be reduced by engine retrofits or other offset techniques; (3) the assumption the Project Sponsor will accurately measure actual construction and operational emissions for purpose of determining how many tons of criteria pollutants must be offset; and (4) the assumption that BAAQMD has and will have reliable verification procedures in place ensuring that 17 tons of offset will actually be achieved.

11 [AQ-7] cont.

5. The DSEIR's impact assessment for Project-caused increases in Toxic Air Contaminants (TACs) is invalid.

The DSEIR's impact assessment for operational Toxic Air Contaminants (TACs) - Impact AQ-3 - is invalid for a number of reasons, in particular because the DSEIR's use of thresholds of significance for Project-caused increases in cancer risk and $PM_{2.5}$ is inconsistent, confusing, and legally erroneous.

a. The DSEIR's health impact assessment for the Project-caused increases in cancer risk from TACs is invalid.

12 [AQ-1c]

The DSEIR uses a threshold of significance for the Project's impact of increasing cancer risk in the area of "100 in one million." As discussed above, for criteria pollutants the DSEIR borrows thresholds of significance from the BAAQMD to determine the significance of both the direct, incremental increase in emissions caused by the Project, and the Project's contribution to cumulative increase in emissions in the area.

In contrast, in its assessment of the Project's impact of increasing cancer risk in the area, the Project ignores BAAQMD's stated "Individual Project" threshold of significance "for Risk and Hazards for new sources and receptors" which is stated as "Increased cancer risk of >10.0 in a million." (Exhibit 1, p. 2-2.) Instead, the DSEIR uses BAAQMD's stated "Cumulative Project" threshold of significance "for Risk and Hazards for new sources and receptors" which is stated as "Increased cancer risk of >100.0 in a million." (DSEIR, p. 5.4-13; see, May 2011, BAAQMD

Updated CEQA Guidelines, p. 2-2.).[13]

The DSEIR estimates the Project's impact of increasing cancer risk for children living at UCSF's Hearst Tower as either 91 or 46 additional cancer cases per one million persons, depending on whether the Project is able to successfully use off-road construction equipment meeting Tier 2 and NOx VDECS standards. (See Figure 1, based on DSEIR, p. 5.4-49, Table 5.4-11.)

Table 1

Hearst Tower Child		No Tier 2/VDECS	Tier 2/VDECS
Background	26	26	26
No Tier 2/VDECS	54	54	
Tier 2/VDECS	9.2		9.2
Operations - Generators	30	30	30
Operations - Mobile	7.2	7.2	7.2
Total	126.4	117.2	72.4
less background		26	26
Project incremental impact		91.2	46.4

12
[AQ-1c]
cont.

The DSEIR estimates the Project's impact of increasing cancer risk for adults living at UCSF's Hearst Tower as either 40 or 38 additional cancer cases per one million persons, depending on whether the Project is able to successfully use off-road construction equipment meeting Tier 2 and NOx VDECS standards. (See Figure 2, DSEIR, p. 5.4-49, Table 5.4-11.)

Table 2

Hearst Tower - Adult		No Tier 2/VDECS	Tier 2/VDECS
Background	26	26	26
No Tier 2/VDECS	2.8	2.8	
Tier 2/VDECS	0.48		0.48
Operations - Generators	30	30	30
Operations - Mobile	7.2	7.2	7.2
Total	66.48	66	63.68
less background		26	26
Project incremental impact		40	37.68

[13] This is also a City criterion for defining "Air Pollutant Exposure Zones" (APEZ). (DSEIR, p. 5.4-12.) An APEZ is "an area in which modeled air pollution exceeds "either: (1) a cancer risk of greater than 100 per one million exposed, and/or (2) PM2.5 concentrations in excess of 10 microgram per cubic meter (ug/m3) (including ambient).... Since the Project is not in an APEZ, the subsequent criterion of significance is whether or not the Project will create an APEZ." (DSEIR, Appendix-TR, Air Quality Appendix, p. 9.)

The DSEIR estimates the Project's impact of increasing cancer risk for adults living at UCSF's Hearst Tower as either 45 or 42 additional cancer cases per one million persons, depending on whether the Project is able to successfully use off-road construction equipment meeting Tier 2 and NOx VDECS standards. (See Figure 3, DSEIR, p. 5.4-49, Table 5.4-11.)

Table 3

UCSF Hospital Child		No Tier 2/VDECS	Tier 2/VDECS
Background	44	44	44
No Tier 2/VDECS	28	28	
Tier 2/VDECS	4.8		4.8
Operations - Generators	30	30	30
Operations - Mobile	7.2	7.2	7.2
Total	114	109.2	86
less background		44	44
Project incremental impact		65.2	42

12
[AQ-1c]
cont.

As discussed above, the DSEIR's premise that the Project Sponsor can obtain a substantial quantity of off-road construction equipment meeting Tier 2 and NOx VDECS standards is illusory. Therefore, the only relevant numbers are the three higher numbers, i.e., 91, 40 and 45. But even using the lower numbers, i.e., 46, 38, and 42, all of them exceed the BAAQMD's "Individual Project" threshold of significance for increased cancer risk of 10 per one million." (Exhibit 1, p. 2-2.) Instead of explaining why, after using BAAQMD's thresholds of significance for all criteria pollutants, the DSEIR does not use the BAAQMD's "Individual Project" increased cancer risk threshold of significance of 10 per one million, the DSEIR simply ignores this threshold.

Thus, the DSEIR uses at least two strategies to avoid disclosing a significant increase in cancer risk: using BAAQMD's cumulative standard instead of its individual project standard, and assuming the Project Sponsor can obtain a substantial quantity of off-road construction equipment meeting Tier 2 and NOx VDECS standards. Dropping either of these unwarranted predicates reveals the Project's impact of increasing cancer risk is significant.[14]

The DSEIR explains its choice of a threshold of significance for cancer risk from TAC's of

[14] See e.g., DSEIR, p. 5.4-49 ["With the minimum level of compliance with this mitigation measure (Tier 2 plus NOX VDECS), increased cancer risk as a result of project construction activities at the maximally impacted receptor would be approximately 9.2 in one million and cumulative excess cancer risk at all receptor locations would be reduced to below the significance threshold of 100 per one million. ¶ While unmitigated increased cancer risk at the maximally impacted receptors would exceed the threshold of 100 in one million, with implementation of Mitigation Measure M-AQ-1 (Construction Emissions Minimization), increased cancer risk at the maximally impacted receptors would be below the threshold of 100 in one million"].)

100 per one million persons as follows:

> The 100 per one million persons (100 excess cancer risk) criterion discussed above is based on USEPA guidance for conducting air toxic analyses and making risk management decisions at the facility and community-scale level. As described by the BAAQMD, the USEPA considers a cancer risk of 100 per million to be within the "acceptable" range of cancer risk. Furthermore, in the 1989 preamble to the benzene National Emissions Standards for Hazardous Air Pollutants (NESHAP) rulemaking, the USEPA states that it "…strives to provide maximum feasible protection against risks to health from hazardous air pollutants by (1) protecting the greatest number of persons possible to an individual lifetime risk level no higher than approximately one in one million and (2) limiting to no higher than approximately one in ten thousand [100 in one million] the estimated risk that a person living near a plant would have if he or she were exposed to the maximum pollutant concentrations for 70 years." The 100 per one million excess cancer cases is also consistent with the ambient cancer risk in the most pristine portions of the Bay Area based on BAAQMD regional modeling.

12 [AQ-1c] cont.

(DSEIR, p. 5.4-13.)[15]

The City's reliance on the EPA's judgment of "acceptable" cancer risk is legally flawed for several reasons. First, the City relies on a simplistic misrepresentation of actual EPA policy. Second, even if EPA policy is what the City implies it is, the DSEIR errs as a matter of CEQA law by using the EPA's judgment of "acceptable" cancer risk to determine the significance of the Project's impacts.

The EPA's actual policy is to assess increased cancer risk based on a host of site-specific factors within a range of values from 1 in one million to 100 in one million. This policy reflects the agency's attempt to balance the costs and benefits of protecting public health in its implementation of a host of federal environmental laws, including the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, CERCLA (Superfund), etc. (See e.g., Starfield, L.E., "The 1990 National Contingency Plan: More Detail and More Structure, But Still a Balancing Act"; Environmental Law Reporter, June 1990, pp. 10222-10251, attached hereto as Exhibit 3.)[16]

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[15] Footnote 21 cites to "54 Federal Register 38044, September 14, 1989." As of July 6, 2015, this document was not included on the City's AB900 mandated web page dedicated to preparing the administrative record concurrently with its CEQA review of the Project. (See Pub. Res. Code § 21186 (a), (b), and (c).)

[16] "In the proposed NCP [Superfund National Contingency Plan], the Agency [EPA] had defined the acceptable risk range as being from 10^{-4} to 10^{-7}, meaning that when the excess risk to an individual of contracting cancer due to a lifetime exposure to a certain concentration of a carcinogen falls between approximately 1 in 10,000 [100 in one million] and 1 in 10 million, it is judged to be an acceptable exposure. As a measure of additional protection, the proposal provided that there should be a "point of departure" of 10^{-6}, toward the more protective end of the scale, that should be used in setting preliminary remediation goals; if conditions warranted, the final remedy could achieve a level elsewhere within the range. ¶ The final rule maintained the point of departure of 10^{-6}, but narrowed the risk range to 10^{-4} through 10^{-6}. This action was taken in response to public comment and concerns that the Superfund range went below the accepted de minimis level used by other EPA programs and those of other federal agencies. ... the Agency has retained the discretion to select a cleanup level outside the range in appropriate circumstances (e.g., where concerns about sensitive populations, synergistic effects among chemical mixtures, etc., suggest that the remedy should attain a level below 10^{-6}. The use of a range of acceptable risk is general practice for most government programs. As discussed below in the section on role of cost, it affords the Agency the flexibility to take into account different situations, different kinds of threats, and different kinds of technical remedies. If a single risk level had been adopted, (e.g., at the more stringent end of the risk range), fewer alternatives would be expected to pass the protectiveness threshold and qualify for consideration in the balancing phase of the remedy selection process." (Id., 20 ELR 10237 [footnotes omitted].)

Instead of following this analytic approach, the DSEIR selects one value at the least environmentally protective end of the EPA's "acceptable risk" range and uses it to determine the significance of the Project's impacts, but without regard to the Project's site-specific considerations. Again, the DSEIR has cherry-picked a threshold of significance to avoid finding the Project's cancer risk impact significant.

Also, CEQA neither requires nor allows the City to use the EPA's judgment of "acceptable" cancer risk to determine the significance of the Project's impacts. The City's discretion to decide that significant environmental harm is "acceptable" in light of the project's benefits arises at the end of the CEQA analysis, in the context of a statement of overriding considerations, not at the beginning of the process, in determining whether impacts are significant.

12 [AQ-1c] cont.

> A statement of overriding considerations is required, and offers a proper basis for approving a project despite the existence of unmitigated environmental effects, only when the measures necessary to mitigate or avoid those effects have properly been found to be infeasible. (Pub. Resources Code, § 21081, subd. (b).) Given our conclusion the Trustees have abused their discretion in determining that CSUMB's remaining effects cannot feasibly be mitigated, that the Trustees' statement of overriding circumstances is invalid necessarily follows. CEQA does not authorize an agency to proceed with a project that will have significant, unmitigated effects on the environment, based simply on a weighing of those effects against the project's

> benefits, unless the measures necessary to mitigate those effects are truly infeasible. Such a rule, even were it not wholly inconsistent with the relevant statute (id., § 21081, subd. (b)), would tend to displace the fundamental obligation of "each public agency [to] mitigate or avoid the significant effects on the environment of projects that it carries out or approves whenever it is feasible to do so" (id., § 21002.1, subd. (b)).

City of Marina v. Board of Trustees of the California State University (2006) 39 Cal.4th 341, 368-69.

This is a critical distinction, because where the Project does not exceed thresholds of significance that are erroneously inflated by the concept of "acceptable risk," the City is absolved of further legal obligation to mitigate the impact. As a result, the public cannot know whether the City will allow an unknown number of cancer cases to occur that it could have feasibly avoided had it scrupulously followed CEQA. Nor does the public know, had the EIR determined that 46 additional child cancer cases per one million persons is significant, whether or not the City would have found the Project's benefits outweigh its environmental and adverse human health effects.

12 [AQ-1c] cont.

The DSEIR also attempts to support its "100 in a million excess cancer cases" by stating: "The 100 in a million excess cancer cases is also consistent with the ambient cancer risk in the most pristine portions of the Bay Area based on the District's recent regional modeling analysis." (DSEIR p. 5.4-13, citing the 2009 BAAQMD Justifications report, p. 67). Neither document, however, explains what this means. For example, how are "excess" cancer cases "consistent" with "ambient" cancer risk? What does "most pristine" mean? On a scale of 1 to 10, are Mission Bay and the "most pristine areas" separated by 1 unit, or 10 units, or somewhere in between? In short, this justification for the threshold is mere verbiage.

b. The DSEIR's health impact assessment for Project-caused increases in $PM_{2.5}$ invalid.

The DSEIR uses a threshold of significance for the Project's health impact of increasing $PM_{2.5}$ concentrations of "10 µg/cubic meter." As discussed above, for criteria pollutants, the DSEIR borrows thresholds of significance from the BAAQMD to determine the significance of both the direct, incremental increase in emissions caused by the Project, and the Project's contribution to cumulative increase in emissions in the area.

13 [AQ-1d]

In contrast, in its assessment of the Project's health impact of increasing $PM_{2.5}$ concentrations, the Project ignores BAAQMD's stated cumulative threshold of 0.8 µg/cubic meter. (See Exhibit 1, p. 2-2.) According to BAAQMD, "Cumulative emissions within the 1,000 foot evaluation zone would be considered significant where the increased average annual ground-level concentrations of $PM_{2.5}$ would be greater than 0.8 $\mu g/m^3$." (Exhibit 4, p. 5.)

Obviously, there is a huge discrepancy between the 10 µg/cubic meter threshold used in the DSEIR compared to the 0.8 ug/cubic meter threshold recommended by BAAQMD. This discrepancy is particularly troubling given that the DSEIR reports Project-caused cumulative increases in $PM_{2.5}$ concentrations just below the 10 µg/cubic meter threshold, but well above the 0.8 µg/cubic meter threshold.

13 [AQ-1d] cont.

It would appear, once again, that the DSEIR has cherry-picked a threshold of significance to avoid finding the Project's health risk impact from increases in $PM_{2.5}$ significant.

Thank you for your attention to this matter.

Very Truly Yours,

Thomas N. Lippe

List of Exhibits

Exhibits 1 through 16 are referenced in this letter.
Exhibit 17 is referenced in Exhibit 1 to this letter.
Exhibits 18 through 30 are referenced in Exhibit 2 to this letter.

1. **July 19, 2015, letter report authored by Greg Gilbert.**
2. **July 20, 2015, letter report authored by Paul Rosenfeld and Jessie Jaeger**
3. **Starfield, L.E., "The 1990 National Contingency Plan: More Detail and More Structure, But Still a Balancing Act"; Environmental Law Reporter, June 1990.**
4. **Excerpts from EIR for the 5M Project, October 15, 2014, pp. 425-426.**
5. **Excerpts from EIR for the SF Museum Of Modern Art Project, July 11, 2011, pp. 367-368.**
6. **Excerpts from EIR for the 706 Mission Project, June 27, 2012, pp. IV.G.20.**
7. **Excerpts from EIR for the 8 Washington Street/Seawall Lot 351 Project, June 15, 2011, pp. IV.E.15-IV.E.18.**
8. **Excerpts from EIR for the 801 Brannan St 1 Henry Adams St Project, June 22, 2011,**

Comments Regarding Air Quality Impact Analysis and Mitigation

Event Center and Mixed-Use Development at Mission Bay Blocks 29 – 32

Draft Subsequent EIR (San Francisco, CA)

Autumn Wind Associates, Inc.
Newcastle, CA

Prepared for Tom Lippe, Attorney

July 19, 2015

I. Introduction

Autumn Wind Associates provides the following comments regarding air quality analysis and mitigation measures identified in the Event Center and Mixed-Use Development at Mission Bay Blocks 29 – 32 (hereinafter referred to as "Events Center" or "project") DSEIR at the request of Tom Lippe, Esq.

This review and commentary focuses on the DEIR's use of flawed construction mitigation measures that will not deliver purported emission benefits; a failure to provide substantive discussion on whether wastewater improvement-related emissions made necessary for completion of the Event Center project should have been reviewed in the DSEIR; failure to meaningfully evaluate and mitigate with effective alternatives to diesel equipment and diesel fuel, including requirement to use zero-emission electric options when appropriate; the unjustified use of trip-related emissions of major sports events from the Oracle Arena for application to the project's sports arena; failure to evaluate the use of the latest available OEHHA health risk guidance known to be under discussion during the preparation of the DSEIR; the Lead Agency's reliance on thresholds of significance that have not been adopted in compliance with CEQA Guidelines; and the use of emission offsets with substantially less lifetime mitigation value than that relied upon by the Lead Agency in the DSEIR. 14 [AQ-8]

II. Construction Emissions From Wastewater Improvements Have Not Been Adequately Reviewed in the DSEIR

At DSEIR pg. 1-9, significant environmental impact areas in the Event Center environmental review process are identified. One of those includes sewer processing plant and related utility improvements made necessary for the Events Center and associated development of the 11 acre project area: 15 [AQ-3, UTIL-3]

> "As indicated on Table 1-2, the SEIR determined that the proposed project would result in significant and unavoidable impacts in the areas of....utilities (construction of new or upgraded wastewater facilities, and determination by the San Francisco Public Utilities Commission that it currently has inadequate capacity to serve the project's wastewater demand)."

Based on the language noted above, it appears the DSEIR's project at Mission Bay Blocks 29 – 32 cannot proceed without sewer and associated utility improvements. However, at DSEIR pg. 1-43 it appears that the project is considered by the Lead Agency to not require or result in the construction of new wastewater treatment facilities or expansion of existing facilities. Then, at DSEIR pg. 1-44 information from measure M-C-UT-4 shows that the project sponsor must pay for "fair share" improvements to the Mariposa Pump Station:

> The project sponsor shall pay its fair share for improvements to the Mariposa Pump Station and associated wastewater facilities required to provide adequate sewer capacity within the project area and serve the project as determined by the SFPUC. The contribution shall be in proportion to the wastewater flows from the proposed project relative to the total design capacity of the upgraded pump station(s). The project sponsor shall not be responsible for any share of costs to address pre-existing pump station deficiencies.

However, at DSEIR, pg. 5.7-13, it appears the wastewater improvements are made necessary by the project and that it cannot proceed without them:

15 [AQ-3, UTIL-3] cont.

> "Therefore, permanent improvements to the pump station and a long term increase in capacity would be needed to accommodate the proposed project in combination with other proposed and planned development in the Mission Bay South Plan area. In addition, as discussed in Section 5.9, Hydrology and Water Quality, the increased wastewater flows from **the proposed project** (emphasis added) in combination with other foreseeable future projects could increase the volume of combined sewer discharges (CSDs) from the Mariposa Pump Station which could necessitate improvements to the Mariposa wet weather pump station."

If the DSEIR project necessitates the improvements to local wastewater treatment facilities and related utility improvements, the associated construction emissions should be analyzed and mitigated as appropriate within the DSEIR and not piecemealed to some other review process or ignored altogether. No information is found in the DSEIR's Air Quality element that shows that construction-related emissions from the necessary wastewater utility improvements were recognized and evaluated within the DSEIR.

III. Air Quality Thresholds of Significance Used in the DSEIR Are Based On Outdated, Non-Scientific NSR Values

16 [AQ-1b]

BAAQMD (District) is regionally responsible for attaining or maintaining healthy air quality in the 9-county Bay Area that includes the proposed Event Center and Mission Bay Blocks 29 -32; the District implements a number of programs for attainment of regional air quality, including

issuance of CEQA guidance used by Lead Agencies in the review and mitigation of air quality impacts and specified emissions of new development. The District has historically acted under CEQA as a commenting agency for new developments subject to CEQA review not otherwise subject to District regulations. CEQA thresholds, used by the City as Lead Agency and applied to the DSEIR (see Table 5.4-6 Criteria Air Pollutant Thresholds), were developed by the BAAQMD many years ago, well prior to the last Ozone Attainment Plan issued by the District in 2001.

How the District's air quality CEQA thresholds were developed is relevant to whether they are appropriate and effective for use in evaluating the potential significance of air impacts of the proposed event center and other land use types anticipated within the DSEIR. While CEQA encourages the use of thresholds (Guidelines section 15064.7) to promote consistency and integration of environmental review activities across regulatory and planning disciplines and programs, the Lead Agency's air quality thresholds must reflect the true significance of the environmental impact for which they act as an impact or mitigation measuring device. Moreover, the courts have found that use of regulatory thresholds must not be applied "in a way that forecloses the consideration of any other substantial evidence showing there may be a significant effect" (CBE v. CA Resources Agency; 126 Cal. Rptr. 2d. 441, Cal.App.3 Dist., 2002).

16 [AQ-1b] cont.

In this case, the Lead Agency's use of District thresholds ignores air pollution nonattainment and ambient air quality monitoring evidence that they have not been adequately effective in reducing land-use related mobile source emissions in the air basin. Importantly, the BAAQMD's CEQA threshold increments (expressed in lbs/day or tons/yr of specified pollutants) were based decades ago on NSR (New Source Review) quantitative increments intended solely for ensuring that the region's stationary source emissions, regulated under permits issued by the BAAQMD, would not cause the region to fall out of "attainment" status for complying with federal air quality ozone standards. NSR increments were established decades ago within federal Clean Air Act programs, aimed exclusively at regulating stationary (not mobile) sources of air pollution, and were keyed quantitatively to an area's air quality designations; worse air quality invokes use of more restrictive NSR daily or annual emission limits.

Surprisingly, there is no scientific basis for how NSR values were established, nor is there any substantive information regarding their formulation or formation left in the historical record; we have researched this issue extensively and have been unable to find written material or anyone in regulatory air agencies (CARB, EPA) who is intimately familiar with or is still alive who can recall how NSR increments were established nearly fifty years ago.

In the DSEIR, BAAQMD's CEQA thresholds of significance were used; those thresholds were established by borrowing NSR values intended to ensure that the BAAQMD's stationary sources would not lead to regional air pollution "nonattainment" episodes. As a practical matter, the region's failure to attain the federal ozone standard is evidence of the lack of scientific credibility in how the BAAQMD's CEQA thresholds were established, as well as their lack of efficacy—had they been scientifically tied to land use growth and the mobile source emissions they create, it would be easily argued that the Bay Area would not now be designated "marginal nonattainment" for ozone air pollution after years of nonattainment.

Use of NSR values that were never scientifically designed, to establish current BAAQMD CEQA thresholds, makes even less sense when comparing the emissions inventory of stationary sources in the Bay Area to emissions resulting from mobile sources (vehicles) that routinely emit regulated pollutants traveling to or from new land use developments. Quite simply, there is no rational nexus between the two categories since stationary source emissions equate to typically less than one-sixth those emitted by the basin's mobile sources.

16 [AQ-1b] cont.

A more effective method for use by BAAQMD in designing CEQA threshold levels would have been to base them on growth in vehicle emissions expected to occur from projected land use growth in the basin---this method was developed and used in 2002 by the Sacramento Metropolitan Air Quality Management District (SMAQMD) to establish CEQA thresholds logically and arithmetically based on estimated increments of mobile source emissions of new development. The increment of new development-related emissions was derived from careful review of five years of immediately-prior building permit records obtained in the nonattainment area, and then adjusted to account for processes (such as ongoing development of rapid transit in the basin) expected to reduce vehicle-miles-travelled from new developments. CEQA threshold emission quantities (expressed as lbs/day or tons/yr) were then set at levels that would account for---and mitigate---only that new land use portion of the basin's total emissions determined by modeling and inventory analyses as necessary to achieve attainment of air quality standards under federal Clean Air Act requirements.

Under this "nexus analysis" approach, CEQA thresholds are scientifically established by correlating increased mobile source emissions from projected land use growth in the nonattainment area to the number of tons of related reductions needed for attainment by CAA-specified date(s). Such an approach greatly reduces the risk of under- or over-mitigating, and provides far more certainty that the estimated tons of emission reductions to result from their use, and critical to ensuring attainment of ambient air quality standards, will be realized. BAAQMD CEQA thresholds were not established scientifically, and the region has continued to violate ambient air quality standards for ozone for many

years now—both act as potent evidence to call into serious question the effectiveness of BAAQMD's NSR-based CEQA thresholds in the DSEIR for Event Center/Mission Bay Blocks 29 – 32. Further, they suggest that air quality impacts are likely underestimated, and mitigation values are overestimated in the DSEIR.

16 [AQ-1b] cont.

IV. Construction and Operational Mitigation Options Have Not Been Thoroughly Reviewed for Diesel Alternatives

Mitigation Measure M-AQ-1 at DSEIR pg. 5-4.36 under item B requires reporting of alternative fuel quantities used to power construction vehicles and equipment at the project site during its 26 month duration. M-AQ-1 should be revised to require the use of low-emission and/or low-CO2 alternative fuels unless costs are substantially (~100%) greater than routine diesel fuel costs. One such product that should have been carefully evaluated in the DSEIR is "Diesel HPR", made from 98% renewable content (a rate about 4 times greater than regular B-20 biodiesel) and currently marketed at 18 locations throughout northern CA and the Bay Area. The price for this ultra-low carbon-intensity diesel, said to have better performance characteristics than traditional petroleum diesel fuel, is competitive with standard onroad and offroad diesel available in CA (as advertised recently in the Sacramento area at $2.89 a gallon).

17 [AQ-6d]

Fossil diesel has a cetane rating of 40. The HPR Diesel product, or similar, has a cetane rating of 74. That level of higher cetane results in lower PM and NOx---which are needed reductions for the project. Because the density of the fuel is slightly lower, so is the chemical energy per unit volume (3%). But because the cetane rating is so much higher PM otherwise not emitted is converted into productive energy, with tractive horsepower (per unit volume) slightly higher than fossil diesel (1%).

Onroad project-serving construction vehicles that cannot otherwise operate without diesel fuel should also be required to use the very low carbon-intensity "Diesel HPR" or similarly effective product, with receipts proving purchase and use provided to the independent, onsite construction mitigation manager (referred to inappropriately as an "Air Quality Specialist" in the DSEIR, as noted elsewhere in this letter) for regular, weekly relay to the OCII. ("Similarly effective" does not mean use of B-20, since its proportion of bio-derived fuel will not exceed 20%, whereas the Diesel HPR product or similar will come almost entirely from renewable sources.)

Additionally, the project will rely on several emergency diesel gensets---these power units will produce emissions during regular testing, and are very likely to emit far greater quantities of emissions during any actual power outages. Those units should be operated on an alternative, low-emission non-diesel fuel. If not possible, those diesel units should be operated solely on the "Diesel HPR" or similar product. No information is found in the DEIR that discusses whether the diesel (and not alternatively fueled) genset option is critically necessary, whether lower-emitting options are available for them, and why those options are or are not permissible for use at the project.

17 [AQ-6d] cont.

See http://www.sacbee.com/news/business/article15203738.html for more information on the Diesel HPR product, and particularly its locations for purchase, costs, and emission benefits over traditional diesel fuel.

V. Construction Mitigation Is Unenforceable and Places Inappropriate Reliance on Project Sponsor for Interpretation and Compliance Determinations

At DSEIR pg. 5.4-35, Mitigation Measure M-AQ-1 is identified and discussed for reducing project-related construction equipment emissions. Under this measure's Item A, a Construction Emissions Minimization Plan is required:

> "**Construction Emissions Minimization Plan**. Prior to issuance of a construction permit, the project sponsor shall submit a Construction Emissions Minimization Plan (Plan) to the OCII or its designated representative for review and approval by an Air Quality Specialist."

18 [AQ-6e]

The measure then goes on to lay out "Compliance Alternatives" that require use of specified types of engines with prescribed emission standards (known as Tiers) utilizing VDECS (Verified Diesel Emission Control Strategies) to reduce equipment NOx emissions and particulates.

Because the project's construction emissions are estimated to exceed the BAAQMD's NOx threshold of significance, and due to the serious nature of diesel particulate matter (DPM) as a toxic air contaminant subject to EPA and CARB regulations resulting from PM2.5 emissions for which the region is designated nonattainment, it is essential that this measure be implemented and executed effectively for the duration of the project. As written, however, the measure lacks enforceability because there is no recognized definition of or qualification process provided in the DSEIR for "Air Quality Specialist" who will pass judgment on the adequacy of construction equipment and emissions levels to be submitted by the project sponsor for approval.

While the BAAQMD has agency positions designated "Air Quality Specialist", those positions possess skillsets exclusive to their particular area of expertise, ranging across the sub-specialties of air quality planning, permitting, compliance and enforcement, stationary source inspection, engineering, air monitoring, incentive programs, etc. There is no generic "air quality specialist", as implied in the DEIR's use of the term, and the DSEIR fails to identify the necessary skillsets for this important position. Ensuring compliance with the components of M-AQ-1 will require an individual experienced with CEQA mitigation requirements; air quality regulations and VDECS technology options and functionality; construction site operations and safety issues; a wide variety of offroad and onroad construction equipment and vehicle engines; hands-on engine and VDECS experience to ensure daily compliance with the applicable Compliance Alternative; and precise, effective record-keeping skills, across the 26 month construction duration. The "'Specialist" must be present during all work hours at the site for each day of construction work across the two-plus years of work that would involve operations of construction engines and vehicles at the 11-acre site.

Because of the importance of the role of the "air quality specialist" in ensuring compliance with M-AQ-1 across the many phases and months of the Arena's construction, this position must be independent, full-time on the project site, and required to provide weekly report submittals to OCII. At pg. 5.4-36, reporting to OCII is required on a quarterly basis. This is without doubt too long a duration since equipment will come and go on a daily basis, and as written now M-AQ-1 can (and probably will) permit a project sponsor "Specialist" to creatively develop post-hoc equipment compliance records that may appear legitimate but are, in fact, not. Considering that there are no checks and balances built into the Measure, the Lead Agency cannot ensure that compliance with the essential objective of the mitigation measure will actually occur.

18 [AQ-6e] cont.

Because of the unusual nature of the duties of the Measure's "Specialist", and as a result of the need for independence from the Applicant to prevent conflict of interest, the EIR must discuss filling the position with a capable, qualified BAAQMD employee under contract to OCII. Should this not be possible, the position must be filled by a qualified, independent contractor chosen by and subject only to the authority of OCII.

Further, M-AQ-1 specifies numerous sub-part requirements (A 1 through 5) to be included in the Construction Emissions Mitigation Plan, and in each case compliance with those sub-parts is left to the "project sponsor". So, too, is compliance with the Measure's additional duties required under M-AQ-1 items B and C. This is not appropriate when considering the extent, complexity, and costs that will be incurred for effective mitigation measure compliance across the 26-month construction period; permitting the project sponsor to create, implement, report, and determine compliance with the Measure is akin to having the fox guard the henhouse and must not be allowed.

As written, the measure is not enforceable due to the subjective, undefined nature of "Air Quality Specialist" who will approve the project sponsor's Construction Emissions Mitigation Plan. Further, it is unacceptable that the Measure will permit the project sponsor to determine compliance with each of the measure's components, record and report information signifying compliance, and then, under part C certify their own compliance with the Plan and its various requirements.

We have inspected construction project sites, under air district contract, to determine compliance with air district-imposed construction equipment mitigations and have found uniformly poor compliance; to exemplify, at one residential subdivision project in south Sacramento County we determined that only one offroad construction vehicle out of nearly twenty were actually compliant with the mitigation requirements that had been imposed on the project by the Lead Agency. This is because there has traditionally been very little, if any, post-EIR follow-through to verify mitigation compliance by Lead Agencies or by the local air district after the CEQA project has been approved for development and construction has started. Knowing this, construction and development firms commonly let air quality mitigations go unmet, although records purporting to show compliance can be easily formulated and submitted post hoc in order to fulfill a paper requirement. Without an independent, qualified 3rd party contractor onsite each day to track, verify, and record emissions- and activity-related information on construction vehicles used at the project site to ensure the EIR's mitigations are implemented effectively, the project is very unlikely to produce more than a token of the emission reductions claimed in the DSEIR.

18 [AQ-6e] cont.

Similarly, M-AQ-2a begins with "The project sponsor shall implement the following measures as feasible:"... The introduction of "as feasible" is a poison pill, since the measure does not conclusively identify the party responsible (and liable) for determining sub-component measure feasibility. This determination must not be left to the project sponsor, but, rather, vested with a qualified independent contractor chosen by and reporting solely to the OCII, or to the BAAQMD on behalf of OCII, to ensure measure implementation at every truly "feasible" turn. Without specifying duties for the accurate determination of what constitutes "as feasible", and then ensuring that those duties are actually implemented by a non-conflicted 3rd party (which, as

19 [AQ-6c, AQ-6f, AQ-7]

written currently, the project sponsor cannot possibly fulfill without potential for conflict of interest), M-AQ-2a lacks necessary enforceability and cannot be expected to produce those real, quantifiable, surplus mitigated emission benefits claimed in the DSEIR.

Finally, M-AQ-2b leaves it to the project sponsor to calculate the amount of emission offsets required to satisfy the project's estimated ozone precursor burden of 17 tons per year, after they have decided what is feasible for Tier 4 equipment to be used at the site and what then to report to OCII under the requirements of M-AQ-1. In total, the construction mitigations proposed in the DEIR are riddled with potential conflicts of interest by leaving the determination of compliance and feasibility to the very party that must identify, implement and pay for them. As written, they cannot be relied upon to deliver the emission benefits that the DEIR assumes will actually occur. The DEIR must be revised to place a qualified, independent, 3rd party entity at the project site daily for the 26 month project duration, making them responsible and liable for accurate, weekly (not quarterly) verifications of equipment emission rates and reductions in reports to the City.

19 [AQ-6c, AQ-6f, AQ-7] cont.

VI. Operational Mitigation Measure for Electrical Outlets is Vague and Unenforceable

Mitigation Measure M-AQ-2a at DSEIR pg. 5.4-42 is designed to reduce the project's operational emissions, requiring the project sponsor to provide outlets for electrically powered landscape equipment "as feasible." As written, this measure is unenforceable since it permits the sponsor to determine feasibility. There is no doubt that the measure will be feasible, since electric power will be ubiquitous across the project site in built structures, at their exteriors, and in power supplied to lighting and other exterior improvements across the project's eleven acres.

Additionally, the mitigation measure should be revised to require that the project sponsor and any future property owners or tenants require in any landscaping contracts the requirement that landscape maintenance firms at the project use only electrically powered landscape equipment. Merely requiring outlets without mandating their use for landscaping onsite renders this portion of M-AQ-2a entirely unreliable for producing actual emission benefits.

20 [AQ-7]

VII. Offsets for Operational Emissions from Warriors Games Appear to be Double-Counted

At DSEIR pg. 5.4-37, new operational emissions from vehicle trips generated by Warrior games are, for the purposes of mitigation, discounted based on the assumption that those emissions have already been counted in the CEQA-review process conducted for Warriors' games at the Oracle Arena (Oakland). This approach is used in the DSEIR to justify the purchase of fewer

21 [AQ-4a]

emission offsets from BAAQMD necessary to reduce the project's onroad emission impacts to less-than-significant levels, and it is predicated on the assumption that no new large sports events will occur at the Oakland Coliseum/Oracle Arena once large-venue sports games move across the Bay to the proposed Arena in San Francisco. From pg. 5.4-37:

> "Some of the motor vehicle trips that would be generated by Golden State Warriors basketball games at the proposed event center would be regional trips similar to those currently generated by basketball games occurring at the Oracle Arena in Oakland, and as a result, the emissions associated with these regional trips would not represent new emissions to the air basin."

At the bottom of the same page, additional material reinforces the crediting strategy:

> "It is unlikely that there would be another NBA franchise in the Bay Area, so all of the professional basketball games occurring in the region would likely be played at the new event center. This assumption is consistent with that of the City of Oakland in its CEQA related analyses."

For the purposes of estimating vehicle trip emissions from large Warriors game-style sporting events that will be held at the proposed San Francisco Events Center, the Lead Agency has assumed that existing (Oracle Arena-based) Warriors game-related vehicle trip emissions will shift from Oakland to the new San Francisco Events Center. Under this DSEIR perspective, there would be no net increase in vehicle trips (and related emissions) since game attendees are expected to drive the same distance (25 miles on average) to the new facility in San Francisco that they are assumed to currently drive to attend a Warriors game (or similar large-venue sports event) at the Oracle Arena in Oakland. Crucial to this perspective is the notion that there would be no new, large-venue sporting events at the Oracle arena which would then act to backfill the loss of Warriors games---otherwise there must be a net gain in total, large-venue sporting event emissions created between the two arenas. In fact, the "no net gain" perspective taken by the Lead Agency in the DSEIR is used to justify deducting those Warriors game "existing trip" emissions from the project's emissions modeling so that fewer emission offsets would be required for the project. Based on our review of information contained in a recent Oakland EIR, this appears to be inappropriate.

21
[AQ-4a]
cont.

For the above-referenced approach to be viable for use in the DSEIR, the vehicle-trip emissions resulting currently from the large-sports venue games held at Oracle must transfer to the proposed San Francisco Event Center *and must then not be backfilled with new, large-sports venue games at Oracle*—otherwise there will be a net gain in emissions not accounted for in either the new Events Center DSEIR or the EIR conducted for the expanding Oracle Arena.

In contradiction to the DSEIR's claim is this statement from Oakland's Coliseum Area Specific Plan DEIR1, Vol. I, pg. 1-1:

> "The Project seeks to retain Oakland's three major professional sports franchises with three new venues and an accompanying mixed-use residential....."

On the next page, this information further clarifies that Oakland will backfill with large sports venues that will continue the emissions currently associated with the Warriors operation at the Oracle Arena:

> "The development of Sub-Area A and a portion of Sub-Area B (the "Coliseum District") is based on the Coliseum City Master Plan, which calls for three new sports venues (a new football stadium and a new baseball park in Sub-Area A plus a new basketball arena and multi-purpose events center in Sub-Area B)..."

At Coliseum Area Spa DEIR, pg. 4.2-59, mobile source emission impacts were modeled based on three scenarios:

21
[AQ-4a]
cont.

- Existing criteria pollutant emissions from the Coliseum District area ("Existing No Project", or "2013 Baseline"),
- Future 2035 criteria pollutant emissions from the Coliseum District if the Project were not developed (i.e., future no Project, or 2035 Baseline), and
- Future 2035 criteria pollutant emissions from the Coliseum District (i.e., future plus Project, or 2035 plus Project).

By logical inference from the first- and second-bulleted points noted above, large sports venue-related emissions currently attributed to Warriors games appear to remain "on the books" for Oracle. Correspondingly, at pg. 4.2-60, existing emissions quantities associated with the Warriors games are retained:

> "Table 4.2-7 shows estimated average daily and annual maximum criteria emissions under current conditions (2013 Baseline), as well as the emissions projected from current land uses at the Coliseum District as they would occur in 2035 (2035 Baseline). These projected 2035 baseline emissions are based on a continuation of existing land uses, vehicle trips, and VMTs."

[1] City of Oakland; Coliseum Area SPA DEIR Vol I; SCH #2013042066; August 2014

Based on the information cited above, it is clear that the City of Oakland anticipates retention of mobile source emissions generated by the equivalent of Warriors games at their Coliseum/Oracle Arena. Further, it appears that the Coliseum/Oracle EIR was certified prior to issuance of the Warriors NOP---thus the claim in the Warriors EIR that large sports venue-related emissions can be transferred from Oakland to San Francisco, and with credit applied to compliance with Mitigation Measure M-AQ-2b (Emission Credits) shown at pg. 5.4-41, is likely neither applicable nor appropriate under CEQA. 21 [AQ-4a] cont.

VIII. Project Health Risks May Be Underestimated Using Older Guidance

The DSEIR provides analysis and discussion of the project's potential to cause significant health risks from project-related toxics, with specific details on health risks and PM2.5 calculations and methodology found in Appendix AQ. Exposure parameters presented in Section 3 of Appendix AQ do not appear to reflect current methods for calculating excess cancer risks, and as a result it is likely that the HRA underestimates Warriors Arena's potential excess cancer risks.

Table 3 lists daily breathing rates referencing BAAQMD's Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines released in January 2010.[2] These breathing rates are consistent with rates recommended by the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) Air Toxics Hot Spots Program Risk Assessment Guidelines released in 2000.[3] After publicly working on revisions during 2014, OEHHA released updated Risk Assessment Guidelines in early 2015 that outline risk calculations for specific age groupings. The new methods incorporate higher daily breathing rates than those listed in the BAAQMD's 2010 Guidelines and used in the HRA. To comply with the latest OEHHA Guidelines, the inhalation intake factors should be re-calculated for the EIR using the updated 95% daily breathing rate for children of 1,090 L/kg-day.[4] 22 [AQ-5]

Additionally, the screening approach taken in the HRA to evaluate operational cancer risks should be revised to include a refined, site-specific analysis of impacts using the USEPA AERMOD

[2] BAAQMD, January 2010. Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. Available at: http://www.baaqmd.gov/~/media/Files/Engineering/Air%20Toxics%20Programs/hrsa_guidelines.ashx?la=en.
[3] OEHHA, September 2000. Air Toxics Hot Spots Program Risk Assessment Guidelines. Part IV: Technical Support Document for Exposure Assessment and Stochastic Analysis. Available at: http://www.oehha.ca.gov/air/hot_spots/pdf/stoch4f.pdf.
[4] OEHHA, February 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessment. Section 5.4.1.1: Residential Inhalation Dose for Cancer Risk Assessment. Available at: http://oehha.ca.gov/air/hot_spots/hotspots2015.html.

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Air Quality Comments for Event Ctr – Mission Bay Blocks 29-32 DSEIR, San Francisco CA
Autumn Wind Associates, Inc. 916.719.5472
July 19, 2015

model. With respect to the number of years of data to model, the USEPA Guideline on Air Quality Models states:

> "Five years of representative meteorological data should be used when estimating concentrations with an air quality model. Consecutive years from the most recent, readily available 5-year period are preferred.[5]"

The DSEIR used meteorological data from 2008; updated AERMOD results, employing five years of the most recent meteorological data, should be used with exposure parameters and methodology in compliance with the 2015 OEHHA Risk Assessment Guidelines to calculate excess cancer risk. 22 [AQ-5] cont.

IX. CEQA Air Quality Thresholds of Significance Have Not Been Adopted By the Lead Agency

At Page 5.4-25 the DSEIR establishes criteria pollutant thresholds adopted by the Bay Area Air Quality Management District (BAAQMD). Following their adoption by the BAAQMD, the City of San Francisco has used these numerical thresholds for virtually all land use development projects undertaken in the City and requiring CEQA review.

However, CEQA Guidelines, § 15064.7(b) requires that "[t]hresholds of significance to be adopted for general use as part of the lead agency's environmental review process must be adopted by ordinance, resolution, rule, or regulation, and developed through a public review process and be supported by substantial evidence." Without exception, this Guidelines section requires that, prior to application of thresholds in actual CEQA environmental reviews, the City undertake its own rule-making proceeding to adopt these thresholds as their own after determining in a public process that they are supported by substantial evidence. Since the City has not formally adopted the air quality significance thresholds in a public process, supported by substantial evidence, their ad hoc application to the DSEIR is inappropriate. 23 [AQ-1a]

X. Mobile-Based Emission Offsets Are Unlikely To Produce Needed Project-Lifetime Reductions

Mitigation Measure M-AQ-2b at DSEIR pg. 5.4-42 identifies the use of emission offsets for the project, requiring the project sponsor pay a mitigation-offset fee to the Bay Area Air Quality Management District's (BAAQMD) Strategic Incentives Division. The measure is designed to 24 [AQ-7]

[5] USEPA, November 9, 2005, Guideline on Air Quality Models. 40 CFR 51, Appendix W, Section 8.3.1.2.a.

offset operational project emissions that have been estimated to exceed the DSEIR's air quality thresholds of significance. As noted at pg. 5.4-42:

> "...the project sponsor shall pay a mitigation offset fee to the Bay Area Air Quality Management District's (BAAQMD) Strategic Incentives Division in an amount not to exceed $18,030 per weighted ton per year of ozone precursors plus a 5 percent administrative fee to fund one or more emissions reduction projects within the San Francisco Bay Area Air Basin (SFBAAB). This fee is intended to fund emissions reduction projects to achieve reductions of 17.0 tons per year of ozone precursors."

There is a serious, fundamental flaw in the logic applying to the measure's requirement to purchase emission offsets, since emission reductions developed through the BAAQMD's Strategic Incentives Division are based on mobile source emission reduction projects with limited and intentionally impermanent lifetimes. These projects typically operate for several years before they are rendered obsolete by new vehicle emission control standards and technologies, and thus they must not be expected to produce the 17 tons per year of ozone precursor offsets, year in and year out, across what is at least a 30 year project planning lifetime.

24 [AQ-7] cont.

Accordingly, M-AQ-2b must be revised to require emission offsets for project operations for, at a minimum, the aforementioned 30 year life of the project. To exemplify, if the BAAQMD purchases mobile emission offsets with an emission reduction life of less than 10 years, the project sponsor must then pay mitigation-offset fees for mobile emission reductions until emission offsets are realized for the minimum 30 year period. Without such protection the project can be expected to offset its significant ozone precursors for no more than one-third of its lifetime; this is clearly inconsistent with CEQA's interest in mitigating the project's significant impacts across its planned lifetime.

** ** **

In summary, we believe the project DSEIR's treatment of air quality impact analysis and mitigation has inaccurately characterized certain project emissions, applied mitigation measures which are unenforceable or will simply not be implemented effectively if they are substantively implemented at all, failed to use thresholds of significance previously adopted by the Lead Agency's Board of Directors pursuant to CEQA Guidelines, and has incorrectly assumed the transfer of Warriors game-related operational emissions established for the Oracle Arena to apply to the project arena to be built in San Francisco.

25 [AQ-8]

Should you have any questions regarding this comment letter, please feel free to contact me at your convenience.

Sincerely,

Greg Gilbert

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July 20, 2015

Thomas N. Lippe
The Law Offices of Thomas N. Lippe
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Comments on the Event Center and Mixed-Use Development Project at Mission Bay Blocks 29-32

Dear Mr. Lippe:

We have reviewed the June 5, 2015 Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center and Mixed-Use Development Project ("Project") at Mission Bay Blocks 29-32. GSW Arena LLC (GSW), an affiliate of Golden State Warriors, LLC, which owns and operates the Golden State Warriors National Basketball Association (NBA) team, proposes to construct a multi-purpose event center and a variety of mixed uses, including office, retail, open space and structured parking on an approximately 11-acre site on Blocks 29-32 within the Mission Bay South Redevelopment Plan Area of San Francisco. The proposed event center would host the Golden State Warriors basketball team during the NBA season, and provide a year round venue for a variety of other uses, including concerts, family shows, other sporting events, cultural events, conferences, and conventions.

Our review concludes that the DSEIR fails to adequately assess the Project's air quality impacts.

1. The FEIR incorrectly utilizes a default hauling trip length of 20-miles, provided by the *California Emissions Estimator Model* ("CalEEMod"),[1] to determine the on-road hauling emissions that would occur during construction; however, utilizing this default value, rather than a site specific trip length, results in an underestimation of the Project's construction emissions. 26 [AQ-3]
2. The DSEIR attempts to mitigate the Project's criteria air pollutant emissions by limiting the off-road equipment used during construction to machinery equipped with, at a minimum, Tier 2 engines with 40 percent NOx verified diesel emission control strategies (VDECS), and at a maximum, Tier 4 or Tier 4 interim engines (Volume 2, p. 5.4-32). However, the DSEIR does not demonstrate the feasibility of this proposed measure. The Project will need to acquire approximately 195 pieces of equipment outfitted with Tier 2 and/or Tier 4 engines. Due to the 27 [AQ-6a]

[1] CalEEMod website, *available at*: http://www.caleemod.com/

limited supply of cleaner-burning off-road equipment, the implementation of this measure, in its entirety, is highly unrealistic. As a result, the proposed Project should not rely on this mitigation measure to reduce emissions; rather the Project should pursue additional, feasible mitigation measures other than Tier 2/Tier 4 construction equipment to reduce the Project's criteria air pollutant emissions. 27 [AQ-6a] cont.
3. The DSEIR does not assess the Project's individual excess cancer risk to the Bay Area Air Quality Management District's (BAAQMD) 10 in one million significance threshold.[2] Rather, it determines the Project's significance by comparing the cumulative cancer risk (background risk plus Project risk) to BAAQMD's cumulative risk threshold of 100 in one million. 28 [AQ-1c]
4. The DSEIR also fails to utilize BAAQMD's cumulative PM2.5 threshold of 0.8 µg/m^3. 29 [AQ-1d]

A revised DSEIR should be prepared to address these inadequacies and to incorporate mitigation to reduce impacts which otherwise would affect regional air quality, and health impacts from toxic air contaminants. 30 [AQ-8]

Inadequate Use of CalEEMod Default Values

31 [AQ-3]

The DSEIR calculates the emissions from on-road haul trucks during Project construction by assuming a trip length of 20-miles, which represents the default hauling trip length provided by CalEEMod (Volume 3, Appendix AQ, p. 6). This default trip length, however, does not represent the actual haul trip length that would occur. Therefore, in an effort to accurately estimate the actual haul trip length, we conducted an independent analysis using the best resources available.

The DSEIR "estimates that the maximum depth of excavation on-site would be approximately 30 feet below San Francisco City Datum; this would require approximately 350,000 cubic yards of soils on-site to be excavated and removed from the site" (Volume 3, Appendix AQ, p. 17). In order to transport this soil off-site, the DSEIR anticipates that approximately 39,952 haul trips will be required over the course of approximately four months (Volume 3, Appendix AQ, Table 6.1-13, pp. 1243).

The DSEIR fails to disclose where this excavated soil will be transported to. According to the DSEIR, in 2006, the City of San Francisco adopted the Construction and Demolition Waste Ordinance[3], which mandates that 75 percent of construction and demolition debris be recycled (Volume 3, Appendix AQ, p. 70). Therefore, it can be assumed that 75 percent of the approximately 350,000 cubic yards of construction debris will be transported to a registered construction and demolition (C&D) debris recovery facility, and the remaining 25 percent will be transported to a registered landfill. The Construction and Demolition Waste Ordinance requires that C&D materials be transported to a registered recovery facility, and provides a list of the facilities currently approved by the City.[4] The

[2] "California Environmental Quality Act Air Quality Guidelines." Bay Area Air Quality Management District, May 2011. *Available at:* http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20CEQA%20Guidelines_May%202011_5_3_11.ashx, p. 2-2
[3] San Francisco Ordinance No. 27-06, *available at:* http://sfenvironment.org/sites/default/files/fliers/files/cd_ordinance.pdf
[4] San Francisco Ordinance No. 27-06, List of Registered Transporters and Registered Facilities, *available at:* http://sfenvironment.org/sites/default/files/fliers/files/sfe_zw_cd_registered_facilities_list.pdf

permitted daily capacity of each facility is not disclosed in the DSEIR; however, due to the large amount of debris that will have to be transported off-site over a very short period of time (four months), it can be assumed that this material will most likely be transported to multiple recovery facilities. Again, because the DSEIR does not disclose where this material will be transported to, we measured the distance of each recovery facility to the Project site, and then used the average distance of these facilities to represent the one-way hauling trip length (see table below).

Recovery Facility Name	Distance From Project Site (miles)
Big for Hauling and Demolition	2.1
Marin Resource Recovery Center	25.6
Smart Demolition	3.1
Blue Line Transfer, Inc.	12.1
Premier Recycle	55.3
West Contra Costa Sanitary Landfill	21.1
Certified Blue Recycling, Inc	19.6
Recology San Francisco	5.0
Windsor Materials Recovery Facility	70.6
Davis Street Transfer & Recycling Center	19.5
SF Recovery Inc	5.5
Zanker Materials Processing Facility	58.5
Average Distance From Project Site	**25**

31
[AQ-3]
cont.

Using this method, we can assume that approximately 29,964 haul trips will transport 262,500 cubic yards of material approximately 25 miles one-way.

The remaining 25 percent, or approximately 87,500 cubic yards, of C&D material will most likely be transported to a landfill. San Francisco currently has a contract with Waste Management, Inc., to transport waste to the Altamont Landfill, which is approximately 53 miles away from the Project site.[5] Once the Altamont Landfill contract expires in 2016, the City of San Francisco is proposing to enter a new agreement with Recology's Hay Road Landfill, which is located approximately 70 miles away from the Project site.[6] According to the DSEIR, construction activities are anticipated to occur starting in 2015, with full Project build out in 2018 (Volume 3, Appendix AQ, p. 5). For that reason, depending on when construction activities actually start, there is the possibility that C&D materials will be transported to the Hay Road Landfill. Therefore, we estimated total haul emissions assuming that 25 percent of C&D material would be transported to the Altamont Landfill (Scenario 1), and then we estimated emissions

[5] "Agreement for Disposal of San Francisco Municipal Solid Waste at Recology Hay Road Landfill in Solano County." Notice of Availability of and Intent to Adopt a Negative Declaration, March 4, 2015. *Available at:* http://sfmea.sfplanning.org/2014.0653E_NOA.pdf

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from an alternative scenario, where we assumed that 25 percent of C&D material would be transported to the Hay Road Landfill (Scenario 2).

The tables below summarize the results of our analysis for each scenario.

Scenario 1: Current Contract with Altamont				
Location		One-Way Distance (miles)	Total One-Way Haul Trips	Total Vehicle Miles Traveled
75%	Recovery Facilities	25	29,964	744,106
25%	Altamont Landfill	53	9,988	527,366
100%	-	-	**39,952**	**1,271,472**

Scenario 2: Proposed Contract with Hay Road Landfill Approved				
Location		One-Way Distance (miles)	Total One-Way Haul Trips	Total Vehicle Miles Traveled
75%	Recovery Facilities	25	29,964	744,106
25%	Hay Road Landfill	70	9,988	695,165
100%	-	-	**39,952**	**1,439,271**

31
[AQ-3]
cont.

When we compared the total vehicle miles traveled (VMT) from each of the above scenarios to the VMT from the CalEEMod default trip length of 20 miles, we found that Scenario 1 would result in a 37 percent increase in VMT, and found that Scenario 2 would result in a 44 percent increase in VMT (see table below).

Scenario	Vehicle Miles Traveled (VMT)
1 – Altamont Landfill	1,271,472
CalEEMod Default	799,040
Net Increase in VMT	**472,432**
Percent Increase in VMT	***37%***
2 – Hay Road Landfill	1,439,271
CalEEMod Default	799,040
Net Increase in VMT	**640,231**
Percent Increase in VMT	***44%***

[6] "Agreement for Disposal of San Francisco Municipal Solid Waste at Recology Hay Road Landfill in Solano County." Notice of Availability of and Intent to Adopt a Negative Declaration, March 4, 2015. *Available at:* http://sfmea.sfplanning.org/2014.0653E_NOA.pdf

We derived emission factors from the California Air Resources Board's (CARB) EMFAC2011 model to estimate the increase in emissions when site specific hauling trip lengths are used.[7] We specified a 2015 calendar year for Scenario 1, which assumes that the Altamont Landfill contract is still active, and we specified a 2016 calendar year for Scenario 2, which assumes that the Altamont Landfill contract has expired, and has been replaced by a new contract with Hay Road Landfill. Additional parameters used to derive these emission factors are specified in the table below.

EMFAC2011 Parameter	Input
Region Type	Air Basin
Region	San Francisco Bay Area
Season	Annual
Vehicle Class	T7 Tractor
Model Year	Aggregated
Speed	Aggregated

EMFAC2011 does not provide emission factors for CH_4 and N_2O, which are mobile-source greenhouse gases that contribute to the effects of climate change. Therefore, we used heavy duty diesel truck emission factors from the Environmental Protection Agency's (EPA) *Emission Factors for Greenhouse Gas Inventories,* which specifies a CH_4 emission factor of 0.0051 grams per mile (g/mile), and a N_2O emission factor of 0.0048 g/mile.[8] We applied Global Warming Potentials (GWPs) to each of these pollutants in order to convert these emissions to carbon dioxide equivalents (CO_2e).[9] 31 [AQ-3] cont.

According to the DSEIR, the CalEEMod default vehicle type for hauling is a mix of all heavy-heavy duty trucks (HHDT), labeled as a T7 vehicle type (Volume 3, Appendix AQ, pp. 1244). Furthermore, the CalEEMod emissions estimates take into account idling emissions, starting exhaust, evaporative emissions, and running losses, as well as emissions from road dust (Volume 3, Appendix AQ, pp. 1245 – 1248). Because our analysis is a bit more simplistic than the emissions calculated in CalEEMod, we estimated the emissions, using the methods and input parameters described above, from a 20-mile default hauling trip length. In an effort to demonstrate consistency, we used 2015 emissions factors to estimate the net increase in emissions for Scenario 1, and used 2016 emission factors to estimate the net increase in emissions for Scenario 2. The results of our analyses are summarized in the table below (see attachment for calculation details).

Scenario 1 vs. CalEEMod Default Hauling Emissions						
	ROG	**CO**	**NOx**	**CO2e**	**PM10**	**PM2.5**
Pounds per Day:						
Scenario 1	9.530	42.934	287.657	54,337	7.346	5.023
CalEEMod Default (2015)	5.989	26.982	180.774	34,147	4.616	3.157
Net Increase	**3.541**	**15.953**	**106.883**	**20,190**	**2.729**	**1.866**
	ROG	**CO**	**NOx**	**CO2e**	**PM10**	**PM2.5**
Tons per Year (CO2e in Metric Tons per Year):						
Scenario 1	0.419	1.889	12.657	2,173	0.323	0.221
CalEEMod Default (2015)	0.264	1.187	7.954	1,366	0.203	0.139
Net Increase	**0.156**	**0.702**	**4.703**	**808**	**0.120**	**0.082**

[7] EMFAC2011 Web Database, *available at*: http://www.arb.ca.gov/emfac/2011/
[8] "Emission Factors for Greenhouse Gas Inventories." Climate Leadership United States Environmental Protection Agency, April 4, 2014. *Available at:* http://www.epa.gov/climateleadership/documents/emission-factors.pdf
[9] "Emission Factors for Greenhouse Gas Inventories." Climate Leadership United States Environmental Protection Agency, April 4, 2014. *Available at:* http://www.epa.gov/climateleadership/documents/emission-factors.pdf, CH_4 GWP is equal to 25, and the N_2O GWP is equal to 298.

Scenario 2 vs. CalEEMod Default Hauling Emissions						
	ROG	**CO**	**NOx**	**CO2e**	**PM10**	**PM2.5**
Pounds per Day:						
Scenario 2	8.800	39.466	273.077	60,759	6.947	4.427
CalEEMod Default (2016)	4.886	21.910	151.604	33,732	3.857	2.458
Net Increase	**3.915**	**17.556**	**121.473**	**27,027**	**3.090**	**1.969**
	ROG	**CO**	**NOx**	**CO2e**	**PM10**	**PM2.5**
Tons per Year (CO2e in Metric Tons per Year):						
Scenario 2	0.387	1.737	12.015	2,430	0.306	0.195
CalEEMod Default (2016)	0.215	0.964	6.671	1,349	0.170	0.108
Net Increase	**0.172**	**0.772**	**5.345**	**1,081**	**0.136**	**0.087**

31 [AQ-3] cont.

Our simple analysis indicates that the use of a CalEEMod default hauling trip length results in an approximate 37 – 44 percent underestimation in mobile-source, hauling emissions. CalEEMod default values should only be relied upon when site specific information is not available. As indicated by our analysis above, hauling destinations can be derived very easily. If site specific information is used to determine hauling trip lengths, the emissions increase significantly. As a result, an updated DSEIR should be prepared to adjust the hauling trip length to reflect site specific distances. Furthermore, worker and vendor trip lengths, which we were not able to determine due to a lack of information disclosed in the DSEIR, should also be adjusted to reflect site specific distances.

Incorrectly Presumed the Use of Tier 2 and Tier 4 Interim Engines

In this updated analysis, it is presumed that all off-road construction equipment will be outfitted with, at a minimum Tier 2 engines with 40 percent NOx verified diesel emission control strategies (VDECS), and at a maximum, Tier 4 or Tier 4 interim engines (Volume 2, p. 5.4-32). There is no substantial evidence, however, to support the assumption that the roughly 195 pieces of off-road equipment utilized during Project construction will meet these standards. Furthermore, it may not be technically feasible to acquire machinery with Tier 2 or Tier 4 engines for the Project's entire construction equipment fleet. As a result, this mitigation measure should not be relied upon to reduce the Project's construction emissions to below levels of significance. Rather, the Project should pursue additional mitigation measures that are more technically feasible to implement. 32 [AQ-6a]

The United States Environmental Protection Agency's (USEPA) 1998 nonroad engine emission standards were structured as a three-tiered progression. Tier 1 standards were phased-in from 1996 to 2000 and Tier 2 emission standards were phased in from 2001 to 2006. Tier 3 standards, which applied to engines from 37-560 kilowatts (kW) only, were phased in from 2006 to 2008. The Tier 4 emission standards were introduced in 2004, and were phased in from 2008 – 2015. [10] These tiered emission standards, however, are only applicable to newly manufactured nonroad equipment. According to the United States Environmental Protection Agency (USEPA) "if products were built before EPA emission standards started to apply, they are generally not affected by the standards or other regulatory requirements."[11] Therefore, pieces of equipment manufactured prior to 2000 are not required to adhere to Tier 2 emission standards, and pieces of equipment manufactured prior to 2008 are not required to adhere to Tier 4 emission standards. Construction equipment often lasts more than 30 years; as a result, Tier 1 equipment and non-certified equipment are currently still in use.[12] It is estimated that of the two million diesel engines currently used in construction, 31 percent were manufactured before the introduction of emissions regulations.[13] Furthermore, in a 2010 white paper, the California Industry Air Quality Coalition estimated that approximately 7% and less than 1% of all off-road heavy duty diesel equipment in California was equipped with Tier 2 and Tier 3 engines, respectively.[14] It goes on to explain that "cleaner burning Tier 4 engines…are not expected to come online in significant numbers until 2014." Given that significant production activities have only just begun within the last year, it can be presumed that there is limited availability of Tier 4 equipment. Furthermore, due to the complexity of Tier 4 engines, it is very difficult if not nearly impossible, to retrofit older model machinery with this technology.[15] Therefore, available off-road machinery equipped with Tier 4 engines are most likely new. According to a September 20, 2013 EPA Federal Register document, a new Tier 4 scraper or bulldozer would cost over $1,000,000 to purchase.[16] It is also relatively expensive to retrofit a piece of old machinery with a Tier 3 engine. For example, replacing a Tier 0 engine with a Tier 3 engine would cost roughly $150,000 or more.[17] Therefore, before applying mitigation measures of this caliber to a Project, the applicant should consider both the cost of the proposed equipment as well as determine the

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[AQ-6a]
cont.

[10] Emission Standards, Nonroad Diesel Engines, *available at:* https://www.dieselnet.com/standards/us/nonroad.php#tier3

[11] "Frequently Asked Questions from Owners and Operators of Nonroad Engines, Vehicles, and Equipment Certified to EPA Standards." United States Environmental Protection Agency, August 2012. *Available at:* http://www.epa.gov/oms/highway-diesel/regs/420f12053.pdf

[12] "Best Practices for Clean Diesel Construction." Northeast Diesel Collaborative, August 2012. *Available at:* http://northeastdiesel.org/pdf/BestPractices4CleanDieselConstructionAug2012.pdf

[13] Northeast Diesel Collaborative Clean Construction Workgroup, *available at:* http://northeastdiesel.org/construction.html

[14] "White Paper: An Industry Perspective on the California Air Resources Board Proposed Off-Road Diesel Regulations." Construction Industry Air Quality Coalition, *available at:* http://www.agc-ca.org/uploadedFiles/Member_Services/Regulatory-Advocacy-Page-PDFs/White_Paper_CARB_OffRoad.pdf

[15] "Tier 4 – How it will affect your equipment, your business and your environment." Milton Cat, *available at:* http://www.miltoncat.com/News/Documents/Articles/For%20the%20Trenches%20-%20Tier%204.pdf

[16] Federal Register Volume 78, Number 183. United States Environmental Protection Agency, September 20, 2013. *Available at:* http://www.gpo.gov/fdsys/pkg/FR-2013-09-20/pdf/2013-22930.pdf

[17] Federal Register Volume 78, Number 183. United States Environmental Protection Agency, September 20, 2013. *Available at:* http://www.gpo.gov/fdsys/pkg/FR-2013-09-20/pdf/2013-22930.pdf

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probability of obtaining an entirely Tier 2 or Tier 4 construction fleet. Unless the Project applicant can demonstrate to the public, either through budget or through a signed contractual agreement with a contractor or supplier, that they will purchase/rent exclusively Tier 2 or Tier 4 construction equipment, this mitigation measure should not be relied upon as a feasible way of reducing Project emissions.

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[AQ-6a]
cont.

Failure to Assess Individual Health Risk from Proposed Project

The DSEIR fails to assess the individual health risk that construction of the Project may have on nearby sensitive receptors. According to the DSEIR, because "both the PM2.5 and cancer risk assessments account for background (existing) concentrations and risk levels," the Project's contribution to PM2.5 concentrations and excess cancer risks are instead combined with background concentrations, and are then compared to cumulative significance thresholds (Volume 2, p. 5.4-45). Instead, the DSEIR uses the individual project cancer risk threshold of 10 in one million to determine the significance of emissions from the proposed emergency generators, exclusively (Volume p. 5.4-46). This application of the 10 in one million threshold is inconsistent with CEQA thresholds set forth by BAAQMD. As a result, the significance of the Project's toxic air contaminant (TAC) emissions during construction is not adequately determined. An updated DSEIR should be prepared to accurately assess the Project's individual health risk according to CEQA guidance set forth by BAAQMD.

The DSEIR does not apply the project risk threshold of 10 in one million to the Project as a whole (stationary, area, and mobile sources of TACs); rather, the DSEIR applies this threshold to stationary sources, exclusively, to the proposed emergency generators that will be used during Project operation (Volume 2, p. 5.4-46). The DSEIR explains this application by stating the following:

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[AQ-1c]

> "The permitting process under BAAQMD Regulation 2, Rule 5 requires a Health Risk Screening Analysis, the results of which are posted on the District's website. Per its Policy and Procedure Manual, the BAAQMD requires implementation of Best Available Control Technology for Toxics and would deny an Authority to Construct or a Permit to Operate for any new or modified source of TACs that exceeds a cancer risk of 10 in one million" (Volume 2, p. 5.4-46).

The requirements and thresholds set forth in BAAQMD's Regulation 2, Rule 5, as referred to in the DSEIR, however, apply only to stationary sources. As a result, the TAC emissions from on- and off-road mobile sources, such as construction equipment and heavy duty diesel trucks, are not held to any sort of significance threshold. This application of the 10 in one million threshold is inconsistent with CEQA thresholds set forth by BAAQMD. According to the BAAQMD's May 2011 *Recommended Methods for Screening and Modeling Local Risks and Hazards*, "the thresholds for local risks and hazards from TAC and PM2.5 are intended to apply to all sources of emissions, including both permitted stationary sources and on- and off-road mobile sources, such as sources related to construction, busy roadways, or freight movements."[18] Therefore, an individual project would be considered significant if the total project's TAC

[18] "Recommended Methods for Screening and Modeling Local Risks and Hazards." Bay Area Air Quality Management District, May 2011. *Available at:* http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20Modeling%20Approach.ashx

emissions, including exhaust from construction equipment, heavy duty diesel trucks, and diesel-powered generators, would result in an increased cancer risk greater than 10 in one million, or would result in an increased ambient air PM2.5 concentration greater than 0.3 μg/m^3.

The BAAQMD's October 2009 *Revised Draft Options and Justification Report*[19] outlines four ways of siting a new source and determining a significance threshold. Any project with the potential to expose people (receptors) to substantial levels of TAC is currently deemed to have a significant impact. The BAAQMD uses the following approach (Option 1) to determine significance:

> "Proposed development projects that have the potential to expose receptors to TAC in <u>excess of the following thresholds from any source, mobile or stationary</u> would be considered to have a significant air quality impact if the:
> - Probability of contracting cancer for the Maximally Exposed Individual (MEI) exceeds 10 in one million.
> - Ground-level concentrations of non-carcinogenic toxic air contaminants would result in a Hazard Index greater than 1 for the MEI" (p. 59).

The second option consists "of applying the current stationary source permitting thresholds to project-generated stationary, area-, and mobile-source TAC emissions" (p. 60). As previously stated, stationary sources of emissions are subject to BAAQMD's permit process per Regulation 2, Rule 5. The permitting process requires that all new or modified stationary sources that emit TACs perform modeling to determine what the concentration of TACs will be at the boundary of their property. This current permitting approach does not include area or mobile sources of emissions in the modeling or permitting assessment. If a proposed stationary source will have operational TAC concentrations from permitted equipment that result in an estimated 1 excess cancer risk in a million, the project is required to install Toxic Best Available Control Technology (TBACT) to minimize emissions of TACs. The TAC modeling must also demonstrate to BAAQMD that implementation of the proposed project would not result in additional incremental exposure of surrounding receptors to levels that exceed 10 in one million for excess cancer risk or a hazard index above one. The BAAQMD will not issue an authority to construct or permit to operate for any stationary source of TACs that would result in concentrations exceeding a 10 in one million threshold. 33 [AQ-1c] cont.

Option 2 expands on Option 1 by requiring the application of the one in a million threshold for stationary sources to install TBACT to projects that have TAC emissions from sources (primarily mobile) not currently required to obtain permits to operate. These non-stationary source type projects, such as the Warriors Arena Project, would be required to implement Toxic Best Practices (TBPs), such as site and circulation design, setbacks from roadways, air conditioning, and vegetation buffers, if their modeled cancer risks are above the one in a million threshold. The BAAQMD would identify a list of TBPs for non-

[19] "Revised Draft Options and Justification Report." Bay Area Air Quality Management District, October 2009. *Available at:* http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/revised-draft-ceqa-thresholds-justification-report-oct-2009.pdf?la=en

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stationary sources to implement if they are above the one in a million threshold. The threshold of significant impact, thereby requiring implementation of all feasible on-site mitigation measures would be the 10 in a million excess cancer risk and a HI of 1.0.

The more stringent Option 3 involves application of a tiered CEQA threshold. New sources of TACs locating in impacted communities, as identified by the BAAQMD's Community Air Risk Evaluation (CARE) Program, would have to install TBACT and/or TBPs and would be subject to a significance threshold of 5 in one million (after consideration of TBACT and/or TBPs). New sources of TACs locating in a community other than an impacted community would be subject to a significance threshold of 10 in one million. Finally, Option 4 proposes a no net increase inhalation cancer risk. Option 4 does not define a "substantial change" because any increase would be considered significant. 33 [AQ-1c] cont.

The first two options suggest that projects with the potential to expose receptors to TACs greater than 10 in one million excess cancers, from any source, mobile or stationary, should be considered significant. The third option suggests a more stringent significance threshold of 5 in one million, and the fourth option suggests an even more stringent threshold, which deems any increase in TACs as significant. Regardless, all four options specify that emissions from both stationary and mobile sources be included when determining project significance. As a result, the maximum threshold that could reasonably apply to the Project's stationary and mobile source TAC emissions is the BAAQMD's individual project threshold of 10 in one million.

Failure to Use District's PM2.5 Cumulative Threshold

To evaluate the cumulative impacts of the Project, the DSEIR implements criteria used to define an Air Pollutant Exposure Zone (APEZ). The DSEIR states:

> "an APEZ [is] defined as an area in which modeled air pollution exceeds 'either: (1) a cancer risk of greater than 100 per one million exposed, and/or (2) PM2.5 concentrations in excess of 10 microgram per cubic meter (μg/m^3) (including ambient)'" (Volume 3, Appendix AQ, p. 9).

The cancer risk cumulative threshold of 100 in one million, used in the DSEIR, is consistent with the cumulative cancer risk threshold set forth by the BAAQMD, but not, as explained above, with the individual project cancer risk threshold. However, the PM2.5 threshold of 10 μg/m^3 is inconsistent with the BAAQMD's cumulative threshold, and represents a value that is far greater than the BAAQMD's recommended value. According to the BAAQMD's May 2011 CEQA Guidelines, "a project would have a significant cumulative impact if the total of all past, present, and foreseeable future sources within a 1,000 foot radius (or beyond where appropriate) from the fence line of a source, or from the location of a receptor, plus the contribution from the project, exceeds the following: 34 [AQ-1c, AQ-1d]

- Non- compliance with a qualified Community Risk Reduction Plan;
- An excess cancer risk levels of more than 100 in one million or a chronic hazard index greater than 10 for TACs; or

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- 0.8 μg/m^3 annual average PM2.5."[20]

BAAQMD suggests that a project would have a significant cumulative impact if the total of all past, present, and foreseeable future sources within a 1,000 foot radius would result in an annual average PM2.5 concentration greater than 0.8 μg/m^3. This threshold is much more stringent when compared to the 10 μg/m^3 threshold used in the DSEIR. As a result, the DSEIR should implement the recommended cumulative threshold set forth by BAAQMD, rather than the 10 μg/m^3 threshold.

Furthermore, the DSEIR uses BAAQMD thresholds to determine the significance of other air quality impacts, but then uses APEZ criteria to determine health risk significance, even though BAAQMD suggests significance thresholds for cumulative health risks. For example, the DSEIR uses BAAQMD's average daily emissions construction thresholds to determine significance of construction emissions on air quality (Volume 2, p. 5.4-25). As is apparent, there is a huge discrepancy between the 10 μg/m^3 threshold used in the DSEIR and the 0.8 μg/m^3 cumulative threshold recommended by BAAQMD. Using an alternative threshold, rather than the one set forth by BAAQMD, demonstrates that the Applicant is picking and choosing the thresholds that apply to the Project to determine significance.

34 [AQ-1c, AQ-1d] cont.

Sincerely,

Paul Rosenfeld

Jessie Jaeger

[20] "California Environmental Quality Act Air Quality Guidelines." Bay Area Air Quality Management District, May 2011. *Available at:* http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20CEQA%20Guidelines_May%202011_5_3_11.ashx, p. 5-15

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July 25, 2015

Ms Tiffany Bohee
OCII Executive Director
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Re: **Noise Impacts** - Comments regarding on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter. 1 [GEN-5]

This letter incorporates by reference, as comments on the DSEIR, all of the comments on the DSEIR contained in the July 22, 2015, letter report authored by acoustical engineer Frank Hubach (attached as Exhibit 1).

I. The DSEIR Is Not Sufficient as an Informational Document with Respect to Noise Impacts.

A fundamental defect in the DSEIR's analysis of noise impacts is its use of thresholds of significance that do not actually measure the impacts that matter. This is readily demonstrated by comparing the two impacts that relate to the consistency of the Project with governing noise standards or plans (i.e., Impacts NO-2 (construction) and NO-4 (operations)) with the two impacts that relate to how noise affects people (i.e., Impacts NO-1 (construction) and NO-5 (operations)). Even in its discussion of the impacts that affect people, the DSEIR uses thresholds of significance that conflate compliance with non-CEQA regulatory programs with less-than-significant impacts under CEQA. This is error. 2 [NOI-2a]

The DSEIR uses several general thresholds of significance for noise impacts:

- Result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

(DSEIR, p. 5.3-16.)

2 [NOI-2a] cont.

Impact NO-1 is described as "Construction of the proposed project would not cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. (Less than Significant)." (DSEIR 5.3-20.) For construction impacts, the DSEIR uses several more specific thresholds of significance, including:

- Non-impact equipment. The impact is considered less than significant as long as construction noise from non-impact equipment is less than 80dba at 100 feet from the noise generating equipment.[1]

- Impact equipment. The impact is considered less than significant as long as the 1-hour Leq is less than 90 dBA for daytime and 80 dBA for nighttime construction noise exposure at residential uses,

[1] DSEIR, p. 5.3-16 - 5.3-17 ["Proposed construction activities would be required to comply with the San Francisco Noise Ordinance and the Mission Bay Good Neighbor Construction Noise Policy. The San Francisco Noise Ordinance prohibits construction activities between 8:00 p.m. and 7:00 a.m. and limits noise from any individual piece of construction equipment, except impact tools approved by the Department of Public Works, to 80 dBA at 100 feet. The Mission Bay Good Neighbor Construction Noise Policy limits pile driving or other extreme noise generating activity (80 dBA at a distance of 100 feet) to 8:00 a.m. to 5:00 p.m., Monday through Friday. As long as project construction activities comply with the noise ordinance, construction noise impacts from non-impact equipment would be considered less than significant. If construction activities using non-impact equipment would exceed these standards and the restrictions of the Mission Bay Good Neighbor Policy, then the noise effects would be potentially significant and mitigation measures would be required."]

and 100 dBA for commercial and industrial uses.[2]

The DSEIR then rigidly adheres to the regulatory scheme of the San Francisco Noise Ordinance in assessing the significance of noise from non-impact equipment, erroneously assuming the noise ordinance's regulatory scheme provides an appropriate threshold for determining whether impacts are significant under CEQA. Subdivision (d) of section 2909 of the San Francisco Noise Ordinance establishes thresholds for determining significance of noise impacts on nearby residents of 45 dBA nighttime/55 dBA daytime noise, stating:

> Fixed Residential Interior Noise Limits. In order to prevent sleep disturbance, protect public health and prevent the acoustical environment from progressive deterioration due to the increasing use and influence of mechanical equipment, no fixed noise source may cause the noise level measured inside any sleeping or living room in any dwelling unit located on residential property to exceed 45 dBA between the hours of 10:00 p.m. to 7:00 a.m. or 55 dBA between the hours of 7:00 a.m. to 10:00p.m. with windows open except where building ventilation is achieved through mechanical systems that allow windows to remain closed.

2 [NOI-2a] cont.

These standards (i.e., 45 dBA nighttime/55 dBA daytime noise) are based on the actual health and welfare of people. But the DSEIR does not use them for construction noise or operational traffic or crowd noise because this provision of the City's noise ordinance only applies to fixed noise sources. The DSEIR thus conflates compliance with the noise ordinance for less-than-significant impacts under CEQA.

The EIR's assumption in this regard violates CEQA, because compliance with regulatory standards cannot be used as a substitute for a fact-based analysis of whether an impact is significant. While San Francisco is free to adopt a noise ordinance that exempts specific noise sources from its regulatory effect, it is not free, under CEQA, to fail to disclose the significance of noise that exceeds these interior noise limits.[3]

[2] DSEIR, p. 5.3-17 ["The San Francisco Noise Ordinance does not identify any quantitative noise limit standard for impact equipment. To assess the potential impacts related to rapid impact compaction, this analysis employs the general construction noise assessment methodology and criteria suggested by the Federal Transit Administration (FTA). This guidance identifies a 1-hour Leq of 90 dBA for daytime and 80 dBA for nighttime construction noise exposure at residential uses. Commercial and industrial land use exposure to construction noise of 100 dBA is suggested as an assessment criterion."]

[3] *See*, e.g., *Californians for Alternatives to Toxics v. Department of Food & Agriculture* (2005) 136 Cal.App.4th 1, 16 (lead agencies must review the site-specific impacts of pesticide applications under their jurisdiction, because "DPR's [Department of Pesticide Regulation] registration does not

Because the DSEIR did not use the thresholds stated in section 2909(d), the noise impact assessment does not present relevant information that is necessary for determining whether the impact is significant. Instead, we have an impact assessment that is constrained by a series of arbitrary distinctions (i.e., the source fixed or not, the equipment impact or non-impact, the receptors are located in residences or hospitals) that have nothing to do with whether the affected community will suffer significant noise impacts.

The DSEIR refers to the World Health Organization (WHO) as "perhaps the best source of current knowledge regarding the health effects of noise impacts because European nations have continued to study noise and its health effects, while the United States Environmental Protection Agency all but eliminated its noise investigation and control program in the 1970s." (DSEIR, p. 5.3-4.) The DSEIR also cites WHO's Guidelines for Community Noise and its thresholds for adverse effects of noise on people. 2 [NOI-2a] cont.

> In contrast to many other environmental problems, noise pollution continues to grow and it is accompanied by an increasing number of complaints from people exposed to the noise. The growth in noise pollution is unsustainable because it involves direct, as well as cumulative, adverse health effects.

(WHO, Guidelines for Community Noise, p. vii.)

Specific effects to be considered when setting community noise guidelines include:

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and cannot account for specific uses of pesticides..., such as the specific chemicals used, their amounts and frequency of use, specific sensitive areas targeted for application, and the like"); *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1109 ["the fact that a particular environmental effect meets a particular threshold cannot be used as an automatic determinant that the effect is or is not significant ... a threshold of significance cannot be applied in a way that would foreclose the consideration of other substantial evidence tending to show the environmental effect to which the threshold relates might be significant"]; *Citizens for Non-Toxic Pest Control v. Department of Food & Agriculture (*1986) 187 Cal.App.3d 1575, 1587-1588 (state agency applying pesticides cannot rely on pesticide registration status to avoid further environmental review under CEQA); *Oro Fino Gold Mining Corporation v. County of El Dorado* (1990) 225 Cal.App.3d 872, 881-882 (rejects contention that project noise level would be insignificant simply by being consistent with general plan standards for the zone in question). *See also City of Antioch v. City Council of the City of Pittsburg* (1986) 187 Cal.App.3d 1325, 1331-1332 (EIR required for construction of road and sewer lines even though these were shown on city general plan); *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 712-718 (agency erred by "wrongly assum[ing] that, simply because the smokestack emissions would comply with applicable regulations from other agencies regulating air quality, the overall project would not cause significant effects to air quality.").

> interference with communication; noise-induced hearing loss; sleep disturbance effects; cardiovascular and psycho-physiological effects; performance reduction effects; annoyance responses; and effects on social behaviour.

(WHO, Guidelines for Community Noise, p. v.)

> The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments.

(WHO, Guidelines for Community Noise, p. iii.)

As discussed by Mr. Hubach:

> WHO's night-time standard for sleep disturbance inside bedrooms is 30 dBA, and outside bedrooms with "window open (outdoor values)" is 45 dBA. WHO's night-time and daytime standard for "speech intelligibility and moderate annoyance" for inside dwellings is 35 dBA. For outdoor living areas, WHO's daytime and evening standard for moderate annoyance is 50 dBA and for serious annoyance is 55 dBA. 2 [NOI-2a] cont.

(Exhibit 1, p. 3.) Yet, despite citing the WHO Guidelines, the DSEIR fails to use these standards as its thresholds of significance, and finds that "ambient plus project" noise levels much higher than the WHO's standards for harmful noise are less than significant.

Another human health and welfare based standard is provided by the State of California:

> State regulations include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are collectively known as the California Noise Insulation Standards and are found in Title 24 of the California Code of Regulations.
>
> The State of California updated its Building Code requirements with respect to sound transmission, effective January 2014. Section 1207 of the California Building Code (Title 24 of the California Code of Regulations) establishes material requirements in terms of sound transmission class (STC) 13 rating of 50 for all common interior walls and floor/ceiling assemblies between adjacent dwelling units or between dwelling units and adjacent public area. The previous code requirements (before 2014) set an interior performance standard of 45 dBA from exterior noise sources. This requirement will be re-instated in July of 2015.

(DSEIR, p. 5.3-10.) DSEIR does not tell us what buildings in area comply with this code. (See DSEIR § 5.3.3.4 [Sensitive Receptors], and Table 5.3-4.) However, as Mr. Hubach observes:

> Table 5.3-8 shows that all three receptors chosen for analysis will add construction noise to pre-existing ambient noise levels that already exceed the health and welfare based standards discussed above. As a result of construction operations (assuming all noise producing construction operations occur at the same time, noise levels at the Madrone Residential Tower will rise from 70.1 to 70.9 dBA (hourly Leq), at the Hearst Residential Tower from 71.2 to 80.8 dBA (hourly Leq), and at UCSF Hospital from 67 to 72.8 dBA (hourly Leq).

(Exhibit 1, p. 4.) Since the Project's noise, when added to background or ambient noise, exceeds the above health and welfare based standards, the impact is significant even if the impact does not violate the San Francisco Police Code.

3 [NOI-4]

For operational traffic noise, the DSEIR states:

> Traffic noise level significance is determined by comparing the increase in noise levels (traffic contribution only) to increments recognized by Caltrans as representing a perceptible increase in noise levels. Additionally, it is widely accepted methodology by both FTA18 and the Federal Interagency Committee on Noise (FICON)19 that thresholds should be more stringent for environments that are already noise impacted. Consequently, for noise environments where the ambient noise level is 65 dBA DNL or less, the significance threshold applied is an increase of 5 dBA or more, which Caltrans recognizes as a readily perceptible increase. In noise environments where the ambient noise level exceeds 65 dBA DNL, the significance threshold applied is an increase of 3 dBA or more, which Caltrans recognizes as a barely perceptible increase.

(DSEIR, p. 5.3-19.)

> Operational noise from non-transportation sources such as egress of patrons from events or sound amplification equipment in common areas are assessed based on noise increases of 8 dBA (for noise generated by commercial uses) over existing ambient (L90) levels and any applicable restrictions of the City's noise ordinance and Police Code. Although these operational noise increases would be of limited duration, they would be expected to occur throughout the life of the project and are therefore considered permanent changes in noise conditions.

(DSEIR, p. 5.3-19.)

As described by Mr. Hubach, for operational noise impacts (Impact NO-5), the DSEIR uses

4 [NOI-2b]

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a series of "ambient plus increment" thresholds. As discussed by Mr. Hubach, using "ambient plus increment" thresholds where existing noise levels are already high:

> disregards the fact the Project will make severe conditions worse. In addition, using these "ambient plus increment" thresholds for operational noise results in an unsustainable gradual increase in ambient noise. It is a formula for ever-increasing noise levels because each new project establishes a new, higher, baseline; then when the next project is approved, the incremental change will be added to the new baseline.

(Exhibit 1, p. 5.)

By ignoring the severity of existing noise levels and only looking to the "de minimis" nature of the Project's incremental effect, the DSEIR's noise impact determinations violate CEQA. (See *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120 ("*CBE*") ["[T]he relevant question"... is not how the effect of the project at issue compares to the preexisting cumulative effect, but whether "any additional amount" of effect should be considered significant in the context of the existing cumulative effect. [footnote omitted] In the end, the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant. [footnote omitted]"].)[4] *Communities* and *Kings County* teach that the significance of a cumulative impact depends on the environmental setting in which it occurs, especially the severity of existing environmental harm.

4 [NOI-2b] cont.

With respect to vibration impacts, as Mr. Hubach states:

> The DSEIR omits important information about the environmental setting. In particular, the DSEIR acknowledges that "Sensitive receptors to vibration include ... vibration-sensitive equipment." (DSEIR, p. 5.3-8.) But the DSEIR does not provide any evidence relating to the use of such equipment in the vicinity. Such information should include the type of equipment, the purpose of its use, its degree of sensitivity, and its distance from Project related sources of vibration.

5 [NOI-5]

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[4] *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 720-21 ["They contend in assessing significance the EIR focuses upon the ratio between the project's impacts and the overall problem, contrary to the intent of CEQA.... We find the analysis used in the EIR and urged by GWF avoids analyzing the severity of the problem and allows the approval of projects which, when taken in isolation, appear insignificant, but when viewed together, appear startling. Under GWF's 'ratio' theory, the greater the overall problem, the less significance a project has in a cumulative impacts analysis. We conclude the standard for a cumulative impacts analysis is defined by the use of the term 'collectively significant' in Guidelines section 15355 and the analysis must assess the collective or combined effect of energy development"].)

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In its impact assessment, the DSEIR inexplicably excludes also the users of vibration sensitive equipment from the category of sensitive receptors, and based on this policy decision, concludes that construction vibration effects are not significant, stating:

"As discussed in the 1998 FSEIR, construction vibration effects on sensitive equipment would be a concern for users of research buildings and could be an inconvenience. However, these users are not considered sensitive receptors, and therefore, construction vibration effects are not considered a significant environmental effect under CEQA." (DSEIR, p. 5.3-25.)

The DSEIR cannot omit an analysis of potentially significant effects by the simple expedient of arbitrarily defining the receptors of such effects as non-sensitive.

5 [NOI-5] cont.

Thank you for your attention to this matter.

Very Truly Yours,

Thomas N. Lippe

List of Exhibits

1. Letter dated July 22, 2015, from Acoustical Engineer Frank Hubach.

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Exh 1

FHA

22 July 2015

Mr. Tom Lippe, Esq.
Law Offices of Thomas N. Lippe APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Project: Warriors Event Center in Mission Bay
FHA # 648-02

Dear Mr. Lippe,

You requested that I review the analysis of this Project's noise impacts in the Draft Subsequent EIR dated 5 June 2015, Chapter 3.5. This letter report responds to your specific questions. My CV is attached.

1. Does the DSEIR use a reliable methodology to determine the significance of Impact NO-1 and Impact NO-5.

Impact NO-1 is "Construction of the proposed project would not cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. (Less than Significant)." (DSEIR, pp. 5.3-20 to 5.3-23.)

Impact NO-5 is "Operation of the proposed project would cause a substantial permanent increase in ambient noise levels in the project vicinity. (Significant and Unavoidable with Mitigation)." (DSEIR, pp. 5.3-32 to 5.3-39.)

In my opinion the DSEIR does not use a reliable methodology to determine whether Impact NO-1 or NO-5 is significant.

6 [NOI-3a]

The DSEIR omits important information about the environmental setting.

For example, to judge the noise impact on residents of the Hearst Tower, it is important to know whether these residents typically open their window to get fresh air or, conversely, whether the building is subject to any requirements to keep windows closed. This is because closed windows provide significant sound transmission loss.

It also important to know what kind of windows nearby buildings have, because standard windows provide much less sound transmission loss than acoustically-rated windows.

7 [NOI-2a]

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California State Building Code Section 1207 requires an interior performance standard of 45 dBA DNL. Given that windows in the Hearst Tower, and adjacent residences, are operable and ostensibly used for ventilation, achieving 45 dBA interior may be in jeopardy. It is unknown if the Hearst Tower has mechanical ventilation to allow the windows to be closed for noise control. Even if they do already have mechanical ventilation, their windows may not have sufficient sound transmission loss for the predicted increased noise levels.

The Title 24 compliance for Hearst Towers may have permitted windows to be open and not have required mechanical ventilation systems. If that is the case, they would need to keep windows open for fresh air and then suffer the increased noise.

I tried to find out if there is a ventilation system mandated by code for Hearst Tower. This is Section 1207.11 of the California State Building Code, which says in noisy settings, windows must be closed to achieve the state's 45 dB interior standard, in which case a mechanical ventilation system must be installed. I searched for an acoustical report typically filed with Planning and/or Department of Building Inspection (DBI) to see what original design requirement were in place. I visited DBI and spoke with Dwayne Farrell who said they had no record of Hearst Tower at 1560 3rd St, and only a crane permit for the parking garage on the opposite corner. He suggested I visit the inspectors and planners in the building to see if they could find a permit number or block and lot information. I did, to no avail. However, it was suggested that perhaps since it is a State building, the State Architect might have all records. So I contacted Luke Molinar, DSA, who did a records search but came up empty on this topic (See Attachment 1 [email exchange with Luke Molinar].) 7 [NOI-2a] cont.

Nevertheless, I visited the Project site on 8 July 2015, to make visual and aural observations. I walked along 3rd St from South St to 16th St, and South St to Terry Francois Blvd. The predominant noise is due to traffic – largely Muni, trucks and the occasional motorcycle. It was noticeably quieter away from 3rd St approaching the waterfront to the east. I spent some time in the pedestrian mall along Gene Friend Way.

I observed many of the windows in Hearst Tower and adjacent Mission Bay Housing were open. (See Attachment 2 [a photograph I took on 8 July 2015, showing part of the Mission Bay Housing building on the left and part of the Hearst Tower on the right], and Attachment 3 [a photograph I took on 8 July 2015, showing part of the Hearst Tower on the right].)

Therefore, regardless of whether the buildings are required to keep windows closed. The residents are opening them, presumably for fresh air.

For Impact NO-1 and Impact NO-5, the DSEIR uses a threshold of significance of the "ambient plus increment" type. For Impact No-1, the "ambient plus increment" threshold of significance is whether the "the increase in noise levels over existing conditions would be less than 10 dBA." (DSEIR, p. 5.3-23.)

This type of threshold discounts the significance or severity of pre-existing noise levels and treats them as if they are irrelevant to whether the incremental change caused by the Project is "significant." The DSEIR finds that "Peak cumulative construction activities would occur during a 3-month period in 2015–2016 and during this time, the increase in noise levels over existing conditions would be less than 10 dBA (without mitigation). All other periods of construction would similarly be under 10 dBA. Therefore, this impact would be less than significant." (DSEIR, p. 5.3-23.)

This conclusion is based on Table 5.3-8, which shows that all three receptors chosen for analysis have pre-existing ambient noise levels that are very loud already (i.e., Madrone Residential Tower is at 70.1 dBA (hourly Leq), Hearst Residential Tower is at 71.2 dBA (hourly Leq), and UCSF Hospital is at 67 dBA (hourly Leq). 8 [NOI-2b]

As a point of reference for these noise levels, the World Health Organization's (WHO) standards for harmful noise are much lower than these pre-existing noise levels. WHO's night-time standard for sleep disturbance inside bedrooms is 30 dBA, and outside bedrooms with "window open (outdoor values)" is 45 dBA. WHO's night-time and daytime standard for "speech intelligibility and moderate annoyance" for inside dwellings is 35 dBA. For outdoor living areas, WHO's daytime and evening standard for moderate annoyance is 50 dBA and for serious annoyance is 55 dBA.

Another point of reference for the pre-exiting noise levels a the three "sensitive receptor locations" selected by the DSEIR is the San Francisco Noise Ordinance. As the DSEIR describes it, section 2909(d) provides "maximum noise levels at any sleeping or living room in any dwelling unit located on residential property must not exceed 45 dBA between 10:00 p.m. and 7:00 a.m., and 50 dBA between 7:00 a.m. and 10:00 p.m" where source of the noise is "fixed sources of noise, such as building mechanical equipment and industrial or commercial processing
machinery." (DSEIR, pp. 5.3-13, 14.)

The DSEIR does not use the WHO standards at all. With respect to the San Francisco Noise Ordinance, the DSEIR does not use the 45 dBA between 10:00 p.m. and 7:00 a.m., and 50 dBA between 7:00 a.m. and 10:00 p.m standard for any aspect of the Project's noise except the fixed machinery (e.g. generators) because the noise ordinance does not use this standard to regulate the Project's noise from construction equipment or operational noise from increased traffic, crowds, concerts, etc.[1]

This approach may be useful to the City for Impacts NO-2 and NO-4, which assess the Project's consistency with other applicable plans and laws, but it does not makes sense for assessing the construction or operational impacts of the Project on actual people.

8 [NOI-2b] cont.

Table 5.3-8 shows that all three receptors chosen for analysis will add construction noise to pre-existing ambient noise levels that already exceed the health and welfare based standards discussed above. As a result of construction operations (assuming all noise producing construction operations occur at the same time, noise levels at the Madrone Residential Tower will rise from 70.1 to 70.9 dBA (hourly Leq), at the Hearst Residential Tower from 71.2 to 80.8 dBA (hourly Leq), and at UCSF Hospital from 67 to 72.8 dBA (hourly Leq). Since the Project's

The DSEIR's use of compliance with the San Francisco Noise Ordinance as a threshold for judging the significance of the Project's construction noise impacts (see DSEIR p. 5.3-17) appears to reflect a policy decision, because it is not based on science.

[1]The DSEIR states that: "The HUD regulations also include a goal (not a standard) that interior noise levels not exceed 45 dB DNL" (DSEIR, p. 5.3-9.) But HUD's goal of 45 DNL interior, is 10 dB greater than the 35 dB Leq level the DSEIR cites as a threshold for sleep disturbance (see DSEIR, 5.3-2), and 15 dB greater than the 30 dB Leq guideline given by WHO.
noise, when added to background or ambient noise, exceeds these health and welfare based standards, the impact is significant even if the impact does not violate the San Francisco Police Code standard.

The same is true of the DSEIR's use, for operational noise impacts, of a threshold of 8 dBA or 8 dBC above ambient noise, based on the San Francisco Noise Ordinance. (DSEIR, p. 5.3-13). The same is true of the DSEIR's use, for mobile sources of operational noise impacts, of "ambient plus increment" thresholds of significance:

> "Traffic noise level significance is determined by comparing the increase in noise levels (traffic contribution only) to increments recognized by Caltrans as representing a perceptible increase in noise levels. Additionally, it is widely accepted methodology by both FTA18 and the Federal Interagency Committee on Noise (FICON)19 that thresholds should be more stringent for environments that are already noise impacted. Consequently, for noise environments where the ambient noise level is 65 dBA DNL or less, the significance threshold applied is an increase of 5 dBA or more, which Caltrans recognizes as a readily perceptible increase. In noise environments where the ambient noise level exceeds 65 dBA DNL, the significance threshold applied is an increase of 3 dBA or more, which Caltrans recognizes as a barely perceptible increase."

(DSEIR, p. 5.3-17).

8 [NOI-2b] cont.

> "Consequently, for noise environments where the ambient noise level is 65 dBA DNL or less, the significance threshold applied is an increase of 5 dBA or more, which Caltrans recognizes as a readily perceptible increase. In noise environments where the ambient noise level exceeds 65 dBA DNL, the significance threshold applied is an increase of 3 dBA or more, which Caltrans recognizes as a barely perceptible increase."

(DSEIR, p 5.3-19)

Using these "ambient plus increment" thresholds where existing noise levels are already too high, as shown in Tables 5.3-9 and 5.3-10 (DSEIR, pp. 5.3-34, 36), disregards the fact that the Project will make already severe conditions worse. In addition, using these "ambient plus increment" thresholds for operational noise results in an unsustainable gradual increase in ambient noise. It is a formula for ever-increasing noise levels because each new project establishes a new, higher, baseline; then when the next project is approved, the incremental change will be added to the new baseline.

Therefore, the operational impact assessment needs to be redone using valid, science-based thresholds that relate to actual human health and welfare effects of noise.

In my opinion, is the Project will cause a significant increase in Impact NO-1 and Impact NO-5 above levels existing without the project. 8 [NOI-2b] cont.

2. Does the DSEIR use a reliable methodology to determine the significance of Impact NO-3?

Impact NO-3 is "Construction of the proposed project would not expose people and structures to or generate excessive groundborne vibration levels. (Less than Significant)." (DSEIR, pp. 5.3-24 to 5.3-26.)

In my opinion the DSEIR does not use a reliable methodology to determine whether Impact NO-3 is significant.

The DSEIR omits important information about the environmental setting. In particular, the DSEIR acknowledges that "Sensitive receptors to vibration include ... vibration-sensitive equipment." (DSEIR, p. 5.3-8.) But the DSEIR does not provide any evidence relating to the use of such equipment in the vicinity. Such information should include the type of equipment, the purpose of its use, its degree of sensitivity, and its distance from Project related sources of vibration. 9 [NOI-3b, NOI-5]

In its impact assessment, the DSEIR inexplicably excludes also the users of vibration sensitive equipment from the category of sensitive receptors, and based on this policy decision, concludes that construction vibration effects are not significant, stating:

> "As discussed in the 1998 FSEIR, construction vibration effects on sensitive equipment would be a concern for users of research buildings and could be an inconvenience. However, these users are not considered sensitive receptors, and therefore, construction vibration effects are not considered a significant environmental effect under CEQA."

(DSEIR, p. 5.3-25.)

Since UCSF is a "research hospital" is it safe to assume that scanning electron-beam microscopes are used by researchers and pathologists. These devices are extremely sensitive to low level vibration. It is common for them to have environmental criteria specifically for vibration. If the specified vibration levels are exceeded the image will blur rendering the instrument useless. Therefore, in my opinion, the DSEIR should include users of vibration-sensitive equipment in the category of sensitive receptors, and then assess the Project's impact on the users.

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For "Human annoyance" from groundborne vibration, the DSEIR uses a threshold of significance of : "For adverse human reaction, this analysis applies the "strongly perceptible" threshold of 0.1 inches per second PPV." (DSEIR, p. 5.3-25.) In my opinion, this threshold should be "perceptible, not "strongly perceptible."

In applying its "strongly perceptible" threshold, the DSEIR says:

> "The closest residence would be the UCSF Mission Bay Housing (Hearst Tower), approximately 200 feet from the project site while the nearest hospital would be approximately 560 feet away. A recent study of vibration induced by rapid impact compaction indicated that at a distance of 30 meters (100 feet), cumulative vibration energy results in maximum vibration level of 2.3 millimeters per second (0.09 inches per second). Because sensitive land uses would be more than 100 feet away, worst-case cumulative vibration levels generated by rapid impact compaction would be below the strongly perceptible threshold."

(DSEIR, p. 5.3- 25.) 9 [NOI-3b, NOI-5] cont

In my opinion, this conclusion is incorrect because the DSEIR's calculation of vibration does take into account the increased vibration on upper floors of this building. Soil attenuation varies with the type of soil and moisture content, and distance attenuation from 100 to 200 feet may only be a factor of 0.5, or less. Accordingly, actual PPV at the Hearst Tower is likely to be 0.045 ips, or considerably greater depending on site-specific parameters. In addition, the DSEIR's calculation does not take into account building resonance effects for above-grade floors which amplify vibration at certain frequencies. Recalculating to take this factor into account indicates vibration on upper floors would certainly be "perceptible" and likely "strongly perceptible."

Alternate Calculation:

rapid impact compaction - 0.09 ips PPV @100 feet
distance attenuation factor - x 0.5 from 100 to 200 feet
rapid impact compaction - 0.045 ips PPV @200 feet
soil attenuation variation - x 2 (6 dB) ground floor
result at Hearst Tower - 0.09 ips PPV @100 feet
resonant amplification - x 3 (10 dB)
result at Hearst Tower - 0.27 ips PPV upper floors
criterion for humans - 0.1 ips PPV "strongly perceptible"

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In my opinion, the Project likely to cause a significant increase in Impact NO-3 above levels existing without the project, particularly when compaction is occurring during construction. 9 [NOI-3b, NOI-5] cont.

Very truly yours,

Frank J. Hubach
President

attached: Attachment 1 [email exchange with Luke Molinar] (Attachment 1 to FHA Report.pdf)
Attachment 2 [photograph - Mission Bay Housing & Hearst Tower] (Attachment 2.pdf)
Attachment 3 [photograph - Hearst Tower] (Attachment 3.pdf)
Frank Hubach CV (FJHresume.pdf; expertCVfjh3.pdf)

FJH:fjh

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July 27, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: **Transportation Impacts** - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter. 1 [GEN-5]

This letter incorporates by reference, as comments on the DSEIR, all of the comments on the DSEIR contained in the July 23, 2015, letter report authored by traffic engineer Dan Smith (attached as Exhibit 1), and the July 21, 2015, letter report authored by traffic engineer Larry Wymer (attached as Exhibit 2).

I. THE DSEIR IS NOT SUFFICIENT AS AN INFORMATIONAL DOCUMENT WITH RESPECT TO TRANSPORTATION IMPACTS.

A. The DSEIR Fails to Assess the Project Traffic Impacts on the Entire Affected Environment.

2 [TR-2b]

The DSEIR studies Project-induced increases in congestion and delay, for both incremental and cumulative impacts, at twenty-two (22) intersections and six (6) freeway ramps, as shown in Table 1.

Table 1

Incremental Impact Assessment (With Implementation of the Special Events Transit Service Plan)	Incremental Impact Assessment (Without Implementation of the Special Events Transit Service Plan)	Cumulative Impact Assessment
Intersections at DSEIR, p. 5.2-18, Table 5.2-34 p. 5.2-121, Table 5.2-35 p. 5.2-123, Table 5.2-36 p. 5.2-172, Table 5.2-47 p. 5.2-174, Table 5.2-48	Intersections at DSEIR, p. 5.2-192, Table 5.2-53 p. 5.2-193, Table 5.2-54	Intersections at DSEIR, p. 5.2-214, Table 5.2-59 p. 5.2-217, Table 5.2-60.
Freeway ramps at DSEIR, p. 5.2-133, Table 5.2-37 p. 5.2-133, Table 5.2-38 p. 5.2-134, Table 5.2-39 p. 5.2-181, Table 5.2-49 p. 5.2-181, Table 5.2-50	Freeway ramps at DSEIR, p. 5.2-198, Table 5.2-55 p. 5.2-198, Table 5.2-66	Freeway ramps at DSEIR, p. 5.2-221, Table 5.2-61 p. 5.2-221, Table 5.2-62

2 [TR-2b] cont.

Remarkably, the DSEIR fails to disclose the criteria the City used to select these intersections and freeway ramps. More importantly, the DSEIR fails to disclose the criteria the City used to *exclude* other intersections and freeway ramps. The omission of this fundamentally important information renders the DSEIR so legally inadequate as an informational document that it frustrates CEQA's goal of providing the public with a meaningful opportunity to comment on the DSEIR.

Also, as shown in the attached report from traffic engineers Larry Wymer and Dan Smith, the DSEIR omitted from its area of study numerous intersections and freeway ramps that will also suffer potentially substantial increases in traffic congestion and delay. The omission of these intersections and freeway ramps from the DSEIR's analysis of the Project's effect on traffic also renders the DSEIR so legally inadequate as an informational document that it frustrates CEQA's goal of providing the public with a meaningful opportunity to comment on the DSEIR.

How did this happen? The DSEIR simply states: "The traffic impact assessment for the proposed project was conducted for 23 study intersections and six freeway ramp locations in the vicinity of the project site" (DSEIR, p. 5.2-72),[1] with no further explanation. The same is true for

[1]The DSEIR actually studies 22 intersections, not 23, in the tables listed in footnote 1.

the six freeway ramps. (DSEIR, p. 5.2-74.)

The DSEIR does inform the reader that:

> The impacts of the proposed project on the surrounding transportation network were analyzed using the Transportation Impact Analysis Guidelines issued by the Planning Department in 2002 (SF Guidelines 2002), which provides direction for analyzing transportation conditions and in identifying the transportation impacts of a proposed project.

(DSEIR, p. 5.2-69.) These Guidelines provide:

> 2. Project Setting
> The setting information shall be presented immediately following the Project Description as a discrete chapter or report section. The goal is to provide a brief but complete description of existing transportation infrastructure and conditions in the vicinity of the project. Normally, the described vicinity is a radius between two blocks and 0.25 mile, however, a larger area may be determined in the scoping process. *The specific perimeters of the study area, for both setting and project impact analysis, are to be confirmed as part of the approval for the scope of work.*

2 [TR-2b] cont.

(Transportation Impact Analysis Guidelines (October 2002), pp.6-7 (italics added).) Based on this text, the reader would expect to find the criteria and rationale for delimiting "the specific perimeters of the study area" in the Scope of Work which the City approved pursuant to these Guidelines as a prerequisite to preparation of the DSEIR. Unfortunately, this expectation is disappointed, because the City-approved Scope of Work is also silent on the topic. (DSEIR, Appendix TR, pp. TR-8 to TR 14.)

Consequently, the City must revise the DSEIR to include an analysis of the Project's congestion and delay impacts on the excluded intersections and freeway ramps and then recirculate the Revised DSEIR for at least 45 days for public review and comment.

B. The DSEIR Fails to Disclose the Severity of the Project's Impacts on Intersections and Freeway Ramps which the Project Will Cause to Deteriorate to Level of Service (LOS) F.

3 [TR-2f]

As explained by Dan Smith in his attached report, the DSEIR fails to disclose the severity of the Project's congestion and delay impacts on intersections and freeway ramps which the Project will cause to deteriorate to Level of Service (LOS) F.

The DSEIR discloses the Project will cause significant congestion and delay impacts at numerous intersections and freeway ramps in the "study area," where Project-induced increases in congestion and delay will cause deterioration in Level of Service (LOS) to LOS E or F. (See intersections and freeway ramps listed in footnote 1.) For the intersections and freeway ramps in the "study area" where Project-induced increases in congestion and delay will cause deterioration to LOS E, the DSEIR provides a measurement of the degree of severity of the significant impact (i.e., average delay for intersections or average density for freeway ramps).

However, for the intersections and freeway ramps in the study area where Project-induced increases in congestion and delay will cause deterioration to LOS F, the DSEIR fails to provide a full measurement of the degree of severity of the significant impact. Instead, for intersections pushed to LOS F, instead of presenting a measure of average delay, the DSEIR provides a "greater than" measurement of "80 seconds per vehicle." (See 5.2-74 and Tables cited above.) For freeway ramps pushed to LOS F, instead of providing the average density, the DSEIR provides no measurement of "existing plus project" density. Instead, the severity of the Project's impacts at intersections and freeway ramps pushed to LOS F has no upper limit, and remains undisclosed, other than to note that "demand exceeds capacity." (See 5.2-75, Table 5.2-19 and Tables cited above.) 3 [TR-2f] cont.

Thus, the DSEIR fails to comply with CEQA because, beyond making the binary determination that the Project's impacts on these intersections and freeway ramps are significant, the DSEIR fails to disclose the severity of these significant impacts. (See *Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831 ["The conclusion that one of the unavoidable adverse impacts of the project will be the 'increased demand upon water available from the Santiago County Water District' is only stating the obvious. What is needed is some information about how adverse the adverse impact will be"].) Consequently, the City must revise the DSEIR to include this missing information, then recirculate the Revised DSEIR for at least 45 days for public review and comment.

C. The DSEIR Fails to Identify the Significance and Severity of the Project's Impacts on Intersections Where the Project Will Use Parking Control Officers.

In its impact assessment tables for "Intersection Level of Service - Existing plus Project Conditions - With a SF Giants Evening Game – Weekday PM and Saturday Evening Peak Hour" (DSEIR, p. 5.2-172, Table 5.2-47) and "Intersection Level of Service - Existing plus Project Conditions - With a SF Giants Evening Game – Weekday Evening and Late Evening Peak Hour" p. 5.2-174, Table 5.2-48), the DSEIR measures the significance of impacts by the use of Level of Service (LOS) and delay measurements. 4 [TR-2f]

But for two intersections, King and Third streets, and King and Fourth streets, the DSEIR provides no LOS or delay measurements, and therefore, no information on whether the Project's congestion and delay impacts on these intersections are significant, and if so, the severity of these significant impacts.

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Instead, the DSEIR indicates that the Project calls for posting Parking Control Officers (PCOs) at these intersections at the times indicated. But the adoption of a mitigation measure cannot substitute for disclosing whether the Project's impacts on these intersections are significant or their severity.[2] 4 [TR-2f] cont.

D. The DSEIR's Analysis of the Project's Construction-Related Traffic Congestion and Delay Impacts Is Legally Flawed.

The DSEIR's analysis of the Project's construction related traffic congestion and delay impacts is legally flawed because it is based on invalid criteria, it fails to lawfully assess the Project's cumulative construction period impacts, and it improperly defers the development of mitigation measures to reduce the Project's construction-related traffic impacts to less than significant.

The DSEIR states "Construction related impacts generally would not be considered significant due to their temporary and limited duration." (DSEIR, p. 5.2-46.) This statement is placed in the section describing the DSEIR's thresholds of significance. Therefore, it appears this conclusion reflects a policy decision rather than a fact-based assessment. 5 [TR-10]

In the impacts analysis section, the DSEIR states: "Construction related impacts generally would not be considered significant due to their temporary and limited duration." (DSEIR p 5.2-111). Elsewhere the DSEIR quantifies the construction period's "temporary and limited duration" as 26 months. (DSEIR, p. 5.2-112.) However, the notion that the DSEIR can determine the Project's construction related traffic impacts to be "less than significant" based primarily on their temporary duration is legally and logically flawed because from a cumulative standpoint, the Project's construction impacts are part of an essentially permanent, not temporary, condition of ongoing construction in this part of San Francisco.

Indeed, the DSEIR's discussion of the Project's cumulative construction period impacts recognizes there are numerous other construction projects planned in Mission Bay and that the construction related traffic impacts of these projects will combine with this Project's construction related impacts. (DSEIR, p. 5.2-210 (Impact C-TR-1.) 6 [TR-10]

However, the DSEIR's discussion of the Project's cumulative construction period impacts

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[2]CEQA does not permit an agency to simply adopt mitigation measures in lieu of fully assessing a project's potentially significant environmental impacts because mere acknowledgment that an impact would be significant is inadequate; the EIR must include a detailed analysis of "how adverse" the impact would be. (*Lotus v. Department of Transportation* (2014) 223 Cal.App.4th 645, 655-56' *Galante Vineyards v. Monterey Peninsula Water Management Dist.* (1997) 60 Cal.App.4th 1109, 1123*; Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831.)

is flawed because it is constrained by several artificial limits.

First, as discussed in section I.A above, the impact assessment is limited to impacts and intersections and freeway ramps within the artificially restricted geographic "study area."

Second, the impact assessment considers only construction projects within the Mission Bay neighborhood without regard to whether other "past, present, or reasonably foreseeable future projects" may be "closely related" because their impacts may combine with the Project's impacts.

Third, the DSEIR's analysis of cumulative traffic impacts for *construction* of the project only references a handful of foreseeable projects located very close to the Project, and the DSEIR's discussion of these projects is solely in terms of whether their construction periods overlap with construction of this Project, as if the operational impacts of other "past, present, and reasonably foreseeable future projects" are not "closely related." (See DSEIR, p. 5.2-10 and 11.)[3] This is incorrect because "closely related" simply means the other projects' impacts may combine with the Project's impacts.

6 [TR_10] cont.

Table 3 in the attached report by Larry Wymer shows that it is possible to include a broader range of projects - across both time and area - in the assessment of the Project's cumulative construction period traffic impacts, and that when this is done, there are many Projects that will be under construction or operational in the period before, during, and after construction of the Project whose effects will combine with those of the Warriors Arena construction. Therefore, the Project's construction impacts are part of an essentially permanent, not temporary, condition of ongoing construction in this part of San Francisco and the DSEIR errs by basing its determination of significance on the "limited duration" of the construction period. (DSEIR, p. 5.2-212.)

The second basis for the DSEIR's less-than-significant determination is the DSEIR's statement that "construction activities would be ... required to be conducted in accordance with City

[3]These projects are:
- 1.13 million gsf of UCSF LRDP projects under construction at the Mission Bay Campus, including, the UCSF East Campus project on Blocks 33/34,
- Construction of Bayfront Park,
- realignment of Terry A. Francois Boulevard,
- construction of a neighborhood park on the north side of Mariposa Street east of Owens Street,
- the Exchange project on Mission Bay Block 40,
- the Family House project on Mission Bay Block 7 East,
- the Residential and Hotel project on Mission Bay Block 1,
- the 360 Berry Street project on Mission Bay Block N4/P3, and
- Caltrain's Peninsula Corridor Electrification Project.

requirements." (DSEIR, p. 5.2-212.) This vague assurance is meaningless because the DSEIR does not specify what these " City requirements" are, does not specify a performance standard that these City requirements would either impose or achieve, and presents no evidence that these unspecified "City requirements" are likely to avoid significant cumulative construction related traffic effects. (See *Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 95 (*CBE*); *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; 1394 (*Gentry*).

The third and final basis for the DSEIR's less-than-significant determination is "Improvement Measure I-TR-1: Construction Management Plan and Public Updates." The DSEIR suggests this Plan would help avoid significant cumulative construction related traffic effects. (DSEIR, p. 5.2-212.) But it is improper for the DSEIR to rely on Improvement Measure I-TR-1 to help reduce impacts to less than significant because it is not identified as a mitigation measure necessary to substantially reduce significant Project impacts; therefore, it is not enforceable. (CEQA Guideline 15126.4(a)(4).)

6 [TR-10] cont.

Finally, the DSEIR fails to quantify the Projects' construction period impacts, presumably based on its qualitative conclusion that unspecified "City requirements" and "Improvement Measure I-TR-1" will avoid significant impacts. This puts the cart before the horse.[4]

E. The DSEIR's Analysis of the Project's Operational Traffic and Transit Congestion and Delay Impacts Is Legally Flawed.

1. The DSEIR understates traffic and transit volumes in the PM peak period of 4:00 to 6:00 PM by using "time of arrival" at the Arena as a proxy measurement for "time of travel."

In modeling traffic and transit impacts, the DSEIR assumes only 5% of basketball game attendees will be traveling in the "study area" in the PM peak period of 4:00 to 6:00 p.m. Table 5.2-21 states that 5% of arrivals are expected before 6:00 p.m. for 7:30 p.m. weekday basketball games; another 11% will arrive between 6:00 and 6:30 p.m. (DSEIR, p. 5.2-83.) This data is based on turnstile counts of people entering the arena.

7 [TR-2d]

As explained by Dan Smith in his attached report, this proxy measurement does not provide reliable data as to when game or event attendees are actually traveling through affected intersections or freeway ramps or using affected transit routes:

> These considerations are so obvious to any transportation professional knowledgeable about sports stadium transportation issues that the analysis presented

[4]See footnote 2 above.

> in the DSEIR cannot be said to constitute the good faith effort to disclose impact that the California Environmental Quality Act demands. Since the entire analysis of transportation impacts flows from the estimate of trip generation and time-of-travel analysis, the entire transportation impact component of the DSEIR must be redone to accurately reflect the time that event attendees are actually traveling on the transportation system instead of the time they enter the event venue.

(Exhibit 1, p. 3.)

In his analysis, Mr. Smith found:

> it seems highly probable that as much as one-third or more of the trips that the DSEIR considers to take place in the 6 to 7 PM period and the 7 to 8 PM period would actually be on the transportation system in the more critical 5 to 6 PM commute peak hour. That would put 7,466 event-related travelers on the transportation system in the 5 PM to 6 PM period instead of the 1,866 assumed in the DSEIR, a difference that would likely result in transportation impacts not disclosed in the DSEIR and/or intensification of impacts and mitigation needs of those that were disclosed.

(Exhibit 1, p. 3.)

Even just applying common sense to the DSEIR's data indicates that many or most of the 11% that the DSEIR says arrive at the turnstile between 6:00 and 6:30 p.m. would be traveling to the event in the PM peak period of 4:00 to 6:00 pm. This minimal adjustment alone changes the assumption on which the modeling is based from 5% to 16% traveling in the "study area" in the PM peak period of 4:00 to 6:00 pm. As shown by Mr. Smith, this minimal adjustment more than doubles the Project's contribution of traffic to affected intersections, and would change the DSEIR's determination from less-than-significant to significant at some intersections. (Exhibit 1, p. 4.)

This issue was flagged in public scoping comments on the DSEIR. (DSEIR, p. 2-15.) Yet, somehow, the DSEIR did not adjust its reliance on turnstile data to develop a reliable metric to use instead. Instead, the DSEIR offers a series of weak or irrelevant rationales for its methodology, including:

> because basketball games typically start at 7:30 p.m. a higher percentage of inbound event attendees would travel to the event center during the 6:00 to 8:00 p.m. period than during the 4:00 to 6:00 p.m. commute peak period.

(DSEIR p. 5.2-71); and

7
[TR-2d]
cont.

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> the SF Guidelines do not include travel demand characteristics for the specialized uses (e.g., sports events, conventions, and other events) that would take place at the proposed event center. Similarly, standard trip generation resources, such as the Institute of Transportation Engineer's Trip Generation Manual, do not include sufficiently detailed trip generation data for such specialized uses. Therefore, the travel demand for the event center component of the proposed project was based on the estimated attendance, as well as information on current travel characteristics of Golden State Warriors basketball attendees at the Oracle arena in Oakland.

(DSEIR, p. 5.2-81); and

> The data are based on information provided by the Golden State Warriors for their current facility, which was then adjusted to provide for earlier arrival patterns based on comparable information collected at similar NBA facilities to account for the increased availability of retail and restaurant uses at the proposed project site compared to Oracle Arena in Oakland. A summary of this data is provided in the travel demand technical memorandum included in Appendix TR.

(DSEIR, p. 5.2-82.)[5]

7
[TR-2d]
cont.

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[5] In the "Travel Demand Methodology and Results" section of Chapter 5.2, the DSEIR states:

> The Basketball Game scenario reflects the travel demand of the office, retail and restaurant uses, plus an evening basketball game. The transportation impact analysis of the Basketball Game scenario was conducted for four analysis hours (weekday p.m., weekday evening, weekday late evening, and Saturday evening), for conditions without and with an overlapping SF Giants evening game at AT&T Park.
>
> Table 5.2-21 presents the expected temporal distribution of arrival and departure patterns for basketball game attendees of the proposed project. The data are based on information provided by the Golden State Warriors for their current facility, which was then adjusted to provide for earlier arrival patterns based on comparable information collected at similar NBA facilities to account for the increased availability of retail and restaurant uses at the proposed project site compared to Oracle Arena in Oakland. A summary of this data is provided in the travel demand technical memorandum included in Appendix TR. Based on this information, it was assumed that approximately 5 percent of arrivals to a basketball game would occur during the p.m. peak hour (5:00 to 6:00 p.m.), and up to 66 percent of arrivals would occur during the evening peak hour (7:00 to 8:00 p.m.). Similarly, up to 70 percent of the departures would occur during the late evening peak hour (9:00 to 10:00 p.m.).

A discussion and summary of the data from other venues than Oracle is provided in DSEIR, Appendix TR, at pp. TR-21 to TR-25 and TR-37 [Appendix A, p. A-9]. The table at page TR-37 provides time of arrival data from, in addition to Oracle, six purportedly "comparable" venues, namely: Icon Venue Group, Houston, Phoenix, Sacramento, Brooklyn (2013-2014), and Brooklyn (2014-2015). An interesting fact about this table is that the data for 4:00 to 6:00 p.m. arrivals at four of these six venues (i.e., Icon Venue Group, Houston, Phoenix, Sacramento) is "included in" the data for later time periods. So, in fact, the only purportedly comparable venue for which the DSEIR presents supporting data is Brooklyn (2013-2014 and 2014-2015). The venue with the largest proportion of arrivals in the 4:00 to 6:00 p.m. period is Brooklyn (2014-2015), with 4.1%.

In short, the City and the Warriors failed to develop reliable accurate, reliable data on the key variable in the entire transportation analysis, i.e., the number of people traveling to events in the peak PM time period when traffic and transit crowding are at their worst. A lead agency "must use its best efforts to find out and disclose all that it reasonably can." (CEQA Guideline, § 15144.) 7 [TR-2d] cont.

The above quoted rationales do not excuse this failure. The scoping comments flagging this issue were submitted to the City between November 19, 2014, and December 19, 2014, during the middle of the basketball season. (DSEIR, p. 2-8 and 2-9, 2-15.) The Warriors played fifty-seven (57) games between December 19, 2014, through the close of the regular season on April 15, 2015.[6] There are thirty (30) teams in the NBA.[7] That means there were approximately eight-hundred and fifty five (i.e., 15 x 57 = 855) regular season games played in the 2014-2015 regular season after December 19, 2014. In the playoffs following the regular season, sixteen teams played a total of seventy-nine games after April 15, 2015.[8]

Therefore, both the Warriors and the City had ample opportunity to conduct market research by interviews and exit polling of a sample of the hundreds of thousands of fans attending these games to discover how far in advance of arriving at the turnstile they traveled through the traffic and transit impacted area surrounding the venue. The City's and Warriors' decision to pass up this opportunity after being informed of the issue does not satisfy their duty to use best efforts to find out

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> Event staff for basketball games would be expected to arrive between 4:30 and 5:00 p.m. and would be on post prior to the gate opening time; event staff would leave between 11:00 and 11:30 p.m.

(DSEIR, p. 5.2-82.)

[6] http://www.nba.com/warriors/schedule,

[7] http://www.nba.com/teams/?ls=iref:nba:gnav

[8] http://www.nba.com/playoffs/

and disclose all they reasonably can.

Indeed, the City was fully aware of the need to gather information more relevant to fans "time of travel" than turnstile counts and made some efforts to do so. But it failed to disclose that there are alternative metrics for "time of travel" or the results of its efforts in this regard. For example, an email exchange dated January 12, 2015, between the City's EIR consultant (ESA) and City Planning officials includes data on arrivals before 6:00 p.m. at the Arco Arena parking lot for a 7:00 p.m. Sacramento Kings game and arrivals before 6:00 p.m. in buildings for other NBA venues. Thus, the City was aware of other measurements (e.g., parking lot entry rather than turnstile counts) that could more accurately predict peak PM period travel to games. 7 [TR-2d] cont.

Also, the arrival numbers cited in this email exchange show 14% arriving at the Arco Arena parking lot before 6 p.m. for one 7 p.m. game and 9% arriving before 6 p.m. in buildings for other NBA venues. These numbers indicate the DSEIR's assumption that 5% of fans will be traveling through the study area before 6 p.m. for 7:30 p.m. games is vastly understated. Yet the DSEIR fails to reference these numbers.

The DSEIR must be revised to provide accurate peak period traffic data and analysis

2. The DSEIR's Analysis of the Project's Cumulative Impacts Does Not Comply With CEQA.

a. The 5% threshold of significance for impacts at intersections and freeway ramps operating at LOS E or F violates CEQA.

For intersections operating at LOS E or F, the DSEIR uses a threshold of significance of "a contribution of 5 percent or more to the traffic volumes at the critical movements operating at LOS E or LOS F" (DSEIR, p. 5.2-73-74.) For freeway ramps operating at LOS E or F, the DSEIR uses a threshold of significance of "a contribution of 5 percent or more to the traffic volumes on the ramp." (DSEIR, p. 5.2-74.)[9] 8 [TR-2i]

No rationale for the 5% threshold is provided. Indeed, blind reliance on this number ignores the law governing the assessment of cumulative impacts, which requires a fact based assessment that takes into account the severity of preexisting impacts. A one-size-fits-all "ratio" violates CEQA. (See *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120 ("*Communities*"); *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d

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[9] "The project may result in significant adverse impacts at intersections that operate at LOS E or LOS F under existing conditions depending upon the magnitude of the project's contribution to the worsening of the average delay per vehicle." (DSEIR, p. 5.2-45.)

692, 720-21 (*Kings County*). *Communities* and *Kings County* teach that the significance of a cumulative impact depends on the environmental setting in which it occurs, especially the severity of existing environmental harm, and that focusing on the magnitude (i.e., "ratio") of the Project's incremental contribution to severe preexisting harm is inconsistent with the definition of cumulative impacts under CEQA.[10] 8 [TR-2i] cont.

b. The year 2040 baseline for assessing the significance of the Project's cumulative impacts violates CEQA.

The DSEIR assesses the Project's incremental traffic and transit impacts and its cumulative traffic and transit impacts pegged to the year 2040, which is 25 years in the future.[11] While the Alliance supports such long range forecasting in general, as used in this DSEIR the year 2040 baseline for assessing the significance of the Project's cumulative impacts is misleading, for two reasons. 9 [TR-2h]

First, this approach overlooks the Project's cumulative traffic and transit impacts pegged to its first 1 to 10 years of operations. This time period is of immediate interest to the citizens of San Francisco because the traffic mess predicted by the DSEIR will be upon them then. And who among them know whether they will even be in the City by the year 2040. Thus, while including a year 2040 baseline is not in itself objectionable, the omission of a baseline 5 to 10 years in the future

[10](*Communities,* 103 Cal.App.4th at p. 120 ["[T]he relevant question"... is not how the effect of the project at issue compares to the preexisting cumulative effect, but whether "any additional amount" of effect should be considered significant in the context of the existing cumulative effect. [footnote omitted] In the end, the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant. [footnote omitted]"]; *Kings County,* 221 Cal.App.3d at pp. 720-21 ["They contend in assessing significance the EIR focuses upon the ratio between the project's impacts and the overall problem, contrary to the intent of CEQA.... We find the analysis used in the EIR and urged by GWF avoids analyzing the severity of the problem and allows the approval of projects which, when taken in isolation, appear insignificant, but when viewed together, appear startling. Under GWF's 'ratio' theory, the greater the overall problem, the less significance a project has in a cumulative impacts analysis. We conclude the standard for a cumulative impacts analysis is defined by the use of the term 'collectively significant' in Guidelines section 15355 and the analysis must assess the collective or combined effect of energy development"].)

[11]"Future 2040 cumulative traffic volumes were estimated based on cumulative development and growth identified by the San Francisco County Transportation Authority SF-CHAMP travel demand model, using model output that represents Existing conditions and model output for 2040 cumulative conditions." (DSEIR, p. 5.2-110.)

renders the DSEIR informationally defective. 9 [TR-2h] cont.

Second, by using a baseline projected to the year 2040, the DSEIR inflates the denominator in the 5% "ratio" it uses to determine the significance of Project cumulative impacts at LOS E and F intersections, thereby masking actual significant effects. (See Exhibit 2 (D. Smith), p. 25.) 10 [TR-2h]

c. The DSEIR's use of a "projection" based approach to the Project's cumulative impacts is misleading.

The DSEIR states that: 11 [TR-2h]

> Future 2040 cumulative traffic volumes were estimated based on cumulative development and growth identified by the San Francisco County Transportation Authority SF-CHAMP travel demand model, using model output that represents Existing conditions and model output for 2040 cumulative conditions. .... The 2040 cumulative traffic volumes take into account cumulative development projects in the project vicinity, such as the build-out of the Mission Bay Area, completion of the UCSF Research Campus and the UCSF Medical Center, the Mission Rock Project at Seawall Lot 337, Pier 70, etc., as well as the additional vehicle trips generated by the proposed project.

(DSEIR, p. 5.2-110.)[12]

The DSEIR presents no evidence supporting the DSEIR's assumption that the year 2040 projection is reliable for predicting future traffic and transit demand, other than the vague assertion that the "SF-CHAMP travel demand model, using model output that represents Existing conditions and model output for 2040 cumulative conditions ... has been validated to represent future 12 [TR-2h]

[12]In the section titled "Approach to Cumulative Impact Analysis" (DSEIR 5.1-6, § 5.1.5), the DSEIR asserts that the CEQA Guidelines provide "two approaches to a cumulative impact analysis ... (a) the analysis can be based on a list of past, present, and probable future projects producing related or cumulative impacts; or (b) a summary of projections contained in a general plan or related planning document can be used to determine cumulative impacts. The projections model includes individual projects and applies a quantitative growth factor to account for other growth that may occur in the area." (DSEIR, p. 5.1-7.) The DSEIR asserts that "The analyses in this SEIR employ both the list-based approach and a projections-based approach, depending on which approach best suits the individual resource topic being analyzed ... the Transportation and Circulation analysis relies on a citywide growth projection model that also encompasses many individual projects anticipated in and surrounding the project site vicinity, which is the typical methodology the San Francisco Planning Department applies to analysis of transportation impacts." (DSEIR, p. 5.1-7.)

transportation conditions in San Francisco." (DSEIR, p. 5.2-110.) But, as explained by Mr Smith, the SF-CHAMP model's margin of error is greater than the 5% threshold used to determine the significance of Project cumulative impacts at LOS E and F intersections. (See Exhibit 2 (D. Smith), p. 25.) Therefore, SF-CHAMP is the wrong tool for the task.

12 [TR-2h] cont.

Further, given the sheer number of developments in this area of the City (see table 3 of Mr. Wymer's report) and the breakneck pace of their approval and implementation, the projection approach is misleading, not informative. Therefore, the DSEIR's cumulative impact assessment must use a list based approach to forecast reasonably foreseeable travel demand, and do so in a meaningful time frame.

F. The DSEIR's Methodology for Analyzing Project Impacts on the Transit System Is Legally Flawed.

The DSEIR summarizes its methodology for analyzing Project Impacts on the transit system, as follows:

> The impact of additional transit ridership generated by the proposed project on local and regional transit providers was assessed by comparing the projected ridership to the available transit capacity at the maximum load point. Transit "capacity utilization" refers to transit riders as a percentage of the capacity of the transit line, or group of lines combined and analyzed as screenlines across which transit lines travel. The transit analyses were conducted for the peak direction of travel for each of the analysis time periods.

13a [TR-2g]

(DSEIR, p. 5.2-75.)

This methodology contains two flaws. First, it suffers from the same unwarranted and unsupported assumptions about basketball fans' time of travel to the arena for games described above. Second, the DSEIR's use of transit screenline and route capacities is also misleading and unsupported.

1. The DSEIR's use of transit screenline and route capacities is misleading and unsupported.

For its Project specific (or incremental) transit impact analysis, the DSEIR uses the following thresholds of significance:

> The proposed project was determined to have a significant transit impact if project-generated transit trips would cause downtown or regional screenlines, and, where applicable, directly affected routes, operating at less than its capacity

> utilization standard under existing conditions, to operate at more than capacity utilization standard. For Muni, the capacity utilization standard is 85 percent for conditions without an event at the project site, and 100 percent for conditions with an event at the project site. For regional operators, the capacity utilization standard is 100 percent for conditions without and with an event at the project site.

(DSEIR, p. 5.2-76, 77.)

For its cumulative transit impact analysis, the DSEIR uses the following thresholds of significance:

> Under 2040 cumulative conditions, the proposed project was determined to have a significant cumulative impact if its implementation would cause the capacity utilization at the Muni and regional screenlines and/or corridors within the screenlines to exceed the capacity utilization standard noted above for conditions without and with an event at the project site, or if its implementation would contribute considerably to a screenline or corridor projected to operate at greater than the capacity utilization standard under 2040 cumulative plus project conditions (i.e., a contribution of 5 percent or more to the transit ridership on the screenline or route). In addition, if it was determined that the proposed project would have a significant project-specific transit impact under existing plus project conditions, then the impact would also be considered a significant cumulative impact under 2040 cumulative conditions.

13a [TR-2g] cont.

(DSEIR, p. 5.2-76, 77.)

For both Project specific (incremental) and cumulative impacts, the DSEIR uses "capacity utilization standards" as baselines against which to measure the Project's impacts. Capacity utilization standards are specific percentages of the theoretical maximum capacity of a transit screenline or transit line.

For Project specific (or incremental) thresholds of significance for Muni, the DSEIR uses two different capacity utilization standards against which to measure the Project's impacts. For conditions without an event at the Project site, the capacity utilization standard is 85 percent of maximum theoretical capacity of the transit screenline or line. For conditions with an event at the Project site, the capacity utilization standard is 100 percent of maximum theoretical capacity.

If the question to be answered by the transit impact analysis is whether the Project will inflict significant suffering on people riding Muni, why does the DSEIR use two different baselines for its impact assessment. If exceeding 85% inflicts suffering without an event, then exceeding 85% will inflict suffering with an event.

The DSEIR does not examine this use of inconsistent baselines. However, the June 21, 2013, Planning Department Memorandum "Transit Data for Transportation Impact Studies" (at Appendix-TR, p. TR-624) states:

> The SFMTA Board has adopted an "85 percent" capacity utilization standard for transit vehicle loads. In other words, transit lines should operate at or below 85 percent capacity utilization. The SFMTA Board has determined that this threshold more accurately reflects actual operations and the likelihood of "pass-ups" (i.e., vehicles not stopping to pick up more passengers). The Planning Department, in preparing and reviewing transportation impact studies, has similarly utilized the 85 percent capacity utilization as a threshold of significance for determining peak period transit demand impacts to the SFMTA lines.

13a [TR-2g] cont.

(DSEIR, Appendix-TR, p. TR-624.) Thus, the 85 percent capacity utilization threshold apparently has nothing to do with the suffering of Muni's passengers; it simply reflects the reality of Muni's operations. And even if 85% of capacity is the break point at which Muni drivers tend to refuse to pick up more passengers due to overcrowding, then using 100% of capacity as a threshold of significance is entirely unsupportable.

For its cumulative impact analysis, the DSEIR uses the same baselines and thresholds of significance discussed above plus one more if the Project "would contribute considerably to a screenline or corridor projected to operate at greater than the capacity utilization standard under 2040 cumulative plus project conditions (i.e., a contribution of 5 percent or more to the transit ridership on the screenline or route)."

13b [TR-2i]

The 5% threshold for determining a Project's contribution to be "considerable" is stated at Appendix-TR, p. TR-625. No rationale for this number is provided. A Project contributing 1% more capacity utilization to a screenline that usually operates at 84%, resulting in a total capacity utilization of 85%, may not contribute considerably to a significant impacts, while a Project contributing 1% more capacity utilization to a screenline that usually operates at 94%, resulting in a total capacity utilization of 95%, may well contribute considerably to a significant impact. A one-size-fits-all "ratio" violates CEQA. (See *Communities, supra; Kings County, supra*.)

G. The DSEIR Unlawfully Defers the Development of Mitigation Measures.

14 [TR-12d]

The DSEIR sketches out a number of concepts for mitigating the Project's significant transportation effects where it defers the development of specific mitigation measure until a future date. The DSEIR's deferral all of the mitigation measures listed below in this section does not meet CEQA requirements to identify specific mitigation measures in the Draft EIR so the public may meaningfully review and comment on them. These measures violate CEQA's requirements for deferred mitigation because the DSEIR does not specify binding performance standards by which

the measures' success can be judged, there is no evidence it is impracticable to develop and include the specific measures in the DSEIR, there is no evidence the measures will be effective, there is no evidence the measures are feasible, there is no evidence the measures will be implemented because the Project Sponsor may deem them infeasible, and the measures are not enforceable. (See *Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 95 (*CBE*); *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; 1394 (*Gentry*).

The listed measures are qualified by language such as "if feasible" or "could include" (e.g., Measure M-TR-2b). Such qualifications render the measures illusory, unenforceable, and ineffective for purposes of the DSEIR's claim of substantial reductions in impact or reductions in impact to less-than-significant levels. (See *Federation of Hillside & Canyon Associations v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1260-1262; *Lincoln Place Tenants Association v. City of Los Angeles* (2005) 130 Cal.App.4th 1491, 1508 ["mitigating conditions are not mere expressions of hope..."].)

Even the listed measures that include performance standards (e.g., Measure M-TR-18) do not require they be achieved. For example, Measure M-TR-18 only requires that the Project Sponsor "work to achieve" the performance standards. CEQA requires that deferred mitigation measures include binding performance standards.

14 [TR-12d] cont.

- Mitigation Measure M-TR-2b: Additional Strategies to Reduce Transportation Impacts. (DSEIR, p. 1-15.)
- Mission Bay FSEIR Mitigation Measure E.47: Transportation System Management Plan. (DSEIR, p. 1-17.)
- Mitigation Measure M-TR-5a: Additional Caltrain Service. (DSEIR, p. 1-18.)
- Mitigation Measure M-TR-5b: Additional North Bay Ferry and/or Bus Service. (DSEIR, p. 1-19.)
- Mitigation Measure M-TR-9a: Crane Safety Plan for Project Construction. (DSEIR, p. 1-20.)
- Mitigation Measure M-TR-9d: Event Center Exterior Lighting Plan. (DSEIR, p. 1-21.)
- Mitigation Measure M-TR-11b: Participation in the Ballpark/Mission Bay Transportation Coordinating Committee. (DSEIR, p. 1-22.)
- Mitigation Measure M-TR-11c: Additional Strategies to Reduce Transportation Impacts of Overlapping Events. (DSEIR, p. 1-23.)
- Mitigation Measure M-TR-13: Additional Muni Transit Service during Overlapping Events.

(DSEIR, p. 1-24.)

- Mitigation Measure M-TR-14: Additional BART Service to the East Bay during Overlapping Events. (DSEIR, p. 1-24.)

- Mitigation Measure M-TR-18: Auto Mode Share Performance Standard and Monitoring. (DSEIR, p. 1-25.)

14 [TR-12d] cont.

H. The DSEIR's Discussion of Transportation Impacts Is Incomplete.

The DSEIR analyzes transportation impacts in two broad scenarios: with and without implementation of the Special Events Transit Service Plan.

In the scenario "With Implementation of the Special Events Transit Service Plan" the DSEIR analyzes two narrower scenarios: with and without a Giants game. In each Giants game scenario, the DSEIR analyzes three narrower scenarios: no event, convention event, and basketball game. The result is six scenarios applied to ten different transportation resources, as shown in Table 2.

15 [TR-2a]

Table 2

<table>
<tr><td colspan="6">With Implementation of the Special Events Transit Service Plan</td></tr>
<tr><td colspan="3">Without Giants game</td><td colspan="3">With Giants game</td></tr>
<tr><td>No event</td><td>Convention event</td><td>Basketball game</td><td>No event</td><td>Convention event</td><td>Basketball game</td></tr>
<tr><td colspan="3">TR-1 Construction - Traffic LS
TR-2 Traffic - Intersections SUM
TR-3 Traffic - Freeway Ramps SUM
TR-4 Transit - Muni LS
TR-5 Transit - Regional - Caltrain SUM
TR-6 Pedestrian LSM
TR-7 Bicycle LS
TR-8 Loading LS
TR-9a Construction Helipad LSM
TR-9b Const. Lights Helipad LS
TR-9c Operation Helipad LS
TR-9b Operation Lights Helipad LSM
TR-10 Emergency Vehicle Access LS</td><td colspan="3">TR-1 Construction - Traffic LS
TR-11 Traffic - Intersections SUM
TR-12 Traffic - Freeway Ramps SUM
TR-13 Transit - Muni LSM
TR-14 Transit - Regional -All SUM
TR-15 Pedestrian LSM
TR-16 Bicycle LS
TR-17 Emergency Vehicle Access LS</td></tr>
</table>

In the scenario "Without Implementation of the Special Events Transit Service Plan"

the DSEIR analyzes only one narrower scenario: without a Giants game and with a basketball game. The result is one scenario applied to ten different transportation resources, but the omission of the other five scenarios, as shown in Table 3.

Table 3

Without Implementation of the Special Events Transit Service Plan	
Without Giants game	
Basketball Game	
TR-1 Construction - Traffic	LS
TR-18 Traffic - Intersections	SUM
TR-19 Traffic - Freeway Ramps	SUM
TR-20 Transit - Muni	SUM
TR-21 Transit - Regional	SUM
TR-22 Pedestrian	LSM
TR-23 Bicycle	LS
TR-24 Loading	LS
TR-25Emergency Vehicle Access	LS

15 [TR-2a] cont.

Since the scenario "Without Implementation of the Special Events Transit Service Plan" is likely enough to justify including it in the DSEIR, the DSEIR should include the other five omitted scenarios.

In addition, the DSEIR's cumulative impact analysis does not even inform the reader if it is performed for the "with" or "without" scenario for "Implementation of the Special Events Transit Service Plan." The cumulative impact analysis should include both scenarios, and should inform the reader which is which.

Thank you for your attention to this matter.

Very Truly Yours,

Thomas N. Lippe

O-MBA10L4

Tiffany Bohee
c/o Brett Bollinger
Re: Mission bay Alliance comments on the Warriors Arena Project DSEIR: **Transportation Impacts**
July 27, 2015
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List of Exhibits

1. July 23, 2015, letter report authored by traffic engineer Dan Smith.
2. July 21, 2015, letter report authored by traffic engineer Larry Wymer.
3. January 12, 2015, email exchange dated between the City's EIR consultant (ESA) and City Planning officials.
4. December 2013, Final Report, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.
5. Final Report Appendices, Appendix B: White Paper, TRANSPORTATION NEEDS, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.
6. Final Report Appendices, Appendix C: CORE CIRCULATION STUDY, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.
7. Final Report Appendices, Appendix K: SF TRAVEL AT A GLANCE, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.
8. May 21, 2013, San Francisco Transportation Plan Update, SPUR Annie Alley Forum, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.

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O-MBA10L4
Exh 1

SMITH ENGINEERING & MANAGEMENT

July 26, 2015

Mr. Tom Lippe
Law Offices of Thomas N. Lippe, APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Draft Subsequent Environmental Impact Report for Event Center and Mixed Use Development at Mission Bay Blocks 29-32. SCN:2014112045

P15003

Dear Mr. Lippe:

Per your request, I have reviewed the Draft Subsequent Environmental Impact Report (hereinafter "the DSEIR") on the above referenced Project in the City and County of San Francisco (hereinafter "the City"). The focus of my review is in regard to matters involving transportation and circulation. My qualifications to perform this review include registration as both a Civil and Traffic Engineer in California and 47 years professional consulting practice in these fields. I have prepared, reviewed, and commented on the traffic and circulation components of numerous environmental impact documents under the California Environmental Quality Act (hereinafter "CEQA"), working for Lead Agencies, Responsible Agencies and private citizens and organizations. I am familiar with the Project vicinity, having lived and worked in the Bay Area since 1967 and having been involved in numerous significant projects affecting the San Francisco Waterfront including a decade of planning studies for the Mission Bay development. My professional resume is attached. My comments follow.

The DSEIR's Transportation Impact Analysis Understates and Fails To Disclose and Mitigate Arena Event Impacts on PM Commute Peak Hour Travel Because It Fails to Consider the Time and Duration of Attendees Travel In Advance of Passing Through Venue Entry Turnstiles 16 [TR-2d]

The DSEIR considers turnstile data on time of arrival at the Golden State Warriors current venue site (Oracle Arena) and other basketball venues to

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estimate how many attendees traveling to a game with a 7:30 PM start time would be traveling on the area transportation system in the 4 to 6 PM peak commute period versus in the 6 to 8 PM early evening peak shoulder period. However, it uses an overly simplistic relationship between turnstile arrival data and whether the attendee traveled in the 4 to 6 peak or in the 6 to 8 shoulder: If the attendee arrives at the turnstiles more than 1.5 hours before the 7:30 event start, they are assumed to have traveled in the 4 to 6 peak; if they hit the turnstiles less than 1.5 hours in advance of the event start, they are presumed to have traveled in the 6 to 8 shoulder. The problem with this is it fails to take into account the duration of each attendee's travel (which varies by where each person is coming from, the mode or modes they choose and the travel time on that mode or modes). It also fails to consider the substantial portion of attendees who, rather than passing through the turnstiles immediately, choose to remain outside for a while (such as stopping at a nearby restaurant / bar for a meal or drinks, or just waiting outside, as in the circumstance where 2 or more people are going to sit together but are traveling independently from different points and one person has all the tickets). Turnstile data is only a weak surrogate measure for end-time of trip for travel to stadium and arena event venues. It is weak and non-representative of the actual times attendees may be traveling on the transportation system for the following reasons. Many attendees at weeknight Warriors games will be coming from places where they will have to travel more than 45 minutes or an hour to get there. Many attendees, when they reach the area of the Project will choose to patronize nearby bars or restaurants or need to wait outside to meet up with others. In reality, someone who has traveled an hour to get to the Project site and passes through the turnstile directly on arrival at 6:30, say, will have actually completed a substantial portion of their trip within the PM peak hour. Another person who has only traveled for, say, 45 minutes but spends a half-hour in a nearby bar before passing through the turnstiles at 6:45 will also have completed most of their trip in the PM peak hour. These offsets of actual time-of-travel on the transportation system from time of passage through the turnstiles are not adequately considered in the DSEIR.

The DSEIR States that 5 percent of arriving 7:30 PM basketball event attendees arrive between 5:00 and 6:00 PM (per Table 5.2-21) which would be 903 person trips for 18,064 maximum attendance. However, Table 5.2-22 shows a total of 1,803 person trips within the 4-6 PM peak hour. Presumably, this discrepancy accounts for roughly 900 trips of the assumed 1100 day-of-game workers (ushers, ticket-takers, vendors, event-level security personnel and other day-of-game functionaries who generally need to be in place when the turnstiles open). Some 95 percent of the attendees are assumed to arrive in the 6 – 8 PM early evening peak shoulder per Table 5.2-21 with the maximum arrival hour between 7 and 8 pm involving 11,742 trips (65 percent of attendees per Appendix TR Table 3).

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[TR-2d]
cont.

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But, considering the facts that:

- over 70 percent of the attendees will be coming from outside San Francisco (including 31.1 percent from the East Bay, 8.9 percent from the North Bay, 26.7 percent from the South Bay and 4 percent from completely outside the Bay Region)[1] meaning many of their trips to the Project site will take 45 minutes to an hour or more,
- many attendees will, after traveling to the vicinity of the Project site, stop in neighboring restaurants and bars for drinks or a meal, thereby advancing the actual time of their trip ahead of their time of passage through the arena turnstiles by 30 minutes to an hour or more. This would apply to attendees coming from points in San Francisco as well as those making longer trips.
- many of the attendees, after completing their trip to the site, may need to wait to meet with others before passing through the turnstiles, thereby advancing the actual time of their trip ahead of their time of passage through the arena turnstiles. While some waits to meet are of short duration, the arrivals may often be disparate by 30 minutes or more. This would apply to attendees coming from points in San Francisco as well as those making longer trips.

When all of these factors are considered, it seems highly probable that as much as one-third or more of the trips that the DSEIR considers to take place in the 6 to 7 PM period and the 7 to 8 PM period would actually be on the transportation system in the more critical 5 to 6 PM commute peak hour. That would put 7,466 event-related travelers on the transportation system in the 5 PM to 6 PM period instead of the 1,866 assumed in the DSEIR, a difference that would likely result in transportation impacts not disclosed in the DSEIR and/or intensification of impacts and mitigation needs of those that were disclosed.

These considerations are so obvious to any transportation professional knowledgeable about sports stadium transportation issues that the analysis presented in the DSEIR cannot be said to constitute the good faith effort to disclose impact that the California Environmental Quality Act demands.[2] Since the entire analysis of transportation impacts flows from the estimate of trip generation and time-of-travel analysis, the entire transportation impact component of the DSEIR must be redone to accurately reflect the time that event attendees are actually

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[TR-2d]
cont.

[1] Per DSEIR Appendix TR Table 8 at page TR 25.
[2] This commenter has consulted regarding transportation issues related to many professional sports stadiums and arenas. In addition, by being an attendee at a very large number of professional sports events and concert events, this writer has observed with a professional eye the transportation and pre-event behavior of attendees at nearly 1200 major league stadium and arena events at various venues. The writer has held season tickets to the Giants at their current venue for 8 years, to the 49ers for 33 years, to the Oakland Raiders for 20 years and a quarter-share of season tickets to the San Jose Sharks.

traveling on the transportation system instead of the time they enter the event venue.

In order to illustrate how consequential is the DSEIR's failure to consider the time difference between the time when event attendees pass through the arena turnstiles and the time when they are actually travelling on the transportation system, we review a simplified scenario. Undisputedly, people who pass through the arena turnstiles in the half-hour between 6:00 AND 6:30 PM were traveling on the transportation system before 6 PM – that is, within the 5 to 6 PM peak period. DSEIR Table 5.2-21 at page 5.2-83 estimates that 11 percent of turnstile arrivals do so in the 6:00 to 6:30 PM half-hour, amounting to 1987 person trips at capacity basketball attendance of 18,064. When these trips are added to the 1803 trips the DSEIR already estimates are traveling in the 5 to 6 pm peak hour[3] , there would really be a total of 3790 Project basketball-related trips traveling in the pm peak hour. In other words, the Project's basketball-related trips in the PM peak hour would be more than doubled (actual factor 2.102).

The effects of a doubling of PM peak hour travel attributable to adding the Project with a 7:30 PM basketball game as compared to what the DSEIR estimates would be most evident at the intersection of Seventh Street with Mission Bay Drive where, instead of operating at LOS D as projected in table 5.2-24, it would operate at deficient LOS E, a significant impact. The effect on outbound MUNI lines T Third and 22 Filmore requires some special attention because Table 5.2-40 is obviously in error, showing the ridership on each of these lines as being *less* with a basketball game than without one. This is completely inconsistent with the text in the first bullet point on page 5.2-141 which states that a basketball game would add 681 new outbound transit trips to these lines in the PM peak hour. If we correct the table to be consistent with the text of the DSEIR analysis, the DSEIR's analysis of these two lines in the "with basketball" scenario should show a total outbound ridership of 3862 trips (or 81.3 percent of capacity).[4] If we add to that the riders who pass through the turnstiles in just the 6 to 6:30 PM period who, because of the offset between overall ride time and the 6-to 6:30 turnstile entry count, must have been riding on the transportation system in the 5 to 6 PM commute peak hour, the analysis would show an added ridership due to basketball of 1431, a net ridership in that situation of 4612, and a capacity utilization of 97.1, extremely close to crush capacity.[5]

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[TR-2d]
cont.

[3] See DSEIR Table 5.2-24 at page 5.2-90.
[4] Regardless of whether the City agrees with our further analysis of the PM peak ridership with a basketball game, it must correct this table to make it consistent with the analysis findings in the text.
[5] Under the City's normal impact threshold, which is riders exceeding 85 percent of screenline capacity, this would be a significant impact on transit. However, because the City has improperly created a Project-specific impact threshold of 100 percent of screenline capacity for this Project, the ridership would fall just below the gerrymandered impact threshold. The impropriety of creating a specially relaxed threshold of impact for this one Project is discussed in a subsequent section.

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The DSEIR Only Analyzes Impacts of Weeknight Basketball Games That Start at 7:30 PM, Not at Other Start Times Closer to the PM Peak.

The only scenarios analyzed involving weeknight basketball games assume a start time of 7:30 pm. But this is not the only times that weeknight basketball games start although it does account for a majority. In the three preceding full seasons to the time of the NOP, 6 percent of the weeknight home games started at 6 PM (average 2.5 games per season) and over the three seasons there were individual games starting at 5 PM and 7 PM. However, the recently completed season proves that earlier games than 7:30 PM start times are not likely to be just a rarity in future years. In the three regular seasons considered in the DSEIR, the Warriors team was mediocre to 'emerging'. However, after this year's excellent regular season, the team played 11 home playoff games, seven of which were weekday games that started at 6 PM. With an outstanding young team, the prospects are that the team could play similar numbers of home 6 PM weeknight playoff games (6 PM being the time nationally broadcast weeknight games normally start) for several seasons hence. Moreover, the national attention this team has attracted could result in several more national broadcasts of regular season home games (also normally starting at 6 PM). So there is a substantial likelihood that weeknight 6 PM games could become a frequent occurrence rather than a rarity. There might easily be 16 out of 54 or so combined regular season and playoff home games that start at 6 PM, or just under 30 percent of the total weeknight home games. Obviously, the 6 PM start puts more travel pressure on the 4 – 6 PM peak. The DSEIR should analyze this basketball start time as a separate scenario rather than dismissing it as an anomaly

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[TR-2a]

The City's Process for Evaluating a Project's Impacts on Public Transit Evades Disclosure of Significant Impacts

The City's process for evaluating transit impacts for projects in the "greater downtown area" (the C-3, SOMA and Mission Bay districts) is to consider peak hour ridership on the routes that cross designated screen lines across portions of the City or, for regional routes, on its perimeters versus the aggregate capacity of the peak hour services crossing those screenlines. There are several problems with this procedure that result in failure to disclose impacts.

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[TR-2g]

- Considering aggregate capacity across screen lines versus aggregate patronage does not reasonably disclose impacts. For the routes inside San Francisco served by the San Francisco Municipal Railway (MUNI), a standard has been established that there is significant impact when ridership crossing the screen line exceeds 85 percent of capacity on that screen line. But this standard of significance involves an underlying assumption that individual travelers could use any of the routes crossing a particular screen line to accomplish their trip. But in actual fact, an individual traveler's particular trip is most often only well served by one route. When some routes crossing a screen line are heavily patronized while others are less patronized, the excess capacity on the less popular routes does not cancel out the overcrowding on the most popular routes. It is noted that the City Planning Department can request that transit impacts be analyzed on an individual line basis. When this is done, if the individual line ridership exceeds 85 percent of capacity *and the project's contribution exceeds 5 percent of the total ridership at its maximum load point (MLP)*, then the project would be found to have significant transit impact.

- MUNI's capacity standards per vehicle involve percentages of standees above seating capacity ranging from 30% to 80% of seating capacity (depending on vehicle type); therefore, the above addition of 5 percent ridership to the impact threshold in analysis of individual lines represents a substantial crush loading.
- The capacity as considered in the analysis is the theoretical capacity of the services as scheduled. However, rarely, if ever, does MUNI deliver all of its scheduled service. San Francisco Municipal Transportation Authority statistics show that MUNI typically delivers an average of between 95 and 98 percent of scheduled services although on some days the percentage of missed runs can be much worse. MUNI's goal is to only deliver 98.5 percent of scheduled service. Principal causes of missed runs include driver unavailability, insufficient vehicle availability and in-service breakdowns. On the light rail lines, the percentage of weekdays when enough light rail vehicles were operationally available to deliver scheduled service averaged only 61.7 percent in fiscal year 2014 and was well under 50 percent in the two preceding years.
- Difficulty maintaining schedule reliability (on-time performance) exacerbates capacity problems. Muni's on-time performance is normally less than 20 percent. As a result, there is difficulty maintaining planned headways between vehicles on a given route. Bunching occurs. When that happens, the lead vehicle in a bunch becomes overcrowded while the one or more closely following vehicles in the bunch are underutilized. Muni experiences bunching on about 4 percent of its trips overall; in excess of 5 percent on its "Rapid Network".

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[TR-2g]
cont.

If the threshold of impact were measured at 85 percent of the capacity of *actual effective service delivered* instead of *theoretical schedule-based service capacity*, more of the individual lines and screen lines would be found to be closely approaching or above the 85 percent of capacity criterion. And as a consequences of these circumstances in the City's procedures and policy criteria, it is rare for a project to be found to have significant impact on MUNI transit services despite the fact that the public perception is that MUNI is overburdened and dysfunctional.

We also note that for scenarios involving arena events at this Project, the DSEIR alters the City's normal criterion for evaluating transit impacts, changing the threshold of significant impact from 85 percent of capacity to 100 percent of capacity. Its basis for making this alteration, which tends to shield the Project from disclosure of significant transit impacts, is that event-goers accept a higher level of crowding than normal riders. However, "accept" is too generous a word. Nobody wants to ride in 'crush load' conditions. Event attendees grudgingly tolerate 'crush loads' as the least undesirable of their other options of a)walking long distances, b)paying much more for taxis or shared ride services, c) paying even much more to drive and park or d) (only in the post-event exit) waiting until the crowding has dissipated. Moreover, this shift in acceptability criterion is impactful of itself in that it imposes the values and tolerances of event-attendees upon normal riders who use the involved lines at that particular time of day. Furthermore, the DSEIR is unclear whether the change in impact criterion is operative only for lines directly serving the Project site, or system-wide, which would have a far greater impact on normal riders. The City's action to alter its normal thresholds of impact in the case of one particular project to lessens the chance of findings of significant impact and is not consistent with the good faith effort to disclose impact that CEQA demands. The City should faithfully disclose impacts as measured by its normal criteria, and, if it still wants to approve the Project, make findings of overriding considerations.

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[TR-2g]
cont.

With regard to regional transit services, considering capacity versus ridership at San Francisco perimeter screenlines (North Bay, East Bay, South Bay) as the sole criterion of impact on the regional systems results in the analysis failing to address other significant impacts that are unrelated to corridor screenline ridership to capacity relationships. For example, in the case of BART, while Transbay capacity (the screen line analyzed) is a concern, an equal concern is the peak period platform capacity at the Embarcadero and Montgomery Street stations. These stations each individually serve 22 percent of all BART travelers and in the peaks are simultaneously serving peak-direction travelers to/from both eastbound and westbound corridors as well as serving contra-peak direction travelers in both directions. The platform congestion at both these stations is a serious operational and safety concern, has been documented in public[6], is visibly worse in the pm peak hour when the Giants have weekday night games scheduled and would presumably be similarly affected by weekday evening Warriors games and other large events at the Project. BART is actively developing designs for adding outboard platforms at both of these stations – a mitigation measure that the Project (and others) could make fair share contributions toward if the Project's impacts at these locations were properly

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[TR-5b]

[6] See *BART Sustainable Communities Operations Analysis*, June 2013

analyzed. But for the present, the DSEIR's is deficient because it completely fails to analyze, disclose and mitigate the Project's impacts on this situation. 19 [TR-5b] cont.

The City's Selections of Intersections (and Freeway Ramps) Studied in the DSEIR Excludes Intersections it Knew or Should Have Known Would Potentially Be Significantly Impacted by the Project

Intersections selected for study in the DSEIR for the subject Project exclude a number of intersection that were to be subject to analysis in the DEIR for the prior proposal for essentially the same project but located on the Piers 30/32 site. Among the intersections slated for study in the prior edition of the project but not studied in the current work are the 9 major intersections along Embarcadero from and including that with Brannan all the way to that with Broadway, plus those at Main with Harrison, Main with Bryant, Beale with Mission, Beale with Bryant, Delancy and the 80 on ramp, Fremont with each of Mission, Harrison and Folsom/80 off, Third with Harrison, Third with Mission, Second and Bryant, Second and Brannan, Second and King, Second and Bryant, First with Harrison and the 80 on ramp, Fourth and Howard, Fourth and Harrison/80 on ramp, Fourth and Bryant/80 off ramp, Bryant with Sterling/80 on ramp. Virtually all of these excluded intersections are heavily congested in the pm peak.

Although the Project location is now shifted to a site approximately 6800 feet south, and the DSEIR has added study intersections in that direction, the excluded intersections are still on the likely paths of traffic coming from the Northbay, Eastbay and northern parts of San Francisco. . The project is fundamentally the same size and will generate fundamentally the same amount of traffic. The amount of traffic through the excluded intersections approaching from and departing to the Northbay, Eastbay and northern parts of San Francisco is essentially unchanged from the totals that would have occurred with the Piers 30/32 site. So there is no reasonable logic for excluding these intersections from the current DSEIR analysis. 20 [TR-2b]

That the excluded intersections are at risk to be impacted by the Project is demonstrated in the DSEIR's own analysis of Alternatives to the Project. One of the alternatives it analyzes is putting the Project back on the previously proposed Piers 30-32 /Seawall Lot 330 site. Appendix TR at page TR-783 analyzes the project on the alternate (or formerly proposed site) at the intersections formerly proposed for evaluation. It shows the Existing + Project with Basketball Event would have significant project-specific impacts at 8 intersections, 5 of which are intersections excluded from the current DSEIR analysis of the Project at its current site, and would make significant contributions to traffic at 4 intersections already at LOS E or F, 3 of which are among the intersections excluded from the analysis of the Project at its currently proposed site. We reiterate, it is clear that most of the traffic contributory to the impacted intersections with the Project on

the formerly proposed site would still pass through these intersections with the Project located at the currently proposed site. So the DSEIR is deficient for excluding these intersections from the analysis of the Project.[7]

We also note that DSEIR Figures 5.2-14 E and 5.2-14 F indicate that approximately 31 percent of Warriors game weekday and Saturday attendees would approach and depart two and from the northwest via 7th Street at times when there are no overlapping Giants games. Although the DSEIR does not specifically present usage of this corridor by Warrior's attendee traffic at times of overlapping Giants home games, it would doubtless be considerably greater. In both cases, this suggests that the capacity-challenged intersections of Seventh and Townsend, Seventh and Brannan, Eighth and Brannan and Eighth and Bryant should have been analyzed in the DSEIR. Please do so. 20 [TR-2b] cont.

There is a similar situation with the study of freeway ramps. The current DSEIR analyzes 6 ramps. The study for the prior site analyzed 12 ramps. Four of the six ramps studied in the current work are new (not considered in the analysis of the former proposed site). In other words, ten of the ramps to be studied in the analysis of the prior site, all problematic in peaks, are eliminated from consideration. There is no reasonable justification for their elimination.

The Transit Analysis Understates Impacts Because It Relies On Stale Transit Baseline Data

This DSEIR's Notice of Preparation was filed on November 19, 2014. The DSEIR's transit impact analysis relies upon transit ridership data published in a City Planning Department memo dated June 21, 2013 entitled *Transit Data for Transportation Impact Studies*[8]. However, the data published in that memo is from counts taken in the fall of 2010 and in 2011. Between 2010/11 and late 2014 when the NOP was filed there have been a large number of significant development projects that have been completed and occupied in the C-3, SOMA and Mission Bay and numerous others approved and placed under construction. These render the transit database collected in 2010/11 stale for evaluation of a Project whose NOP was filed in late 2014. Hence, the transit analysis is inadequate for relying on stale data. 21 [TR-2c]

Similarly, for the regional transit corridor screenlines, the cited *Transit Data for Transportation Impact Studies* memo relies on data from a SFMTA TEP Project

[7] Our colleague, Mr. Larry Wymer of Larry Wymer and Associates Traffic Engineering has provided a separate letter of comment on this DSEIR (dated July 21,2015) that concurs in the need for study of additional intersections and provides supporting data.
[8] *Transit Data For Transportation Impact Studies* is reproduced in DSEIR Appendix TR at pages TR-624 thru TR-632.

document produced in October, 2012. Obviously, the transit ridership data in that document reflects observations some time before October, 2012. Again, significant development has occurred in the C-3, SOMA and Mission Bay between whenever the data published in October 2012 was collected and the date of the NOP for the subject Project. This would result in significantly heavier loadings on the regional transit carriers in the peak periods at the time of the NOP than represented in the *Transit Data for Transportation Impact Studies* memo. For example, the data relied on in the DSEIR indicates BART's Transbay peak hour ridership is 19,716. *BART Sustainable Communities Operations Analysis* report[9] indicates peak hour Transbay ridership at 21,600 passengers in 2012 and projects 21,815 peak hour peak direction riders by 2015. BART's ridership values would respectively put BART at 98 percent of capacity in 2012 and at 98.9 percent currently. This leaves considerably less capacity for peak hour travelers to the Project to be accommodated without impact.

The DSEIR transit analysis should be redone based on updated estimates of baseline transit ridership, taking into account projections of transit use from the environmental documents for all projects known to the City to have been completed since the time of the actual transit ridership counts or known to be reasonably certain, at the time of this Project's NOP, of being completed by the estimated time of completion of this Project

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[TR-2c]
cont.

The Traffic Analysis Underestimates Impacts Because It Relies on Stale Baseline Data

The traffic impact component of the DSEIR relies on a number of traffic counts taken in 2013 and others in June, 2014. It adjusts those counts to account for traffic from the UCSF Medical Center Phase 1 and the Public Safety Building that are located close to the Project site and were under construction when the counts were taken but were occupied about the time of the NOP. However, it seems likely that there was other development in C-3, SOMA and Mission Bay completed in the period between when the 2013 counts were taken and the date of the NOP that would logically affect baseline traffic at some of the intersections analyzed in the DSEIR and still more that is known to the City to be reasonably certain of completion by the time of completion of the subject project. Please list all such developments and adjust the baseline traffic used in the DSEIR analysis accordingly.[10]

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[TR-2c]

[9] *BART Sustainable Communities Operations Analysis*, Bay Area Rapid Transit District, June, 2013.
[10] The aforementioned separate comment letter on this Project by Mr. Larry Wymer includes a spreadsheet reflecting, to the best of Mr. Wymer's ability based on culling the posting of environmental documents of development projects on the City Planning Department's web site, a listing of such projects and the traffic they would contribute to locations that were or should have been studied in this DSEIR's traffic analysis. However, responsibility for developing a comprehensive list of such projects and adjusting the baseline for their effects rests with the City Planning Department that is charged with generating and maintaining these records, not to an independent party attempting to do so from the outside.

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The DSEIR Fails to Evaluate Impacts at Intersections Under PCO Control

The DSEIR does not report LOS or delay at intersections that are under PCO control in certain situations, claiming that LOS cannot be calculated for intersections under PCO control. However, this interpretation evades the issue of why PCO control is employed in the first place. The reason is because it is assumed or known through experience that these locations would become gridlocked (deep LOS F conditions) if left to automated traffic control. In theory, the PCO or group of PCOs is/are smarter than an automated traffic signal in such circumstances. In particular, the human controllers can observe downstream blockages and give advantage to movements with unblocked downstreams and alter phase sequences to give green to movements as their downstreams become unblocked. But fundamentally, any intersection under PCO control should be regarded as being at LOS F. But this poses another issue. There is no determination of how much worse (more impacted) conditions are in the Existing + Giants game + Warriors game situation than in the Existing + Giants game alone scenario. This determination is an essential purpose of this DSEIR and it is not being evaluated.

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[TR-2f]

The DSEIR Fails To Evaluate Quantitatively the Severity of the Project's Traffic Impacts at Locations That Are Already In LOS F Condition

The DSEIR tables reporting intersection delay and intersection LOS for the various locations and scenarios analyzed fail to report the actual delay at intersections experiencing delay at or above the threshold of LOS F. They merely report the delay as being greater than 80 seconds of delay per vehicle. This manner of reporting prevents the public from knowing the severity of the Project's traffic impacts when it affects intersections already in impacted condition.

Most commercially available intersection LOS/delay calculation programs do calculate the actual delay of intersections that are above the LOS F threshold. It is the analyst's option to display the actual value in the program output or to suppress reporting it and display the >80 symbol. Some analysts claim that once an intersection is in LOS F, the delay value is irrelevant. But that is nonsense. If an existing condition is, say, just at the 80 second delay LOS threshold and a project causes the delay value to increase to 81 seconds, in that instance the degradation caused by the project may be almost imperceptible. But if the computation shows that the project increases delay to, say, 120 seconds per vehicle, than the degradation caused by the project is clearly quite severe and seriously impactful. Since an essential objective of an EIR is to disclose how

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[TR-2f]

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adverse or severe a project's impacts are, the DSEIR is deficient in failing to disclose information relative to severity that it easily could have disclosed.

The same considerations apply to the freeway ramp analysis where, once a ramp has reached the average vehicle density threshold of LOS F operations[11], the DSEIR presents a special character symbol instead of the actual density compiled, thereby thwarting the ability of the public or professional reviewers to understand how severe and adverse the impacts of the project really are. We also note that DSEIR Table 5.2-2 contains an apparent error in the entry for the I-80 eastbound ramp at Sterling for the weekday evening (6-8 PM) period. It reports that vehicle density is 38 vehicles per vehicle lane-mile but a LOS of C. If the density really is 38, this ramp would be in the LOS E-F range; if the LOS really is C, the density would have to be less than 28. Please correct the error. 24 [TR-2f] cont.

Complex Interrelated Issues Are Not Addressed In the DSEIR

At present, persons traveling between BART or the MUNI LRT lines and the Project site can make a simple in-station transfer to/from the K-T line from any of the downtown Market Street stations. Once the Central Subway is completed, the T-Third line will no longer be directly inter-routed with the K-Ingleside line in the Market Street subway. Instead, access from BART and the Market Street LRT lines to the T line that serves the proposed Project site will only be via the Powell Street station and only via a 1,000 foot tunnel in the wrong direction that connects Powell to the Union Square station where T LRT trains can be boarded – an unattractive and slower transfer than at present. Although other MUNI LRT lines from the Market Street subway will continue to connect to 4th and King via the Embarcadero, passengers on those lines or those from BART who transfer to them at the Market Street stations will be faced with another transfer to the T-Third at that point or an walk of .8 miles to the Project site. These are less attractive options than what is available at present. With the rise of ride-share services like Uber and Lyft that can be summoned via a cell phone application – a new phenomenon, the percentage of persons who take ride share services or conventional taxi instead of transit all the way to the site may be far more than for AT&T Park events (which will continue to be served by LRT lines that stop directly in all the Market Street BART stations). This is detrimental as each time people use ride-share or conventional taxi services to 25 [TR-5a]

[11] Vehicle density, the number of vehicles per lane mile, is the logical measure of either congestion or high quality service on freeways and ramps in merge and diverge areas. In free-flowing conditions, vehicles operate with substantial space between them so the number of vehicles per lane mile is low. At highly congested conditions, stop-and-go or crawl speed operations, vehicles are closely spaced and the number of vehicles per lane mile is high. Per *Highway Capacity Manual 2000* the threshold for LOS E and F operations is 35 passenger car equivalents per lane-mile per hour. With true scientific caution, *Highway Capacity Manual 2000* counsels against reporting vehicle densities in the LOS E-F range because flow rates, a principle factor in calculating vehicle density, vary radically in LOS E-F situations. Nevertheless, the computed vehicle densities are what they are, and constitute the only reasonable way to measure weather the Project's effects on an already unacceptable ramp situation are significantly deleterious or not.

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access the Project, they cancel the environmental savings of direct transit access usage and double the number of motor vehicle trips to the area as compared to if they drove and parked in the area (because the ride-share or taxi vehicle drives away after dropping passengers off). The DEIR does not appear to address these considerations. Please do so. 25 [TR-5a] cont.

The DSEIR Cumulative Analysis Fails To Consider and Analyze the Project in the Context of the City's Proposal to Remove the Northern Portion of I-280 As Far South As the Mariposa Street Interchange

Since at least as long ago as 2012, the City has been actively considering a proposal to demolish the northern portion of I-280 as far south as the Mariposa Interchange, eliminating the on- and off -ramp connections to King Street and to Sixth Street[12]. If carried out, the I-280 truncation would shift much of the traffic that now uses those ramps to surface streets in the immediate vicinity (including two of the frontage streets) of the subject Project. Moreover, development of the site freed up would add to demands on the traffic and transit system. In view of the City's continuing active consideration and refined development of this proposed major change in transportation infrastructure[13] both well before and after the NOP for the subject Project, this DSEIR should have, at a minimum, in addition to the cumulative scenarios studied, analyzed the proposed Project in the context of an alternative transportation network scenario that reflects the truncation of I-280 as far south as the Mariposa Interchange. However, the DSEIR's only mentions the I-280 truncation project in two places. One is a single short background paragraph about ongoing projects in the vicinity of the site in the Appendix TMP introductory section. The other is a lengthier two-paragraph description at DSEIR pages 5.2-109 and 5.2-110. That section concludes by stating that the information on the 280 truncation is provided for information purposes only and that because that project is not fully designed, has not received the approval of other responsible agencies and is not funded, it is speculative and is not considered in the DSEIR cumulative 2040 analysis. However, since the City has already spent in excess of $ 1.7 million in design and feasibility studies, has already approached other responsible agencies for funding involvement and approvals and since it has such a vast potential consequence for the transportation network in the immediate area of the subject 26 [TR-2h]

[12] Evidence of this is the unveiling by the Mayor's Transportation Policy Director, Gillian Gillett, at a San Francisco Planning and Urban Renewal Association (SPUR) forum on January 10, 2013, releasing a City study deceptively named Fourth and King Street Railyards, Final Summary Memo dated December, 2012 and a related request dated January 7, 2013 by the Office of the Mayor to Steve Hemminger. Executive Director of the Metropolitan Transportation Commission.
[13] The City's continuing interest in the I-280 truncation is demonstrated by the initiation of the San Francisco Planning Department's *Railyard Alternatives and I-280 Boulevard Feasibility Study*, which began in June, 2014 and in the May 11, 2015 *San Francisco Chronicle* column by Matier & Ross lead by the statement "San Francisco Mayor Ed Lee is quietly shopping plans to tear down Interstate 280 at Mission Bay and build an underground rail tunnel through the area – complete with a station between the proposed Warriors arena and AT&T Park.".

Project by the forecast year of the cumulative analysis, and since that forecast year, 2040, is 25 years hence, it is evasive, irresponsible, improper for the City to have failed to at least considered an *alternative cumulative scenario* that assumes the latest design concept from the *Railyard Alternatives and I-280 Boulevard Feasibility Study* in *addition to* the cumulative scenario that was analyzed. The DSEIR should be revised to include such a cumulative alternative and recirculated in draft status for the 45 day review period. 26 [TR-2h] cont.

There Is No Evidence The DSEIR Considered the Disruptive Impacts of the At-Grade Rail Crossing of 16th Street on Intersection LOS at the Intersections of 16th and 3rd and 16th and 7th Streets.

The Caltrain rail mainline crosses Sixteenth Street in an at-grade crossing between the study intersections of Sixteenth with Third and with Seventh Streets. In the 5 to 6 PM peak hour, gate closure protection to allow train passage blocks Sixteenth Street traffic 10 times and another 10 times in the 6 to 7 PM early evening peak shoulder period. Increased rail traffic and increased train lengths will increase the blockage time. There is no evidence this blockage has been taken into account in the LOS calculations for the nearby intersections.
If it has, please explain how. If it hasn't, please adjust the calculations or explain why not. 27 [TR-2f]

The Project's Truck Loading and Truck Staging Provisions Appear Inadequate.

With regard to loading facilities, the Project Description narrative at DSEIR page 3-20 states: "*The loading and service areas, including 13 truck loading docks, would be located on the Lower Parking Level 1"*. After describing dimensions of those loading dock spaces, the narrative continues: *"In addition to the 13 on-site below grade loading area, 17 on-street commercial loading spaces would be provided on South Street (8 spaces), Terry A Francois Boulevard south of South Street (8 spaces) and 16th Street (1 space) …".* 28 [TR-8]

This statement in the Project Description has multifold inaccuracies:

- The accompanying scale drawing of Lower Parking Level 1 actually shows 14 off street truck loading spaces but about half of them cannot be accessed or egressed if trucks, especially the 70± foot tractor trailer rigs, are occupying nearby spaces.
- Other docks, if not completely blocked by vehicles in other loading docks, involve extremely difficult backing maneuvers.
- Some docks involve "blind" right hand backing turns from the "hammerhead" area that are ordinarily avoided in truck loading area design.
- The Project does not *provide* 17 on-street commercial loading spaces. It does not *provide* any. It simply asserts claim to enough on-street parking

area to park 17 large trucks, taking use of area that otherwise would be available for public parking.

- In addition to the above, the Project does not appear to have sufficient area for staging of trucks that have already been unloaded. Headliner rock concerts and family shows are often supported by large numbers of trucks. For instance, concerts for U-2's current tour are supported by 26 tractor-trailer rigs. The Rolling Stones are supported by about the same number. A national political convention would involve many more. It is obvious that this many trucks cannot be staged within the proposed site plan, especially since the loading docks also need to be used for the truck loading that is routine for any event (such as delivery of food. drink and souvenir supplies for the concessions, removal of garbage and support for the other uses in the proposed Project. It appears that the Project will either stash those trucks, when not actively loading or unloading, by preempting public on-street parking areas in the Project vicinity or by obtaining a formal off-site staging area. Which of these is planned and if a formal staging area is planned, where is it and what is its capacity? 28 [TR-8] cont.

Construction Impacts on Transportation and Circulation Are Not Adequately Addressed

In its section describing thresholds of significance, the DSEIR's transportation and circulation analysis declares that "Construction related impacts generally would not be considered significant due to their temporary and limited duration". This assessment by fiat rather than by a reasonable effort to measure or estimate the Project's construction impacts on the transportation and circulation system is inconsistent with the good faith effort to disclose impact demanded by CEQA. It also flies in the face of common sense. For example: 29 [TR-10]

- A project that is located on a heavily trafficked street, a street with high-volume transit service or a street with heavy pedestrian flows would tend to have much more construction impacts on transportation than a project on a minor street that has none of those characteristics.
- A project whose construction causes closures of traffic lanes or closures of continuous sidewalks or temporarily eliminates or relocates transit stops has more construction impact on transportation than one that does not. A project that does those things on busy streets has more construction impact on transportation than one on lesser-used streets.
- A project that is large tends to involve more workers commuting daily, more daily import of supplies and construction materials, more export of demolition and construction refuse and, as a consequence of its size, tends to be of longer duration, tends to have greater construction impacts on transportation than a smaller one.

These considerations that distinguish the severity of construction impacts on transportation can be defined or measured both qualitatively and quantitatively. The DSEIR is deficient in failing to do so.

Despite its "by fiat" finding that the Project's construction impacts on transportation and circulation are less than significant (LS in the Summary Of Impacts And Mitigation Measures), the DSEIR identifies "Improvement Measure I-TR-1: Construction Management Plan and Public Updates". This so called 'Improvement Measure' is a surrogate 'Mitigation Measure' and, by its very existence, is de facto admission that the Project does have construction impacts on transportation and circulation that should have been disclosed as such. 29 [TR-10] cont.

Unfortunately, the measure is in part, vague and yet to be defined (deferred mitigation that is improper under CEQA, and in other parts, defies common sense. We discuss these subjects in a subsequent section.

The DSEIR Concludes, Without Adequate Foundation, That the Project Would Not Have Adverse Impact on Emergency Access

The emergency entrance to the newly opened UCSF Benioff Children's Hospital is located on Fourth Street near its intersection with Mariposa, about 1050 feet (as the crow flies) from the nearest corner of the Project site. At two locations in the Transportation and Circulation section the DSEIR states that if a project were to result in inadequate emergency access, the project would be found to have a significant impact on the environment. Yet incredibly, it concludes that the subject Project would not result in inadequate emergency access when capacity events are taking place at the Project on weekday evenings, weekend afternoons or weekend evenings, regardless of whether or not the Giants or other events at AT&T park are taking place at overlapping times. The DSEIR offers no objective data to support its conclusion that emergency access would not be adversely impacted in event travel peaks – such as relative emergency vehicle travel time data with and without event traffic[14]. Instead, the DSEIR relies on its own rationalizations of why emergency vehicles might not be slowed during event travel peaks to justify concluding the Project would not have significant impact. 30 [TR-9]

The DSEIR notes drivers' obligations to get out of the way of emergency vehicles under the vehicle code. However, it fails to note that in special event access/egress situations, when vehicles are queued bumper to bumper and pedestrians are swarming the crosswalks, drivers abilities to clear the way for emergency vehicles are impaired and the emergency vehicles will inevitably be delayed more than in a

[14] Emergency responders ordinarily log the time calls are received by dispatch, the time the subject is reached and the time the subject is delivered to an emergency care facility. So there is an objective data base that could have been examined to assess the consequences when special events currently take place in the area versus times when special events are not taking place.

normal traffic situation. The DSEIR notes that the presence of PCOs will help clear paths or emergency vehicles through event traffic. PCOs can help, but when event traffic is jammed up with scant maneuvering space and pedestrians are swarming about, PCOs can only do so much and the emergency vehicle(s) will inevitably be delayed compared to normal traffic. The DSEIR also claims emergency vehicles can utilize the proposed exclusive transit lane on 16th Street to bypass normal vehicles in event jams. This will be fine until an emergency vehicle overtakes a transit vehicle, at which time a more confusing than normal maneuvering will have to take place. And not all the emergency vehicles will be approaching from points from which 16th Street is the best route. Finally, not all vehicles traveling in emergencies are official emergency vehicles equipped with emergency lights and sirens. Quite often, parents, caregivers or friends attempt to rush a person requiring emergency care to the emergency room in private vehicles. Private vehicles on an emergency mission are often not recognized as such by other drivers, pedestrians, or PCOs and consequently, it event traffic, suffer even more delay than official emergency vehicles. 30 [TR-9] cont.

Because of these considerations, the DSEIR's conclusions about emergency access impacts are not only unsupported by objective data but incorrect and implausible.

Mitigation Measures Are Vague, Insubstantive, Unresponsive to the Impact Purportedly Addressed or Do Not Qualify as Mitigation Under CEQA 31 [TR-12a]

A number of the mitigation measures (and de facto mitigation measures identified as "improvement measures") identified in the DSEIR are vague, insubstantive, unresponsive to the impact purportedly addressed or offer no basis for the DSEIR's conclusion. Measure having these characteristics, which disqualify them as adequate mitigation under CEQA, are not limited to those cited as egregious examples highlighted below.

<u>De Facto Mitigation Measure: Improvement Measure I-TR-1: Construction Management Plan and Public Updates</u> 32 [TR-11]

The first section of this measure states as follows:

> *Construction Coordination* – To reduce potential conflicts between construction activities and pedestrians, bicyclists, transit and vehicles at the project site, the project sponsor shall require that the contractor prepare a Construction Management Plan for the project construction period. The preparation of a Construction Management Plan could be a requirement included in the construction bid package. Prior to finalizing the Plan, the project sponsor/construction contractor(s) shall meet with DPW, SFMTA, the Fire Department, Muni Operations and other City agencies to coordinate feasible measures to include in the Construction Management Plan to reduce traffic congestion, including temporary transit stop relocations and other measures to reduce potential traffic, bicycle, and transit disruption and pedestrian circulation effects during construction of the proposed project. This review should consider other ongoing construction in the project vicinity, such as construction of the nearby UCSF LRDP projects and construction on Blocks 26 and 27.

While expressing good intention, what will be done as the result of this measure is so vague and subject to future determination as to constitute deferred mitigation. To be an effective measure, it should commit to explicit features such as the following examples:

A continuous protected sidewalk will be maintained at all times on the Project's frontage on the east side of Third Street. Third Street will not be subject to lane closures at any time during the construction period. All access to the Project for workers, import of construction materials and equipment and export of demolition and construction debris shall be from the Sixteenth Street, South Street or Terry Francois Boulevard frontages. All connections to underground utilities shall be made from the Sixteenth Street, South Street or Terry Francois Boulevard frontages.

The second section of this measure states as follows:

32 [TR-11] cont.

Carpool, Bicycle, Walk and Transit Access for Construction Workers – To minimize parking demand and vehicle trips associated with construction workers, the construction contractor could include as part of the Construction Management Plan methods to encourage carpooling, bicycle, walk and transit access to the project site by construction workers (such as providing transit subsidies to construction workers, providing secure bicycle parking spaces, participating in free-to-employee ride matching program from www.511.org, participating in emergency ride home program through the City of San Francisco (www.sferh.org), and providing transit information to construction workers.

This section contradicts common sense and common knowledge. It is common knowledge that few construction workers will use a bicycle, walk or use transit to travel to and from work - for compelling reasons. Many workers carry their personal tools and equipment with them each day; it is impractical to do this while walking, bicycling or riding transit. Construction work often involves strenuous physical labor. Consequently, even if not carrying tools and equipment, construction workers are normally disinclined to walk or bike to and from work. Because of the physical labor aspect, construction workers are frequently dirty and sweaty on the homebound commute. Because of this, construction workers are themselves uncomfortable and make other riders uncomfortable if they ride transit. Because these considerations are well known, it is ridiculous and cynical for the City to pad the DSEIR with useless statements such as that reproduced above.

Mitigation Measure M-TR-2

This sequence of mitigation measures purportedly reduces the effects of Impact TR-2 (that the proposed Project would result in significant traffic impacts at multiple intersections that would operate at LOS E or LOS F under Existing plus Project conditions without a SF Giants game at AT&T Park) even though the impacts are still classified Significant and Unavoidable with Mitigation (SUM). While many of the measures sound potentially useful, close consideration reveals they do not have quantifiable effects, they affect conditions that are not part of the original

33 [TR-12a]

quantification of impact or they are ineffective in changing the behavior of the problem traveler population. We consider the mitigation measures for Impact TR-2 in sequence.

Mitigation Measure M-TR-2a: Additional PCOs during Events

This measure involves providing four more PCOs during events than the Project's proposed TMP and suggests 5 intersections where they may be deployed. The problem with this is that while PCOs can help prevent unnecessary degeneration of conditions (such as drivers 'blocking the box' or jaywalkers obstructing lanes on the green phase, they cannot cure fundamental LOS E or F conditions.

Mitigation Measure M-TR-2b: Additional Strategies to Reduce Transportation Impacts

This measure involves fourteen itemized strategies in four subgroups. The lead in states:

"The project sponsor shall work with the City to pursue and implement, if feasible, additional strategies to reduce transportation impacts. In addition, the City shall pursue and implement, if feasible, additional strategies that could be implemented by the City or other public agency (e.g., Caltrans)."

33 [TR-12a] cont.

Critical words here are "if feasible". CEQA requires that "feasible mitigation" be developed. If there is any doubt at this point about the feasibility of the mitigation proposals, they cannot be presented in the DSEIR as mitigation.

Strategies to Reduce Traffic Congestion

 The City to work with Caltrans to install changeable message signs upstream of key entry points onto the street network, such as on I-280 northbound.

Variable message signing only helps LOS if there are uncongested routes to which traffic can be directed. The variable message signs placed on the freeway approaches to Candlestick Park when the 49ers still played there were noteworthy in their uselessness because there were no uncongested routes to which traffic could be directed.

 The City to provide coordinated outreach efforts to surrounding neighborhoods to explore the need/desire for new on-street parking management strategies, which could include implementation of time limits and Residential Parking Permit program areas.

Neighborhood parking conditions and parking permit programs have nothing to do with the LOS E and F conditions at major intersections that are the object of mitigation in this item. The proposal is irrelevant.

□ The project sponsor to offer for pre-purchase substantially all available on-site parking spaces not otherwise committed to office tenants, retail customers or season ticket holders, and to cooperate with neighboring private garage operators to presell parking spaces, as well as notify patrons in advance that nearby parking resources are limited and travel by non-auto modes is encouraged.

Preselling parking so that drivers have a fixed destination they can travel to directly instead of circling blocks looking for parking is a good idea. But it solves a problem not accounted for in the DSEIR's original measurement of impact. The DSEIR's underlying traffic assignments all assume drivers are destined for explicit destinations, not milling about looking for one. So this would not reduce the LOS impacts forecast.

□ The project sponsor to create a smart phone application, or integrate into an existing smart phone application, transportation information that promotes transit first, allows for pre-purchase of parking and designates suggested paths of travel that best avoid congested areas or residential streets such as Bridgeview north of Mission Bay Boulevard and Fourth Street.

The problem with this entry is similar to some of the prior entries. At event times, there really are no uncongested paths to the Project vicinity, pre-purchase of parking helps solve a problem unaccounted for in the intersection LOS computations, keeping people out of residential streets is inconsistent with the supposed objective of reducing congestion at major intersections and people driving and using the app to find parking or avoid most congested routes are likely inured to transit first promotional messages. 33 [TR-12a] cont.

□ The City and the project sponsor to work to identify off-site parking lot(s) in the vicinity of the event center, if available, where livery and TNC vehicles could stage prior to the end of an event.

This is a worthwhile action. But it avoids an on-street clutter of pick-up activity that was not accounted for in the original intersection LOS impact estimates. Hence, it does not mitigate the impact disclosed.

□ The City to include on-street parking spaces within Mission Bay in the expansion and permanent implementation of SF*park*, including installation of sensors, dynamic pricing, and smart phone application providing real-time parking availability and cost.

This is a worthwhile action. But again, it helps solve a problem that is not reflected in the DSEIR intersection LOS analysis – that of vehicles cruising the area searching for parking. The 'searching' traffic would be additive to the traffic that was considered in compiling the LOS impacts.

□ The City shall work to include the publicly accessible off-street facilities into the permanent implementation of SF*park*, and incorporate data into a smart phone application and permanent dynamic message signs.

The problem with this is the same issue as above – the 'searching' traffic it may reduce was never considered in the DSEIR's analysis. Hence, it does not reduce the LOS impacts as disclosed.

□ If necessary to support achievement of non-auto mode shares for the project, the project sponsor shall cooperate with future City efforts for active interventions to effectively manage and price the parking supply in the project vicinity to reduce travel by automobile, thus improving traffic conditions.

The problem with this proposed mitigation measure is twofold. First, the project sponsor does not control most of the parking event attendees may use in the Project vicinity. Hence, it cannot meaningfully "manage and price" the parking supply. Second, for the 2015-16 basketball season, Warriors individual game tickets at season ticketholder prices range from $30 to $60 in the upper deck and from $85 to $550 in the lower deck. Season ticketholder per game prices for the recent 2015 playoffs ranged from $100 to $165 (upper deck) and from $210 to $1050 (lower deck) in the first round to, in the final round, from $230 to $345 (upper deck) and $525 to $2000 (lower deck). At these ticket prices, very few of the attendees who haven't already chosen to ride transit for other reasons are going to be sensitive enough to parking pricing to change mode. So this strategy is unlikely to be effective. 33 [TR-12a] cont.

□ The project sponsor to seek partnerships with car-sharing services.

Given the above ticket pricing inference as to the economics of event goers, it is doubtful that car-sharing partnerships would have quantifiable effect on travel habits or the ultimate intersection LOS impacts. Hence, there is no mitigation.

Strategy to Enhance Non-auto Modes

□ The project sponsor to provide a promotional incentive (e.g., show Clipper card or bike valet ticket for concession savings, chance to win merchandise or experience, etc.) for public transit use and/or bicycle valet use at the event center.

Given the above ticket pricing inference as to the economics of event goers, it is doubtful that the suggested incentives would have any effect on travel habits or the ultimate intersection LOS impacts. Hence, there is no mitigation.

Strategies to Enhance Transportation Conditions in Mission Bay and Nearby Neighborhoods

 The project sponsor to participate as a member of the Mission Bay Ballpark Transportation Coordination Committee (MBBTCC) and to notify at least one month prior to the start of any non-GSW event with at least 12,500 expected attendees. If commercially reasonable circumstances prevent such advance notification, the GSW shall notify the MBBTCC within 72 hours of booking.

The notification provided herein is useful to set the ordinary event traffic management procedures in place for the scheduled date. However, there is no inference that this would change the intersection LOS impacts disclosed in the DSEIR. Hence, there is no mitigative effect.

 The City and the project sponsor to meet to discuss transportation and scheduling logistics following signing any marquee events (national tournaments or championships, political conventions, or tenants interested in additional season runs: NHL, NCAA, etc.).

Again, the notification provided herein is useful to set the ordinary event traffic management procedures in place for the scheduled date. However, there is no inference that this would change the intersection LOS impacts disclosed in the DSEIR. Hence, there is no mitigative effect. 33 [TR-12a] cont.

Strategies to Increase Transit Access

 The City to coordinate with regional providers to encourage increased special event service, particularly longer BART and Caltrain trains, and increased ferry and bus service.

If the City really wanted to mitigate the significant impacts on intersection LOS, instead of just asking the regional service providers for more services, it should condition the Project to pay the regional providers for the incremental cost of such services over fare revenue generated. Otherwise, the measure as constituted is unenforceable and ineffective.

 The City to work in good faith with the Water Emergency Transportation Agency, the project sponsor, UCSF, and other interested parties to explore the possibility of construction of a ferry landing at the terminus of 16th Street, and provision of ferry service during events.

Discussing possibilities is not mitigation. If the City wants to have this measure as an effective mitigation, it must condition the Project to contribute a fair-share payment to the ferry landing, if developed, and to pay fair share incremental costs over fare revenues for ferry operations.

The next section of mitigation for Project Impact TR-2 counts on the Mission Bay FSEIR Mitigation Measure E.47: the Transportation System Management Plan. 34 [TR-12b, TR-12c]

However, the effects of those portions of that TSM Plan that have been implemented have been absorbed and are reflected in the existing baseline counts that underlie this DSEIR's disclosures of impact TR-2. To constitute effective mitigation for the subject Project, this DSEIR should identify the specific elements of the hypothetical Mission Bay FSEIR Mitigation Measure E.47 that have actually been implemented and what enhancements to it this Project needs to carry out. For instance, considering the elements of Mission Bay FSEIR Mitigation Measure E.47 the following observations can be made.

FSEIR Mitigation Measure E.47.a: Shuttle Bus - Operate shuttle bus service between Mission Bay and regional transit stops in San Francisco (e.g., BART, Caltrain, Ferry Terminal, Transbay Transit Terminal), and specific gathering points in major San Francisco neighborhoods (e.g., Richmond and Mission Districts).

To be effective mitigation, the DSEIR must disclose what additions to shuttle routes and times of service would be needed to alter conditions reported in Impact TR-2 and commit the Project to implement them.

FSEIR Mitigation Measure E.47.b: Transit Pass Sales - Sell transit passes in neighborhood retail stores and commercial buildings in the Project Area. 34 [TR-12b, TR-12c] cont.

The effect of this measure is not quantifiable as mitigation. It is doubtful that anyone who might use transit to and from the Project site is deterred from doing so for want of a convenient location selling transit passes.

FSEIR Mitigation Measure E.47.c: Employee Transit Subsidies - Provide a system of employee transportation subsidies for major employers.

While transit subsidies might alter the commute modes of some daytime employees at the Project, given the composition of uses proposed, it is unclear how many employers would be characterized as "major" and consequently, how many employees would be qualified for subsidies. Hence, the effect of this measure cannot be quantified.

FSEIR Mitigation Measure E.47.e: Secure Bicycle Parking - Provide secure bicycle parking area in parking garages of residential buildings, office buildings, and research and development facilities. Provide secure bicycle parking areas by 1) constructing secure bicycle parking at a ratio of 1 bicycle parking space for each 20 automobile parking spaces, and 2) carry out an annual survey program during project development to establish trends in bicycle use and to estimate actual demand for secure bicycle parking and for sidewalk bicycle racks, increasing the number of secure bicycle parking spaces or racks either in new buildings or in existing automobile parking facilities to meet the estimated demand. Provide secure bicycle racks throughout Mission Bay for the use of visitors.

This measure might change the mode of choice of a few daytime employees or visitors to the site who would otherwise not use bicycle but it is not likely to change the choices of event attendees, particularly in the evening or evening workers.

FSEIR Mitigation Measure E.47.f: Appropriate Street Lighting - Ensure that streets and sidewalks in Mission Bay are sufficiently lit to provide pedestrians and bicyclists with a greater sense of safety, and thereby encourage Mission Bay employees, visitors and residents to walk and bicycle to and from Mission Bay.

Since adequate lighting is a prerequisite of any modern urban development, it is unlikely that this measure would change the mode splits the DSEIR already projects in disclosing impact TR-2. The measure has no. quantifiable mitigation effect.

FSEIR Mitigation Measure E.47.g: Transit and Pedestrian and Bicycle Route Information - Provide maps of the local and citywide pedestrian and bicycle routes with transit maps and information on kiosks throughout the Project Area to promote multi-modal travel.

The amount of change in the mode choice pattern the DSEIR already projects that provision of this information would result in is not quantifiable. Hence, there is no clear mitigation of Impact TR-2.

34 [TR-12b, TR-12c] cont.

FSEIR Mitigation Measure E.47.h: Parking Management Strategies - Establish parking management guidelines for the private operators of parking facilities in the Project Area.

This measure is so vague that consequences of it are not quantifiable. Hence, there is no clear mitigation of Impact TR-2.

FSEIR Mitigation Measure E.47i: Flexible Work Hours/Telecommuting - Where feasible, offer employees in the Project Area the opportunity to work on flexible schedules and/or telecommute so they could avoid peak hour traffic conditions.

This FSEIR mitigation measure does nothing to address the Project's special event transportation impacts in the PM peak and Early Evening hours.

FSEIR Mitigation Measure E.49: Ferry Service - Make a good faith effort to assist the Port of San Francisco and others in ongoing studies of the feasibility of expanding regional ferry service. Make good faith efforts to assist in implementing feasible study recommendations.

As previously noted in the context of other mentions of ferry service, this item does not qualify as mitigation for the DSEIR subject project since the DSEIR has failed to determine that ferry service is feasible and since it does not condition the Project to take qualifying actions such as paying fair share contributions to development of a ferry landing serving the Project or paying a fair share of the incremental cost of ferry operations over revenue.

Impact and Mitigation Measure TR-5

The DSEIR finds that the Project would result in a substantial increase in transit demand that could not be accommodated by regional transit capacity and finds it significant and unavoidable with mitigation (SUM). However, many of the purported mitigations disclosed are fatally flawed as demonstrated below.

Mitigation Measure M-TR-5a: Additional Caltrain Service
As a mitigation measure to accommodate transit demand to and from the South Bay for weekday and weekend evening events, the project sponsor shall work with the Ballpark/Mission Bay Transportation Coordinating Committee to coordinate with Caltrain to provide additional Caltrain service to and from San Francisco on weekdays and weekends. The need for additional service shall be based on surveys of event center attendees conducted as part of the TMP.

Coordination does not qualify as mitigation. Doing something substantial such as offering to pay for incremental cost of additional services over revenues is necessary to consider this as mitigation. And determining the need for special service should have been done in this DSEIR, not deferred to subsequent surveys.

35 [TR-12b]

Mitigation Measure M-TR-5b: Additional North Bay Ferry and/or Bus Service
As a mitigation measure to accommodate transit demand to the North Bay following weekday and weekend evening events, the project sponsor shall work with the Ballpark/Mission Bay Transportation Coordinating Committee to coordinate with Golden GateTransit and WETA to provide additional ferry and/or bus service from San Francisco following weekday and weekend evening events. The need for additional service shall be based on surveys of event center attendees conducted as part of the TMP.

The same comment as immediately above applies. M-TR -5b does not qualify as mitigation under CEQA.

In summary, as these examples demonstrate, the measures proposed in an attempt to mitigate the Project's significant impacts lack substance, and their feasibility is still undetermined. Hence, the attempt at disclosing feasible mitigation is inadequate under CEQA.

Excessively Distant Time Frame and Massive Development Assumptions Masks Significance of Project's Nearer Term Cumulative Impacts

36 [TR-2h]

The cumulative analysis of the Project's transportation and circulation impacts is done in the context of a Year 2040 (25 years hence) plan-based development scenario. That scenario assumes development in Downtown, the SOMA and

Mission Bay that would add 162,000 new PM peak hour trips over existing[15]. Per DSEIR Table 5.2-22, the Project, at its highest PM peak hour trip generation intensity (with an evening capacity basketball game scheduled) would generate some 4599 person trips. This is only 2.84 percent of the new downtown-SOMA-Mission Bay trips projected in the 2040 cumulative analysis. As previously noted, San Francisco transportation impact thresholds require a project to add 5 percent to critical movements at an intersection already at unacceptable LOS, 5 percent to vehicle density on freeway ramps already at unacceptable levels, and 5 percent to MUNI ridership on screen lines and specific routes already exceeding acceptable percentages of capacity. Because the Project comprises only 2.84 percent of the PM peak hour core area trip growth contemplated in the cumulative analysis, it is highly unlikely that this Project, or any project of similar size, or even nearly double its size, could ever be found to cause transportation impacts that are cumulatively significant, given the nature of the impact thresholds and the distant and bloated development scenario that is the context of the cumulative transportation impact analysis of the Project. A more reasonable cumulative analysis would consider a future analysis year of, say, 10 years forward, and consider other development projects and transportation infrastructure projects that are reasonably foreseeable in that time frame. The cumulative analysis should be redone in that or similar context. 36 [TR-2h] cont.

While on this subject, it is worthwhile considering the transportation forecast model relied upon in the cumulative analysis – SF Champ. This is a model that, by its nature, is intended to provide information guiding major planning development policy decisions and major transportation investment decisions. It is not intended, or suitable, for providing microscale information at the level of transportation impact assessment of individual development projects on intersections, freeway ramps, individual transit lines and so on. This is evident in the validation statistics of the model. On traffic *screenlines* its validation accuracy is within 10 percent on only 80 percent of the screenlines tested[16]. Its accuracy on individual roadways and intersections would be significantly less. Since the criterion of significant cumulative impact at unsatisfactory intersections and ramps is a 5 percent contribution to the traffic at that location, the accuracy of the model is less than the impact threshold that the environmental analysis is attempting to measure. So using this forecast model for an EIR type micro-analysis is like using a sledge hammer or pile driver to drive a common pin. The lesson in this is that the City should be using a project-based build-up analysis over a shorter term future to develop the cumulative scenario.

Conclusion

[15] *San Francisco Transportation Plan 2040, Appendix C, Core Circulation Study*, SFMTA, 2013.
[16] See *San Francisco Transportation Forecasting Model Final Report, Executive Summary,* San Francisco County Transportation Authority by Cambridge Systematics, October 1, 2002.

Due to all of the foregoing, the DSEIR transportation and circulation section is inadequate. The document must be completely revised, a revision that will involve 37 [TR-2j]
disclosure of significant new information. Hence, the document should be recirculated in draft status for a full 45 day review period. 38 [ERP-5]

Sincerely,

Smith Engineering & Management
A California Corporation

Daniel T. Smith Jr., P.E.

O-MBA10L4
Exh 2

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Tom Lippe
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RE: Draft Subsequent EIR Informational Sufficiency Review for Golden State Warriors Arena aka - Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (SCN:2014112045)

Mr. Lippe,

This letter summarizes the professional opinions of Larry Wymer, licensed California Traffic Engineer (#1955), on the informational sufficiency of the Draft Subsequent Environmental Impact Report (DSEIR) for the proposed Golden State Warriors Arena. Henceforth, "DSEIR" will refer to the arena project's DSEIR

Per your request, I reviewed specific aspects of the DSEIR focusing on transportation and circulation. My Curriculum Vitae is attached outlining my 26 years of consulting experience in traffic engineering/transportation planning.

My opinions are outlined below.

OPINION 1 - The DSEIR's Transportation and Circulation analysis does not adequately analyze the entirety of the study area impacted by the development

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The defined study area for the DSEIR is taken to be a subsection of the study area identified for the "Mission Bay Final Subsequent Environmental Impact Report", from which the DSEIR was tiered. Since the Mission Bay FSEIR was completed in 1998, the assumptions included therein are presently 17 years old and require appropriate revisions, and possibly expansions beyond those assumed within that report, to provide a similar level of impact analysis as provided therein.

Numerous San Francisco regional planning documents conclude that auto trips within and adjacent to the DSEIR's study area will increase significantly up to the 2040 cumulative year horizon. Specifically, the "2040 San Francisco Transportation Plan" concludes that daily auto trips within the "SoMa/Mission Bay" (South of Market/Mission Bay) regions along roadways arena traffic would travel will grow by the following percentages between 2012 and 2040:[1]

- Overall SoMa/Mission Bay auto trips (2012-2040) = +82% (+125,000 vehicles)
- So/Ma between Downtown Core & I-80 (2012-2040) = +42%
- So/Ma (south of I-80) to Mission Bay = +174%

[1] San Francisco Transportation Plan 2040, Appendix K: SF Travel At a Glance

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The DSEIR provides six figures showing "Project Vehicle Trip Patterns to Major Parking Facilities" serving the arena. **Table 1** summarizes the information within these figures establishing the trip percentages that travel to/from or through the SoMa and North Mission Bay areas.

Table 1
Project Vehicle Trip Patterns to Major Parking Facilities
North Mission Bay & South SoMa

Figure	Page	Figure Title	Trip Assignment Along Roadway: Seventh St s/o Townsend St	Fourth St s/o Townsed St	King St e/o Third St	from WB I-80 to Fifth St
5.2-14A	5.2-95	Project Vehicle Trip Patterns to Major Parking Facilities - Inbound Weekday PM Peak Hour - No Event and Convention Event	18% / 22%	7% / 7%	5% / 11%	8% / 7%
5.2-14B	5.2-96	Project Vehicle Trip Patterns to Major Parking Facilities- Outbound Weekday PM Peak Hour - No Event and Convention Event	19% / 19%	7% / 12%	5% / 5%	8% / 8%
5.2-14C	5.2-97	Project Vehicle Trip Patterns to Major Parking Facilities - Inbound Saturday Evening Peak Hour - No Event	20%	8%	5%	9%
5.2-14D	5.2-98	Project Vehicle Trip Patterns to Major Parking Facilities - Outbound Saturday Evening Peak Hour - No Event	20%	8%	5%	7%
5.2-14E	5.2-99	Project Vehicle Trip Patterns to Major Parking Facilities - Inbound Weekday and Saturday Peak Hours - Basketball Game Without a SF Giants Evening Game	31% / 32%	13% / 13%	9% / 11%	29% / 30%
5.2-14F	5.2-100	Project Vehicle Trip Patterns to Major Parking Facilities - Outbound Weekday Late Evening Peak Hour - Basketball Game Without a SF Giants Evening Game	31%	13%	11%	20%

Source: "Event Center and Mixed Use Development at Mission Bay Blocks 29-32" DSEIR (June 5, 2015)

The table above establishes that the arterials within the northern portion of the study area will experience significant increases in traffic volumes ranging from 9% to 32%. At issue for much of this traffic is where the traffic will originate.

Table 5.2-23 (page 5.2-85), and corresponding text on pages 5.2-84 to 5.2-86, describes expected trip distribution patterns to the project site from attendees arriving from the downtown area, with increased numbers on weekdays due to attendees traveling to the study area directly from their jobs downtown:

> *The origin/destination distribution range for a weekday basketball game reflects an adjustment for event attendees who would travel to the event center directly from work rather than from their place of residence. The adjustment was based on a survey of Golden State Warriors season ticket holders (see Appendix TR). As shown in Table 5.2-23, the number of trips starting in San Francisco on a weekday is projected to be about 7.5 percentage points greater than on a weekend, with the corresponding reductions in trips arriving from the East Bay (2 percentage points), North Bay (4 percentage points), and South Bay (1.5 percentage points) areas. The majority of visitor trips to a convention event, retail, office, and restaurant uses would be from within San Francisco (70 to 81 percent), followed by South Bay (9 to 10 percent), and then East Bay (3 to 9 percent) origins/destinations.*

Because these attendees will be arriving largely from the high employment areas in and near downtown, significant numbers of attendees would be required to pass through the SoMa area and northern portion of the DSEIR's defined study area to arrive at either the stadium or one of the ancillary land uses (i.e. restaurants) in the vicinity of the proposed arena. And because these attendees will be travelling to the arena directly from work, it can be reasonably assumed many (if not most) would initiate their trip within the later part of the PM peak period (i.e. 5:00/5:30 to 6:00

pm). Thus it can be expected many intersections north of those studied within the DSEIR (i.e. from north of Market Street to south of King Street) will experience large increases in PM peak hour traffic volumes as a result of this Project.

When these project volumes are combined with the 42% to 174% increases within this same area (from north of Market Street to south of King Street), the potential impacts are compounded necessitating the need to widen the study area northward towards downtown. Thus the increases in both cumulative background and project traffic volumes, particularly during weekday PM peak hour periods, requires widening the study area beyond that included within the Mission Bay Blocks 29-32 DSEIR, and beyond the study area within the 1998 "Mission Bay Final Subsequent Environmental Impact Report" from which the more recent DSEIR was tiered.

A revised SEIR should expand the study area northward to at least Market Street, an area henceforth referred to as the "expanded study area". For planning purposes, the expanded study area into north Mission Bay and SoMa is assumed to be northward from the existing study area within an area bounded generally by 8th Street to the west, Market Street to the north between 8th Street and The Embarcadero, northward along The Embarcadero to Broadway, and the San Francisco Bay to the east. A few additional intersections are included in the neighborhood east of the I80/US-101 interchange.

Further justification for expanding the study area northward is provided in Opinion 2 below.

The following opinion will almost exclusively focus on weekday PM peak hour conditions since that is the time period my proposed expanded analysis is assumed will largely experience the most significant impacts.

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[TR-2b]
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OPINION 2 - The DSEIR's Transportation and Circulation analysis does not analyze impacted study intersections and ramps in the SoMa and North Mission Bay areas, most notably those between Market Street and King Street

To assist in reviewing the adequacy of the DSEIRs study area limits, I reviewed the draft traffic study (in memorandum format) for the previous proposed arena site. That memorandum report was titled *"Travel and Parking Demand Estimates for the Proposed Event Center and Mixed Use Development at Piers 30-32 and Seawall Lot 330";* stamped "Draft-Subject to Revisions; dated August 9, 2013; submitted by Jose I. Farran of Adavant Consulting; and submitted to the San Francisco Planning Department (Brett Bollinger, Chris Kern and Viktoriya Wise), Orion Environmental (Joyce Hsiao), and Environmental Science Associates (Paul Mitchell). The traffic study for this earlier proposed arena will henceforth be referred to as the "2013 memorandum traffic study," or "2013 arena study" within tables.

Although the arena analyzed in the 2013 memorandum traffic study was also originally proposed to be located south of I-80 (same as the currently proposed arena), trip distribution patterns and intersections identified as critical intersections warranting study stretches significantly further northward into and through the entire SoMa area, with a few even included north of Market Street. Since both versions of the arena project are located south of I-80, traffic arriving at the respective arena sites would include traffic originating from the downtown areas as described in Opinion 1, traffic would travel southeastward along SoMa arterials and through SoMa intersections to both sites, and traffic would also pass through still more intersections within the first several blocks south of I-80. The original 2013 memorandum traffic study analyzed 12 intersections north of I-80 and 10 intersections between I-80 and King Street, whereas none of these 22 intersections were analyzed within the DSEIR. A review of trip distribution patterns for both versions of the project reveal that trip distribution and assignment patterns are not substantially different between the two, however the DSEIR fails to reflect this reality with a noticeable absence of much needed analysis of the critical intersections identified in the traffic study for the earlier site.

Table 2 provides a summary of 27 study intersections located within the SoMA area and blocks north and south of I-80 which were analyzed within the 2013 memorandum traffic study, and the PM peak hour levels of service which

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were established therein for Existing (No Project), Existing Plus Project, and Existing Plus "No Event" Project conditions. The table also notes that 10 of these 27 intersections were analyzed within the1998 Mission Bay DSEIR, yet only 5 of those 10 intersections (and 5 of the 27) were analyzed within the DSEIR. And finally, the table shows that 13 of the 22 intersections neglected in the DSEIR would operate at deficient level of service (LOS) E or F operations for no project and/or plus project conditions.

Table 2
Expanded Study Area LOS Analysis

Intersection	Original Arena Study LOS Operations Weekday PM Peak Hour (4:00-6:00)						LOS Analysis Intersection # if Analyzed w/in Study		
	Existing (No Project)		Existing Plus Project		Existing Plus No Event		2013 Arena Study [1]	1998 Mission Bay FSEIR [2]	2015 DSEIR Arena Study [3]
	Delay	LOS	Delay	LOS	Delay	LOS			
The Embarcadero / Broadway	36.70	D	37.40	D	36.90	D	1		
The Embarcadero / Washington St	30.50	C	38.00	D	31.50	C	2		
The Embarcadero / Mission St	79.50	E	>80 (1.13)	F	>80 (1.06)	F	3		
The Embarcadero / Howard St	>80 (1.13)	F	>80 (1.38)	F	>80 (1.18)	F	4		
The Embarcadero / Folsom St	61.90	E	>80 (1.39)	F	66.80	E	5		
The Embarcadero / Harrison St	71.00	E	>80 (1.01)	F	>80 (0.93)	F	6		
The Embarcadero / Bryant St	>80 (1.51)	F	>80 (1.08)	F	>80 (2.17)	F	7		
The Embarcadero / Brannon St	39.10	D	42.40	D	37.60	D	9		
The Embarcadero / Townsend St	58.10	E	70.40	E	62.60	E	10		
2nd St / King St	55.80	E	63.10	E	59.60	E	11	X	
3rd St / King St	72.70	E	>80 (0.99)	F	>80 (0.95)	F	12	X	1
4th St / King St	51.90	D	59.50	E	56.00	E	13	X	2
5th St / King St / I-280 Ramps	59.20	E	72.80	E	56.00	E	14	X	3
Main St / Harrison St	>80 (0.91)	F	>80 (1.07)	F	>80 (0.93)	F	15		
Main St / Bryant St	21.20	C	24.20	C	32.50	C	16		
Beale St / Mission St	33.80	C	41.80	D	37.10	D	17		
Beale St / Bryant St	54.00	D	>80 (1.15)	F	>80 (1.13)	F	18		
Fremont St / Harrison St	32.40	C	38.80	D	34.40	C	19	X	
Fremont St / Folsom St	53.60	D	>80 (0.75)	F	54.00	D	20		
1st St / Harrison St / I-80 Ramps	>80 (1.13)	F	>80 (1.28)	F	>80 (1.17)	F	21	X	
4th St / Howard St	52.20	D	54.40	D	53.10	D	22		
4th St / Harrison St / I-80 Ramps	41.80	D	44.50	D	42.00	D	23		
4th St / Bryant St / I-80 Ramps	>80 (0.76)	F	>80 (0.87)	F	>80 (0.77)	F	24	X	
5th St / Harrison St / I-80 Ramps	48.40	D	>80 (1.07)	F	60.90	E	25	X	4
2nd St / Brannon St	20.20	C	28.20	C	21.30	C	27		
2nd St / Bryant St	>80 (1.23)	F	>80 (1.27)	F	>80 (1.24)	F	28	X	
5th St / Bryant St / I-80 Ramps	see note [4]		see note [4]		see note [4]		? [4]	X	5

NOTES:

Deficient LOS E or F within 2015 DSEIR LOS analysis.

[1] = Analyzed in Original 2013 Arena Study - "Event Center & Mixed-Use Development at Piers 30-32 & Seawall Lot 330" (GSW P30-32 LOS_Table 052815_FP.xlsx)(pg TR-783)

[2] = Analyzed in 1998 "Mission Bay Final Subsequent Enviroronmental Impact Report"

[3] = Analyzed in 2015 "Event Center and Mixed Use Development at Mission Bay Blocks 29-32" (SCN:2014112045).
Table only considers study intersections north of the proposed project site, thus study intersections #6 through #22 of the DSEIR are neglected herein.

[4] = Incomplete data from memoranudm traffic study indicates deficient LOS E &/or F but no specifics regarding intersection #, delays, and which scenarios are projected to experience LOS E/F.

The information provided in the Table above supports Opinion 1 that the DSEIR's Transportation and Circulation analysis does not adequately analyze the entirety of the study area impacted by the development, and that by extension the DSEIR's Transportation and Circulation analysis also does not adequately analyze impacted study intersections and ramps in the SoMa and North Mission Bay areas.

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Based on the deficient levels of service identified in the table above which the proposed project would potentially add significant traffic volumes, a revised SEIR should add (at a minimum) the following 13 study intersections from the expanded study area identified above.

1) Mission Street / The Embarcadero
2) Howard Street / The Embarcadero
3) Folsom Street / The Embarcadero
4) Harrison Street / The Embarcadero
5) Bryant Street / The Embarcadero
6) Townsend Street / The Embarcadero
7) King Street / Second Street
8) Harrison Street / Main Street
9) Bryant Street / Beale Street
10) Folsom Street / Freemont Street
11) Harrison Street / First Street
12) Bryant Street / Fourth Street
13) Bryant Street / Second Street

Further justification for adding these 13 intersections is provided below.

Table 3 (divided into 3 sections 3a, 3b and 3c) summarizes a review of all of the CEQA Documents and notices for non-SFPUC projects consisting of Environmental Impact Reports, Negative Declaration, NOPs, etc. which were listed on the City/County of San Francisco's Planning Department Website as of July 17, 2015.[2] Each of the projects were reviewed to establish the location of the project relative to the arena, and more importantly if traffic generated by the project would impact any intersections the arena might also impact.

39a [TR-2b] cont.

If a cumulative project is located both well outside of the expanded study area, and it can be reasonably concluded the project would add little to no traffic to potential study intersections within the expanded study area, the project was eliminated from further consideration and not included in Table 3.

If the cumulative project was located near the expanded study area with the potential to add traffic volumes to potential study intersections within the expanded study area, the project was reviewed further to make a determination whether or not it should be added to Table 3.

If a cumulative project was located within the general boundaries of the expanded study area, it was included in Table 3 regardless of whether an EIR had been prepared or the project was at the initial NOP stage with study intersections yet to be determined.

For those projects which have an EIR and corresponding traffic impact study, I reviewed the traffic impact study with particular attention to trip distribution and study intersection graphics, and LOS intersection and freeway ramp operations analysis tables. I noted any study intersections located within the expanded study area described in Opinion 1 which were found to operate at a deficient level of service for weekday PM peak hour conditions for any scenario whether it be existing, cumulative, no project, plus project, etc. These intersections, along with corresponding deficient delays and LOS E and/or F operations, are noted in Table 3.

If the proposed project was located within the expanded study area itself, it is included in Table 3 whether it has completed an EIR with corresponding LOS tables, or simply an NOP with no traffic analysis yet. They were included because the project will obviously add some level of (yet to be determined) traffic to (yet to be determined) study intersections in the expanded study area, some of which might be newly added study intersections for the arena

[2] http://www.sf-planning.org/index.aspx?page=3562

project. Cumulative NOP projects without an EIR or traffic impact study are included for future planning purposes with the assumption an EIR and traffic impact study might be ready when a review is initiated to establish a revised scope and study area for a revised DSEIR. In the meantime, Table 3 includes an "NA" (not applicable) notation in place of a list of intersections operating at deficient levels of service.

Note that Table 3 is considered a planning level tool. Because a more detailed analysis will need to be performed at a later time to establish trip distribution and assignment patterns through the expanded study area, there is at present some uncertainty regarding the complete list of intersections within the expanded study area which will warrant study. Although an initial list of additional study intersections is provided below which in my opinion satisfies that criteria, it is not comprehensive and requires additional planning level analysis to expand to a full list. Thus without foresight regarding what intersections may or may not be included within that final list, and in the interest of providing an initial list of potential study intersections, Table 3 simply lists any and all study intersections identified as operating deficiently within the expanded study area within any EIR or traffic study.

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Table 3a
Approved & Cumulative Projects with Designated Study Intersections at LOS E or F from SoMa to Mission Bay

Case #	Project Name and Document	Study Intersections at LOS E or F (No Project Delay/LOS) > (Plus Project Delay/LOS) Existing Conditions	Cumulative Conditions	Latest Update	Construction Status	Pgs in Report	Pgs in PDF	Study Link
2007.1275E and 2014.13	San Francisco 2004 and 2009 Housing Element	10) ---------------------- 11) ---------------------- 12) ---------------------- 13) 1st St/Market St (67.7 / E) 14) 1st St/Mission St (>80.0 / F) 15) 1st St/Harrison St (>80.0 / F) 16) ---------------------- 17) 2nd St/Bryant St (60.3 / E) 18) ---------------------- 19) ---------------------- 20) 4th St/Harrison St (63.2 / E) 22) ---------------------- 23) ---------------------- 24) 6th St/Brannan St (>80 / F) 55) ----------------------	10) The Embarcadero / Broadway (>80.0 / F) 11) The Embarcadero / Washington St (69.1 / E) 12) The Embarcadero / Harrison St (55.0 / E) 13) 1st St/Market St (>80.0 / F) 14) 1st St/Mission St (>80.0 / F) 15) 1st St/Harrison St (>80.0 / F) 16) 2nd St/Folsom St (>80.0 / F) 17) 2nd St/Bryant St (>80.0 / F) 18) 3rd St/King St (>80 / F) 19) 4th St/King St (57.3 / E) 20) 4th St/Harrison St (67.4 / E) 22) 6th St/Market St (60.2 / E) 23) 6th St/Mission St (>80.0 / F) 24) 6th St/Brannan St (>80.0 / F) 55) 3rd St / Cesar Chavez St (>80.0 / F)	7/14/2015	CONSTRUCTION ONGOING **(thru 2019)**	V.F-31 V.F-31	363 363	http://sfmea.sfplanning.org/2007.1275E_DEIR.pdf
2014.0198E	850 Bryant Street -- Hall of Justice - Rehabilitation and Detention Facility	Bryant Street/Sixth Street (>80 / F)	Bryant Street/Sixth Street (>80 / F)	5/13/2015	Construction Planned **2016-2020**	84 84	92 92	http://sfmea.sfplanning.org/2014.0198E_PMND.pdf
2014-001272ENV	Pier 70 Mixed-Use District Project	NOP Stage - No study intersections identified	NOP Stage - No study intersections identified	5/6/2015	Construction Planned **2018-2029**	NA	NA	http://sfmea.sfplanning.org/2014-001272ENV_NOP.pdf
2013.1407E	Academy of Art University Project	------------------------------------ ------------------------------------ ------------------------------------ ------------------------------------ Bryant Street/Fifth Street (64.3 / E) > (63.3 / E) ------------------------------------ ------------------------------------	Eighth St/Market St (70.8 / E) > (72.7 / E) Sixth St/Market St (>80 / F) > (>80 / F) Sixth St/Mission St (71.2 / E) > (72.8 / E) Second St/Folsom St (55.4 / E) > (60.4 / E) Fifth St/Bryant St (>80 / F) > (>80 / F) Sixth St/Brannan St (>80 / F) > (>80 / F) Sixth St/Folsom St (63.6 / E) > (69.2 / E)	4/10/2015	???	4.6-11 4.6-131	295 415	http://sfmea.sfplanning.org/2008.0586E_DEIR_VolI-3.pdf
2009.0291E and 2010.0275E	San Francisco Museum of Modern Art (SFMOMA) Expansion/Fire Station Relocation and Housing Project	1) Third/Market (56.2 / E) > (58.0 / E) 2) ------------------------------------ 3) ------------------------------------ 11) ------------------------------------ 14) Sixth/Shipley Streets (WB) (37.3 / E) > (37.5 / E)	1) Third/Market Streets (>80 / F) 2) Third/Mission Streets (>80 / F) 3) Third/Howard Streets (>80 / F) 11) Fifth/Harrison Streets/I-80 off-ramp (>80 / F) 14) Sixth/Shipley Streets (WB) (60.3 / F)	2/24/2015	CONSTRUCTION ONGOING **(2013-spring 2016)**	261 301	300 340	http://sfmea.sfplanning.org/2010.0275E_DEIR1.pdf
2007.0347E	Second Street Improvement Project	1) Market St/ Montgomery St (51.0 / D) > (77.8 / E) 2) New Montgomery St/Mission St (61.3 / E) > (>80 / F) 3) Howard St/New Montgomery St (39.5 / D) > (77.2 / E) 4) Howard St/Hawthorne St (19.6 / B) > (61.9 / E) 5) Hawthorne St/Folsom St (74.5 /E) > (>80 / F) 6) Harrison St/ Hawthorne St (43.4 / D) > (71.0 / E) 7) -- 8) -- 9) -- 10) Third St/King St (>80 / F) > (>80 / F) 14) -- 15) Second St/Folsom St (64.6 / E) > (30.7 / C) 16) -- 17) Second St/Bryant St (>80 / F) > (>80 / F) 18) South Park St/Second St (EB) (>80) / F) (4.6 / A) 20) -- 21) -- 22) -- 23) Harrison St/Essex St (>80 / F) > (>80 / F) 26) -- 27) Folsom St/ First St (>80 / F) > (>80 / F) 28) Harrison St/ First St (>80 / F) > (>80 / F) 29) Fifth/Bryant/I-80 EB on-ramps (> 80 / F) > (> 80 / F)	1) Market St/Montgomery St (>80 / F) > (>80 / F) 2) Mission St/New Montgomery St (>80 / F) > (>80 / F) 3) Howard St/New Montgomery St (17.5 / B) > (55.9 / E) 4) Howard St/Hawthorne St (12.0 / B) > (42.7 / D) 5) Folsom St/Hawthorne St (>80 / F) > (>80 / F) 6) Harrison St/Hawthorne St (30.5 C) / (>80 / F) 7) Bryant St/Third St (>80 / F) > (>80 / F) 8) Brannan St/Third St (>80 / F) > (>80 / F) 9) Townsend St/Third St (>80 / F) > (>80 / F) 10) King St/Third St (>80 / F) > (>80 / F) 14) Howard St/Second St (>80 / F) (>80 / F) 15) Folsom St/Second St (>80 / F) > (>80 / F) 16) Harrison St/Second St (>80 / F) > (>80 / F) 17) Bryant St/Second St (>80 / F) (>80 / F) 18) South Park St/Second St (61.0 / F) > (10.7 / B) 20) Townsend St/Second St (73.3 / E) > (>80 / F) 21) King St/Second St (>80 / F) > (>80 / F) 22) Folsom St/Essex St (>80 / F) > (>80 / F) 23) Harrison St/Essex St (>80 / F) > (>80 / F) 26) Howard St/First St (>80 / F) > (>80 / F) 27) Folsom St/First St (>80 / F) > (>80 / F) 28) Harrison St/First St (>80 / F) > (>80 / F) 29) Fifth St/Bryant St/I-80 EB On-Ramp (>80 / F) > (>80 / F)	2/11/2015	Construction Planned **Fall 2016-late 2017**	54 90	70 106	http://sfmea.sfplanning.org/2007.0347E_Draft%20SEIR_Appx.pdf
2014.0012E	Better Market Street Project	NOP Stage - MARKET STREET intersections between Octavia Boulevard and The Embarcadero	NOP Stage - MARKET STREET intersections between Octavia Boulevard and The Embarcadero	1/14/2015	Construction Planned **2018**	NA	NA	http://www.sf-planning.org/index.aspx?page=4003

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Table 3b
Approved & Cumulative Projects with Designated Study Intersections at LOS E or F from SoMa to Mission Bay

Case #	Project Name and Document	Study Intersections at LOS E or F (No Project Delay/LOS) > (Plus Project Delay/LOS) Existing Conditions	Cumulative Conditions	Latest Update	Construction Status	Pgs in Report	Pgs in PDF	Study Link
2011.0409E	5M Project, 925-967 Mission Street	Existing No Project > Existing Plus Project 1) Fourth/Market/Stockton (56.1 / E) > (64.6 / E) 2) ---------------------------- 3) Fourth/Howard (52.5 / D) > (74.8 / E) 4) Fourth/Folsom (>80 / F) > (80 / F) 5) Fifth/Market (55.9 / E) > (56.8 / E) 8) Fifth/Natomac (EB) (38.2 / E) > (40.9 / E) 9) ---------------------------- 10) ---------------------------- 11) Fifth/Harrison (58.7 / E) > (60.7 / E) 12) Fifth/Bryant (>80 / F) > (>80 / F) 13) Sixth/Market (44.6 / D) > (45.3 / D) 15) Sixth/Minnac (WB) (>50 / F) > (>50 / F] 16) Sixth/Natomac (EB) (>50 / F) > (>50 / F) 17) ---------------------------- 18) Sixth/Folsom (43.3 / D) > (>80 / F) 19) ---------------------------- 20) Sixth/Bryant (>80 / F) > (>80 / F) 21) Sixth/Brannan (74.4 / E) > (>80 / F)	Existing No Project > Cumulative Plus Project 1) Fourth/Market/Stockton (56.1 / E) > (>80 / F) 2) Fourth/Mission (28.1 / C) > (>80 / F) 3) Fourth/Howard (52.5 / D) > (>80 / F) 4) Fourth/Folsom (>80 / F) > (>80 / F) 5) Fifth/Market (55.9 / E) > (>80 / F) 8) Fifth/Natoma (38.2 / E) > (>50 / F) 9) Fifth/Howard (15.1 / B) > (>80 / F) 10) Fifth/Folsom (27.7 / B) > (>80 / F) 11) Fifth/Harrison (77.1 / E) > (>80 / F) 12) Fifth/Bryant (> 80 / F) > (>80 / F) 13) Sixth/Market (44.6 / D) > (62.4 / E) 15) Sixth/Minna (WB) (>50 / F) > (18.5 / B) 16) Sixth/Natoma (EB) (>50 / F) > (>80 / F) 17) Sixth/Howard (35.5 / D) > (>80 / F) 18) Sixth/Folsom (43.3 / D) > (>80 / F) 19) Sixth/Harrison (31.6 / C) > (>80 / F) 20) Sixth/Bryant (>80) / F) > (>80 / F) 21) Sixth/Brannan (74.4 / E) > (>80 / F)	10/15/2014	Construction Planned **Phase 1: 2017-2021** **Phase 2: 2020-2025**	310 351	386 427	http://sfmea.sfplanning.org/2011.0409E_DEIR.pdf
2013.0154E	Moscone Center Expansion Project	1) Market St/N. Montgomery St (66.8 / E) > (66.8 / E) 2) -- 3) Market St/Fourth St (57.7 / E) > (58.0 / E) 4) Market St/Fifth St (59.3 / E) > (60.0 / E) 5) Mission St/N. Montgomery St (70.7 / E) > (70.9 E) 6) Mission St/Third St (71.9 / E) > (74.9 E) 7) -- 9) -- 11) Howard St/Third St (>80 / F) > (>80 / F) 12) Howard St/Fourth St (65.7 / E) > (69.5 / E) 13) -- 14) Folsom St/ Hawthorne St (78.4 / E) > (79.2 / E) 15) Folsom St/Third St (>80 / F) > (>80 / F) 16) Folsom St/Fourth St (>80 / F) > (>80 / F) 17) -- 18) -- 19) -- 20) -- 21) Harrison St/Fifth St (60.4 / E) > (60.7 / E) 22) -- 23) -- 24) Bryant St/Fifth St (>80 / F) > (>80 / F)	1) Market St/N. Montgomery St (>80 / F) 2) Market St/Third St (>80 / F) 3) Market St/Fourth St (>80 / F) 4) Market St/Fifth St (>80 / F) 5) Mission St/N. Montgomery St (>80 / F) 6) Mission St/Third St (>80 / F) 7) Mission St/Fourth St (>80 / F) 9) Howard St/N. Montgomery St (58.6 E) 11) Howard St/Third St (>80 / F) 12) Howard St/Fourth St (>80 / F) 13) Howard St/Fifth St (>80 / F) 14) Folsom St/ Hawthorne St (>80 / F) 15) Folsom St/Third St (>80 / F) 16) Folsom St/Fourth St (>80 / F) 17) Folsom St/Fifth St (>80 / F) 18) Harrison St/Hawthorne St (>80 / F) 19) Harrison St/Third St (>80 / F) 20) Harrison St/Fourth St (>80 / F) 21) Harrison St/Fifth St (>80 / F) 22) Bryant St/Third St (>80 / F) 23) Bryant St/Fourth St (>80 / F) 24) Bryant St/Fifth St (>80 / F)	9/16/2014	Construction Planned **2014-2018**	IV.A-54 IV.A-54	155 155	http://sfmea.sfplanning.org/2013.0154E_DEIR.pdf
2013.0208E	Seawall Lot 337 and Pier 48 Mixed-Use Project	NOP Stage - No intersections identified	NOP Stage - No intersections identified	12/11/2013	Construction Planned **2015-2021**	NA	NA	http://sfmea.sfplanning.org/2013.0208E_NOP.pdf
2005.0424E	465 Tehama/468 Clementina Street	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	11/19/2013	???	NA	NA	http://sfmea.sfplanning.org/2005.0424E_FMND.pdf
2011.0702E	101 Polk Street	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	3/27/2013	CONSTRUCTION ONGOING **(thru early 2016)**	NA	NA	http://sfmea.sfplanning.org/2011.0702E_PMND1.pdf
2007.0385E	345 Brannan Street	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	3/20/2013	CONSTRUCTION ONGOING **(thru late 2015)**	NA	NA	http://sfmea.sfplanning.org/2007.0385E_PMND.pdf

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[TR-2b]
cont.

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Table 3c
Approved & Cumulative Projects
with Designated Study Intersections at LOS E or F
from SoMa to Mission Bay

Case #	Project Name and Document	Study Intersections at LOS E or F (No Project Delay/LOS) > (Plus Project Delay/LOS)		Latest Update	Construction Status	Pgs in Report	Pgs in PDF	Study Link
		Existing Conditions	Cumulative Conditions					
2008.1084E	706 Mission Street – The Mexican Museum and Residential Tower Project	Existing No Project > Existing Plus Project Third / Market (56.2 / E) > (63.2 / E) ------------------------ ------------------------ ------------------------ Fourth / Market (>80 / F) > (>80 / F) ------------------------ ------------------------	Existing No Project > Cumulative Plus Project Third / Market (56.2 / E) > (>80 / F) Third / Stevenson (12.1 / B) > (>80 / F) Third / Mission (20.1 / C) > (>80 / F) Third / Howard (36.1 / D) > (>80 / F) Fourth / Market (>80 / F) > (>80 / F) Fourth / Mission (41.8 / D) > (>80 / F) Fourth / Howard (42.5 / D) > (>80 / F)	3/7/2013	CONSTRUCTION ONGOING **(thru September 2018)** (http://www.sfgate.com/bayarea/article/Record-breaking-condo-project-coming-to-SoMa-6126543.php)	IV.E.37 IV.E.60	149 172	http://sfmea.sfplanning.org/2008.1084E_DEIR_Part_3.pdf
2000.618E	801 Brannan and One Henry Adams Streets Project	1) ------------------------ 2) ------------------------ 3) ------------------------ 4) ------------------------ 5) Division/Brannan/Potrero/Tenth (57.8 / E) > (61.5 / E) 6) Eighth/Brannan (55.4 / E) > (77.5 / E) 7) ------------------------ 9) ------------------------ 10) Division/Rhode Island (NB) (24.6 / C) > (39.2 / E) 15) ------------------------ 16) Sixteenth/Rhode Island (NB) (48.7 / E) > (>50 / F)	1) Seventh/Harrison (>80 / F) 2) Ninth/Bryant (60.6 / E) 3) Eighth/Bryant (>80 / F) 4) Seventh/Bryant (>80 / F) 5) Division/Brannan/Potrero/Tenth (>80 / F) 6) Eighth/Brannan (>80 / F) 7) Seventh/Brannan (75.7 / E) 9) Seventh/Townsend (>80 / F) 10) Division/Rhode Island (NB) (>50 / F) 15) Sixteenth/Kansas/Henry Adams (>80 / F) 16) Sixteenth/Kansas/Rhode Island (NB) (>80 / F)	1/9/2013	CONSTRUCTION ONGOING One Henry Adams **(thru 2016)** http://news.theregistrysf.com/equity-residential-breaks-ground-on-one-henry-adams-in-san-francisco/801 Brannon) 801 Brannon **(thru Spring 2017)** (http://www.bizjournals.com/sanfrancisco/blog/real-estate/2015/05/equity-residential-soma-apartments-801-brannan.html)	177 205	271 299	http://sfmea.sfplanning.org/2000.618E_DEIR1.pdf
2011.1381E	Art & Design Educational Special Use District (1111 8th Street)	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	9/26/2012	?????	NA	NA	http://sfmea.sfplanning.org/2011.1381E_
2011.1086E	752 Carolina Street	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	9/5/2012	?????	NA	NA	http://sfmea.sfplanning.org/2011.1086E_PMND-CPE.pdf
2008.0586E	Academy of Art University Project	NOP Stage - No study intersections identified	NOP Stage - No study intersections identified	9/29/2010	?????	NA	NA	http://www.sf-planning.org/modules/ShowDocument.aspx?documentid=8289
2006.1106E	222 Second Street	1) ------------------------ 2) ------------------------ 3) ------------------------ 4) ------------------------ 5) ------------------------ 6) ------------------------ 7) ------------------------ 8) Folsom Street / Second Street (36.8 / D) > (60.5 / E) 9) Harrison Street/ Fourth Street (62.0 / E) > (68.1 / E) 10) Harrison Street / Second Street (55.7 / E) > (64.2 / E) 11) Harrison Street / First Street (>80 / F) > (>80 / F) 12) Second Street / Tehama Street (28.7 / D) > (>50 / F)	1) Mission Street / Third Street (>80 / F) 2) Howard Street / Third Street (>80 / F) 3) Howard St / New Montgomery St (>80 / F) 4) Howard Street / Second Street (>80 / F) 5) Howard Street / First Street (>80 / F) 6) Howard Street / Fremont Street (>80 / F) 7) Folsom St. / Hawthorne St. (76.6 / E) 8) Folsom Street / Second Street (>80 / F) 9) Harrison Street/ Fourth Street (>80 / F) 10) Harrison Street / Second Street (>80 / F) 11) Harrison Street / First Street (>80 / F) 12) Second Street / Tehama Street (>50 / F)	7/8/2010	CONSTRUCTION ONGOING **(thru 2016)** (http://www.bloomberg.com/news/articles/2014-04-22/linkedin-said-to-fully-lease-tishman-s-san-francisco-tower)	81 81	109 109	http://www.sf-planning.org/modules/ShowDocument.aspx?documentid=8070
2006.1506E	749 Wisconsin Street	NOP Stage - No study intersections identified	NOP Stage - No study intersections identified	6/30/2010	?????	NA	NA	http://www.sf-planning.org/ftp/files/MEA/2006.1506E_749_Wisconsin_NOP.pdf
2004.0588E	255 Seventh Street Project	Reduction in Traffic Volumes	Reduction in Traffic Volumes	2/24/2007	?????	NA	NA	http://www.sf-planning.org/modules/ShowDocument.aspx?documentid=408

39a
[TR-2b]
cont.

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Table 4 (divided into tables 4a and 4b due to length) combines and refines information provided within Tables 2 and 3 to provide a better planning level focus on the selection of study intersections within the expanded study area. It includes all of the intersections identified and included within Table 2 and/or Table 3. The table is organized with intersections separated into five different categories with those within the top most section being those which in my opinion absolutely satisfy the criteria of requiring analysis within a revised DSEIR, and those at the bottom of the list not requiring analysis unless a future screening analysis included them. A full and complete list of additional study intersections should be determined through a planning level analysis which considers trip distribution and assignment through the SoMa and northern Mission Bay areas north and south of I-80.

For clarity, intersections are organized within Table 4 with a specific order. For example, intersection "A"/"B" is such that street "A" consists of the northwest-southeast street (i.e. The Embarcadero, 1st St, 2nd St, ... , 7th St, 8th St, etc.) and street "B" consists of the southwest-northeast street (i.e. Market St, Mission St, ... , Harrison St, Bryant St, Brannan St, Bryan St, King St, Berry St, etc.). Additionally, lists of intersections are ordered beginning in the northeast (i.e. The Embarcadero/Broadway) and ending in the southwest (i.e. 8th St/Berry St).

The first five intersections (included within Table 4a) were already included within the DSEIR and are assumed would be included within the revised DSEIR. They are included simply to provide a full list of the intersections included in the 2013 memorandum traffic study.

The second set of intersections (also included within Table 4a) are comprised of the same thirteen intersections identified above as those which a revised SEIR should add (at a minimum) into the traffic analysis, all of which were also included within the 2013 memorandum traffic study.

The third set of intersections (also included within Table 4a) are comprised of the nine remaining intersections analyzed within the 2013 memorandum traffic study which may or may not be established as being included within a revised SEIR depending on the outcome of a refined trip distribution/assignment process.

The fourth set of intersections (also included within Table 4a) are comprised of the eleven remaining intersections analyzed within the 1998 Mission Bay FSEIR excluded from the 2015 DSEIR which may or may not be established as being included within a revised SEIR depending on the outcome of a refined trip distribution/assignment process.

The fifth and final set of intersections (comprising the entirety of Table 4b) are all of the remaining intersections included within Table 3, some of which may be established as being included within a revised SEIR depending on the outcome of a refined trip distribution/assignment screening process.

39a
[TR-2b]
cont.

Table 4a
Potentially Impacted Intersections in Expanded Study Area

Intersection	Approved/Cumulative Projects LOS E/F (E=Existing)(C=Cumulative) Project ID Code (see notes) A	B	C	D	E	F	G	H	I	J	#	2013 Arena Study [1] #	ENP	E+P	E+P (NE)	LOS E/F	2015 DSEIR Arena Study [2]	1998 Mission Bay FSEIR [3]	Note
3rd St / King St	-C				EC						2	12	E	F	F	E/F	1	X	KEEP
4th St / King St	-C										1	13	D	E	E	E/F	2	X	KEEP
5th St / King St / I-280 Ramps											0	14	E	E	E	E/F	3	X	KEEP
5th St / Harrison St / I-80 Ramps				-C		EC	EC				3	25	D	F	E	E/F	4	X	KEEP
5th St / Bryant St / I-80 Ramps			EC		EC	EC	EC				4	see note [4]				E/F	5	X	KEEP
The Embarcadero / Mission St											0	3	E	F	F	E/F			ADD 1
The Embarcadero / Howard St											0	4	F	F	F	E/F			ADD 2
The Embarcadero / Folsom St											0	5	E	F	E	E/F			ADD 3
The Embarcadero / Harrison St	-C										1	6	E	F	F	E/F			ADD 4
The Embarcadero / Bryant St											0	7	F	F	F	E/F			ADD 5
The Embarcadero / Townsend St											0	10	E	E	E	E/F			ADD 6
Main St / Harrison St											0	15	F	F	F	E/F			ADD 7
Beale St / Bryant St											0	18	D	F	F	E/F			ADD 8
Fremont St / Folsom St											0	20	D	F	D	E/F			ADD 9
1st St / Harrison St / I-80 Ramps	EC				EC					EC	3	21	F	F	F	E/F		X	ADD 10
2nd St / Bryant St	EC				EC						2	28	F	F	F	E/F		X	ADD 11
2nd St / King St					-C						1	11	E	E	E	E/F		X	ADD 12
4th St / Bryant St / I-80 Ramps							-C				1	24	F	F	F	E/F		X	ADD 13
The Embarcadero / Broadway	-C										1	1	D	D	D				
The Embarcadero / Washington St	-C										1	2	C	D	C				
The Embarcadero / Brannon St											0	9	D	D	D				
Main St / Bryant St											0	16	C	C	C				
Beale St / Mission St											0	17	C	D	D				
Fremont St / Harrison St											0	19	C	D	C			X	
2nd St / Brannon St											0	27	C	C	C				
4th St / Howard St						EC	EC	-C			3	22	D	D	D				
4th St / Harrison St / I-80 Ramps	EC						-C				2	23	D	D	D				
Essex St / Harrison St / I-80 Ramps					EC						1							X	
2nd St / Harrison St					-C					EC	2							X	
3rd St / Townsend St					-C						1							X	
3rd St / Berry St											0							X	
4th St / Townsend St											0							X	
4th St / Berry St											0							X	
6th St / Brannan St / I-280 ramps	EC		-C			EC					3							X	
7th St / Harrison St									-C		1							X	
7th St / Bryant St									-C		1							X	
7th St / Brannon St									-C		1							X	
7th St / Townsend St									-C		1							X	

NOTES:

Approved/Cumulative Projects

A = (2007.1275E & 2014.1327E) = San Francisco 2004 and 2009 Housing Element
B = (2014.0198E850 Bryant Street -- Hall of Justice - Rehabilitation and Detention Facility
C = (2013.1407E) = Academy of Art University Project
D = (2009.0291E & 2010.0275E) = San Francisco Museum of Modern Art (SFMOMA) Expansion/Fire Station Relocation and Housing Project
E = (2007.0347E) = Second Street Improvement Project
F = 2011.0409E) = (5M Project, 925-967 Mission Street
G = 2013.0154E) = (Moscone Center Expansion Project
H = (2008.1084E) = 706 Mission Street – The Mexican Museum and Residential Tower Project
I = (2000.618E) = 801 Brannan and One Henry Adams Streets Project
J = (2011.1381E) = Art & Design Educational Special Use District (1111 8th Street)
K = (2006.1106E) = 222 Second Street

Original Arena Study LOS Operations - Weekday PM Peak Hour (4:00-6:00)

= Study Intersection # in Study / ENP = Existing No Project / E+P = Existing Plus Project / E+P(NE) = Existing Plus No Event

[1] = Analyzed in Original 2013 Arena Study - "Event Center & Mixed-Use Development at Piers 30-32 & Seawall Lot 330" (GSW P30-32 LOS_Table 052815_FP.xlsx)(pg TR-783)

[2] = Analyzed in 2015 "Event Center and Mixed Use Development at Mission Bay Blocks 29-32" (SCN:2014112045).
Table only considers study intersections north of the proposed project site, thus study intersections #6 through #22 of the DSEIR are neglected herein.

[3] = Analyzed in 1998 "Mission Bay Final Subsequent Envirornmental Impact Report"

[4] = Incomplete data from memoranudm traffic study indicates deficient LOS E &/or F but no specifics regarding intersection #, delays, and which scenarios are projected to experience LOS E/F.

39a
[TR-2b]
cont.

Table 4b
Potentially Impacted Intersections in Expanded Study Area

Intersection	Approved/Cumulative Projects LOS E/F (E=Existing)(C=Cumulative) Project ID Code (see notes) A	B	C	D	E	F	G	H	I	J	#	2013 Arena Study [1] #	ENP	E+P	E+P (NE)	LOS E/F	2015 DSEIR Arena Study [2]	1998 Mission Bay FSEIR [3]	Note
Fremont St / Howard St										-C	1								
1st St / Market St	EC										1								
1st St / Mission St	EC										1								
1st St / Howard St					-C					-C	2								
1st St / Folsom St					EC						1								
Essex St / Folsom St					-C						1								
2nd St / Howard St					-C					-C	2								
2nd St / Tehama St										EC	1								
2nd St / Folsom St	-C		-C		EC					EC	4								
2nd St / South Park St					EC						1								
2nd St / Townsend St					-C						1								
New Montgomery St / Market St					EC		EC				2								
New Montgomery St / Mission St					EC		EC				2								
New Montgomery St / Howard St					EC		-C			-C	3								
Hawthorne St / Howard St					EC						1								
Hawthorne St / Folsom St					EC		EC			-C	3								
Hawthorne St / Harrison St					EC		-C				2								
3rd St / Market St				EC			-C	EC			3								
3rd St / Stevenson St								-C			1								
3rd St / Mission St				-C			EC	-C		-C	4								
3rd St / Howard St				-C			EC	-C		-C	4								
3rd St / Folsom St							EC				1								
3rd St / Harrison St							-C				1								
3rd St / Bryant St					-C		-C				2								
3rd St / Brannan St					-C						1								
3rd St / Cesar Chavez St	-C										1								
4th St / Market St / Stockton						EC	EC	EC			3								
4th St / Mission St						-C	-C	-C			3								
4th St / Folsom St						EC	EC				2								
4th St / Harrison St										EC	1								
5th St / Market St						EC	EC				2								
5th St / Natoma St						EC					1								
5th St / Howard St						-C	-C				2								
5th St / Folsom St						-C	-C				2								
6th St / Market St	-C		-C			EC					3								
6th St / Mission St	-C		-C								2								
6th St / Minna St						EC					1								
6th St / Natoma St						EC					1								
6th St / Howard St						-C					1								
6th St / Folsom St			-C			EC					2								
6th St / Shipley St				EC							1								
6th St / Harrison St						-C					1								
6th St / Bryant St		EC				EC					2								
8th St / Market St			-C								1								
8th St / Harrison St / I-80 Ramps											0								
8th St / Bryant St									-C		1								
8th St / Brannan St									EC		1								
9th St / Bryant St									-C		1								
10th St / Brannan St / Division / Potrero									EC		1								
16th St / Kansas St / Henry Adams St									-C		1								
Rhode Island St / Division St									EC		1								
Sixteenth / Kansas St / Rhode Island St									EC		1								

39a
[TR-2b]
cont.

OPINION 3 –The DSEIR's Transportation and Circulation analysis understates and fails to disclose and mitigate arena event impacts on PM commute peak travel because it fails to consider the time and duration of attendees travel in advance of passing through venue entry turnstiles

39b
[TR-2d]

I have reviewed Dan T. Smith Jr.'s opinion within his report dated July 15, 2015 regarding The DSEIR's failure to adequately consider PM peak hour impacts due to its failure to consider the time and duration of attendees travel in advance of their arrival at the turnstile. I agree particularly with his statement that:

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"many attendees will, after traveling to the vicinity of the Project site, due to their this stop in neighboring restaurants and bars for drinks or a meal, thereby advancing the actual time of their trip ahead of their time of passage through the arena turnstiles by 30 minutes to an hour or more."

I can personally attest to this dynamic. I have personal experience with 'time of arrival' issues pertaining to the NBA arena where the Sacramento Kings play, presently called 'Sleep Train Arena', but historically called (and still commonly called) 'Arco Arena'. I lived in Sacramento for sixteen years (1996-2012), and during seven of those years (1996-2003) I literally lived within 100 ft of the I-80/Truxel Road interchange. The I-80/Truxel Road interchange is presently 1 of 3 main interchanges providing primary access to the arena, and during the time I lived near the interchange I witnessed the building of the interchange (about 1998, which at the time became the 2nd main interchange providing primary access to the arena). I also witnessed and experienced the development of nearly ALL of the ancillary commercial developments (including restaurants, bars, shopping, etc.) surrounding the arena following the completion of the Truxel interchange. Throughout those seven years I commuted to/from work along the highways and arterials surrounding the arena, and frequented the commercial developments surrounding the arena during and immediately after the PM peak hour period. Thus on each and every game day, whether I personally went to a game myself or not, I experienced first-hand the increased trip generation to ancillary land uses during the later part of the PM peak hour (i.e. 5:00-6:00), experienced increased traffic volumes on I-80 and connecting arterials near the arena, and experienced worsening levels of service and increased delays. In addition to living for a time in the immediate vicinity of the arena, I also attended over 200 NBA games at the arena (as well as dozens of other special events at the arena) throughout the sixteen years I lived in Sacramento. Although I moved to and lived in the Rocklin area between 2003 and 2012, I continued to visit the arena for games, concerts, etc. and would often arrive early to meet with friends and/or frequent one of the many restaurants in the area. Through this experience, I can personally attest to the fact that the ancillary commercial uses surrounding the arena most definitely experiences a significant uptick beginning about 5:00/5:30 pm on game days (and other special events), and that this uptick most definitely increases traffic volumes along I-80, on I-80 freeway ramps to the three interchanges providing primary access to the arena, and along the arterials (and surface streets) surrounding the arena. As part of my research to provide opinions of the sufficiency of review for the proposed Golden State Warriors Arena in Mission Bay, I contacted one of the traffic engineers in the City of Sacramento's Department of Transportation to discuss this 'early arrival' dynamic. He was in agreement that the area most definitely experiences an uptick in traffic and resulting worsening in levels of service during the end of the PM peak period. 39b [TR-2d] cont.

Please feel free to give me a call if you have any questions.

Sincerely,

Larry Wymer & Associates Traffic Engineering

Larry Wymer, CA T.E. 1955

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July 24, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: **Hydrology, Water Quality and Biological Impacts** - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter. 1 [GEN-5]

This letter incorporates by reference, as comments on the DSEIR, all of the comments on the DSEIR contained in the July 21, 2015, letter report authored by Matt Hageman (attached as Exhibit 1) and the July 21, 2015, letter report authored by Erik Ringelberg and Kurt Balasek (attached as Exhibit 2).

I. The DSEIR Is Not Sufficient as an Informational Document with Respect to the Project's Wastewater Treatment Infrastructure Impacts.

The DSEIR concedes the Project's cumulative wastewater flow , in combination with other approved projects, will exceed the Mariposa Pump Station's capacity, and therefore, the Project will have a significant and unavoidable impact because it "would require or result in the construction of new wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects." (DSEIR, p. 5.7-13 - 5.7-20 [Impact C-UT-2].) But the DSEIR's disclosure of the nature and severity of the potentially significant impacts of building these new wastewater treatment facilities falls far short of CEQA's requirements. 2 [UTIL-3]

The DSEIR generally describes the type of new wastewater treatment facilities that might be built, stating:

> the SFPUC anticipates that improvements might include actions such as complete pump station replacement, enlarging or realigning the existing sewer main on Mariposa Street between 3rd Street and the Mariposa Pump Station; upgrading and adding dry weather pumps with potential temporary wet weather pump modifications; upgrading or replacing the dry-weather sump in the pump station; constructing new connections to the transport and storage box structure and rehabilitating the structure; and improving the hydraulic capacity of the downstream gravity sewers, if needed. If a new dry weather pump station is required, it could potentially be constructed within approximately a quarter mile radius of the existing Mariposa Pump Station.

(DSEIR, p. 5.7-14.)

The DSEIR then identifies a number of potentially significant impacts of constructing new wastewater treatment facilities necessitated by the Project, stating:

> These construction activities would be expected to result in temporary increases in truck and construction employee traffic, noise, and air pollutant and greenhouse gas emissions. In addition, depending on the site-specific design and location, the pump station improvements could result in physical effects on cultural resources, biological resources, water quality, and hazardous materials.

(DSEIR, p. 5.7-14.)

The DSEIR then vaguely suggests that these impacts could be mitigated to less than significant levels by adopting "typical" mitigation measures, stating:

> Most, if not all, of these potential impacts can generally be mitigated to a less-than-significant level with typical mitigation measures, similar to those identified in the Initial Study and the SEIR for this project. Long-term operational impacts would likely be less than significant because operation of the pump stations would be similar to existing operations of these facilities.

(DSEIR, p. 5.7-14.)

These vague descriptions fail to discharge the City's legal obligations under CEQA to fully

2
[UTIL-3]
cont.

describe the Project, including its "reasonably foreseeable consequence" of necessitating the construction of additional wastewater treatment facilities, and to include an "analysis of the environmental effects" of this future action and the mitigation measures that may reduce those impacts. (See e.g., *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 396 (*Laurel Heights I*) ["an EIR must include a analysis of the environmental effects of future expansion or other action if: (1) it is a reasonably foreseeable consequence of the initial project; and (2) the future expansion or action will be significant in that it will likely change the scope or nature of the initial project or its environmental effects].)

As shown in both the DSEIR's analysis of mitigation measures and the Mission Bay Alliance's comments on many types of impacts that construction of additional wastewater treatment facilities will cause (e.g., air quality, noise, traffic), the "mitigation measures ... identified in the Initial Study and the SEIR for this project" do not ensure that "impacts can generally be mitigated to a less-than-significant level."

2
[UTIL-3]
cont.

Finally, the DSEIR states:

> In the event that additional future wastewater flows would exceed the pump station capacities before the needed wastewater system improvements could be completed, it is assumed that the SFPUC would make internal operational or piping changes to accommodate the additional flows in the interim in order to remain in compliance with RWQCB permit requirements. The interim system modifications would be subject to the approval of the RWQCB under the terms of the Bayside NPDES permit. Approval by the RWQCB would ensure that water quality of the Bay would be protected during the interim period. Any interim system modifications are assumed to be operational or internal to the existing pump stations and therefore would not result in any physical environmental effects.

This remarkable passage suggests that the City is prepared to approve and allow construction of this Project without ensuring the construction of additional, adequate, sewage treatment capacity required by the Project. This is the opposite of responsible planning. Moreover, the City is apparently poised to take this action based on several unsupported assumptions. First, the DSEIR assumes, without discussion or evidentiary support, that interim modifications will not have a significant effect on the environment.

Second, the DSEIR assumes the Project's wastewater impacts on the Bay will only be "interim" until the SFPUC builds or expands permanent new wastewater treatment facilities; and that in this supposedly "interim" period, the Regional Water Quality Control Board will mitigate any "interim" impacts to less than significant. But there is no evidence to support the assumption the Project's wastewater can be treated to avoid significant adverse effects on Bay water quality before the SFPUC builds or expands permanent wastewater treatment facilities. Nor is there evidence that

3
[UTIL-6,
HYD-3]

Regional Water Quality Control Board regulation during any purported "interim" period would avoid significant adverse effects on Bay water quality. Nor is there any evidence as to how long this purportedly "interim" period will last, or how many other projects that will cumulatively exceed the Mariposa Pump Station's capacity will commence operations during this purportedly "interim" period.

Indeed, this DSEIR's approach represents a total abdication of the City's legal responsibility under CEQA to identify the Project's significant effects, to identify mitigation measures that would substantially reduce those effects, and to adopt all feasible mitigation measures that would substantially reduce those effects. To put it colloquially, punting the problem to the SFPUC or Regional Water Quality Control Board does not pass muster under CEQA.

3 [UTIL-6, HYD-3] cont.

II. The DSEIR Is Not Sufficient as an Informational Document with Respect to the Project's Contaminated Stormwater Impacts on San Francisco Bay Water Quality or Biological Resources.

In the chapter on the Project's Water Quality impacts, the DSEIR evaluates the impact of Combined Sewage Discharges (CSDs or CSOs) to the Bay that exceed treatment capacity of the Mariposa Pump Station due to the combination of increased storm water flows combined with sewage wastewater flows. The DSEIR uses two thresholds of significance based on the City's NPDES permit, stating:

> ● Wet weather flows to combined sewer system: The impact analysis examines whether project related increases in wastewater flows would contribute to combined sewer discharges during wet weather. The impact is considered less than significant if the increased flows would not increase the frequency of combined sewer discharges above the long-term average specified in the NPDES permit for the SEWPCP, the North Point Wet Weather Facility, and Bayside wet-weather facilities.

4 [HYD-5]

> ● Effluent discharges from SEWPCP: For the analysis of impacts related to changes in the quality of effluent discharges from the SEWPCP, the analysis considers whether discharges of wastewater to the combined sewer system would cause effluent quality to exceed the discharge limitations of the NPDES permit for the SEWPCP. If not, the impact is considered less than significant.

(DSEIR, p. 5.9-30.)

Thus, for purposes of complying with CEQA's requirement that it identify the Project's significant impacts, the DSEIR makes two unsupported assumptions: (1) that City compliance with its NPDES permits will avoid significant impacts, and (2) that the City will in fact comply with its NPDES permits. The DSEIR must support these assumptions with evidence.

5 [HYD-4]

In addition, the first threshold quoted above only looks at "frequency of combined sewer discharges above the long-term average" and ignores increases in quantity and duration of overflows. (See DSEIR, pp. 5.9-34 to 5.9-36.) The DSEIR notes:

> The model analyzed the effects of discharging the average flows from the proposed project in combination with the existing average flows in the drainage area. Under this scenario, the frequency of CSDs would not increase, but the volume of the CSDs would increase from 5.34 to 5.63 million gallons and the duration would increase from 17.2 to 17.3 hours.

(DSEIR, 5.9-35.) The DSEIR finds this impact less than significant because it defines "significance" solely in terms of the *number* of CSD events and compliance with the City's NPDES permit, regardless of the *quantity* of sewage discharged, stating:

> Because average and peak wastewater flows from the project site would not increase the frequency of CSD events from the Mariposa sub-basin and would be consistent with the requirements of the NPDES permit, project level water quality impacts related to contributions to an increase in CSD frequency would be *less than significant.*

(DSEIR, 5.9-35, 36.) The DSEIR makes the same finding for the Project's cumulative impact based on the same evidence and the same rationale. (DSEIR, 5.9-35, 36.)

This is a legal error because the DSEIR cannot merely reference a project's compliance with another agency's regulations. Lead agencies must conduct their own fact-based analysis of project impacts, regardless of whether the project complies with other regulatory standards.[1]

6 [HYD-6]

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[1] *See*, e.g., *Californians for Alternatives to Toxics v. Department of Food & Agriculture* (2005) 136 Cal.App.4th 1, 16 (lead agencies must review the site-specific impacts of pesticide applications under their jurisdiction, because "DPR's [Department of Pesticide Regulation] registration does not and cannot account for specific uses of pesticides..., such as the specific chemicals used, their amounts and frequency of use, specific sensitive areas targeted for application, and the like"); *Citizens for Non-Toxic Pest Control v. Department of Food & Agriculture (*1986) 187 Cal.App.3d 1575, 1587-1588 (state agency applying pesticides cannot rely on pesticide registration status to avoid further environmental review under CEQA); *Oro Fino Gold Mining Corporation v. County of El Dorado* (1990) 225 Cal.App.3d 872, 881-882 (rejects contention that project noise level would be insignificant simply by being consistent with general plan standards for the zone in question). *See also City of Antioch v. City Council of the City of Pittsburg* (1986) 187 Cal.App.3d 1325, 1331-1332 (EIR required for construction of road and sewer lines even though these were shown on city's general plan); *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 712-718

The 1998 Mission Bay FSEIR sets the stage for this legal error in its finding that CSO impacts on the Bay are less than significant, stating:

> The same conclusions for the proposed project apply to the cumulative effects of Bayside projects, in that the cumulative increase in pollutant mass load from these projects would have a less-than-significant effect on water quality. As shown in Table V.K.8, the project would represent less than 3% of the increased total pollutant load from the Bayside. The cumulative loads for pollutants would generally increase by 4-6%. Thus, the project would cause approximately half of this cumulative increase for the Bayside. To put this in context, City discharges are a very small portion of the region-wide discharges to the Bay. Compared to municipal dischargers in the Bay Area, the load contribution of the Southeast Plant represents about 12 % of all other municipal dischargers, and the Mission Bay project would represent less than 3 % of that 12% (or 0.36% of all municipal wastewater discharged to the Bay). In addition, besides municipal wastewater, other sources of pollutant loading to San Francisco Bay include riverine inputs, nonurban runoff, urban runoff, point sources, dredging/sediment disposal, spills, and atmospheric deposition. Of these sources, point sources, including municipal dischargers and other permitted industrial dischargers, represent about 1-6 % of the total load input to the Bay-Delta estuary. Regarding stormwater discharges, San Francisco Bayside stormwater flows are about 1.8% of the total regional urban storm flow to the Bay. Considering the contribution of the project and of the cumulative Bayside projects in the context of all the other pollutant inputs to the Bay, the cumulative pollutant loading from Bayside projects would be extremely small.

(1998 MB FSEIR, p. V.K.52.)

This logic reflects the "de minimis" and "ratio" rationales rejected in *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120 ("*CBE*") ["[T]he relevant question"... is not how the effect of the project at issue compares to the preexisting cumulative effect, but whether "any additional amount" of effect should be considered significant in the context of the existing cumulative effect. [footnote omitted] In the end, the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant. [footnote omitted]"], and *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 720-21 ["They contend in assessing significance the EIR focuses upon the ratio between the project's impacts and the overall problem, contrary to the intent

6 [HYD-5] cont.

(agency erred by "wrongly assum[ing] that, simply because the smokestack emissions would comply with applicable regulations from other agencies regulating air quality, the overall project would not cause significant effects to air quality.").

of CEQA.... We find the analysis used in the EIR and urged by GWF avoids analyzing the severity of the problem and allows the approval of projects which, when taken in isolation, appear insignificant, but when viewed together, appear startling. Under GWF's 'ratio' theory, the greater the overall problem, the less significance a project has in a cumulative impacts analysis. We conclude the standard for a cumulative impacts analysis is defined by the use of the term 'collectively significant' in Guidelines section 15355 and the analysis must assess the collective or combined effect of energy development"].) *Communities* and Kings *County* teach that the significance of a cumulative impact depends on the environmental setting in which it occurs, especially the severity of existing environmental harm.

Therefore, accepting the Hydroconsult numbers at face value, the starting point for assessing whether adding 2.9 million gallons per year[2] of incompletely treated CSD pollution to the existing condition of San Francisco Bay is significant is the existing condition of San Francisco Bay.[3] The DSEIR says very little on the topic. The 1998 Mission Bay FSEIR provides some information, but the DSEIR does not discuss how much of the 1998 Mission Bay FSEIR's information may be outdated as a result of the passage of seventeen years, and is, therefore, unknown.

The 1998 Mission Bay FSEIR characterizes "municipal wastewater" as follows:

> Municipal wastewater is a relatively strong waste stream containing high concentrations of organic matter that will decompose (measured as biochemical oxygen demand because the decomposition requires oxygen), inorganic particulates (measured as total suspended solids), nutrients (measured as total nitrogen and phosphorus), and pathogenic microorganisms. It also contains oil and grease and small quantities of toxic metals, pesticides, solvents, and plasticizers (additives in plastics that maintain softness and pliability). Conventional secondary treatment, as employed by San Francisco at its Southeast Water Pollution Control Plant, greatly reduces the concentrations of most substances in municipal wastewater. On the other hand, dissolved metals and organic substances that are resistant to breakdown by bacteria, may pass through the plant relatively unaltered. This waste stream, after

6 [HYD-5] cont.

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[2] 5.63 – 5.34 = 0.29 x 10 = 2.9.

[3] "If the rainstorm is a large one, and the capacity of the storage/transport box sewers is exceeded, treated combined sewer overflows (CSOs) occur at outfalls along the City's shoreline. When combined sewage is temporarily stored in transport/storage structures, floating materials are removed from the water surface and some solids settle to the bottom of the structures. The accumulated solids are then flushed to the treatment plant after the storm has subsided. The treatment that occurs within the structures is approximately equivalent to primary treatment." (1998 MB FSEIR, p. V.K.8-9.)

> treatment, is referred to as municipal wastewater effluent in this SEIR.

(1998 MB FSEIR, p. V.K.4.)

The 1998 Mission Bay FSEIR characterizes "urban stormwater " as follows:

> Urban stormwater is a large-volume wastewater stream. Pollutants contained in urban runoff include street litter, sediment (mostly inorganic particulates, measured as total suspended solids), oil and grease, oxygen-demanding substances, pathogenic microorganisms, toxic metals, and pesticides. The concentrations of oxygen-demanding substances, nutrients, and pathogenic microorganisms are much lower than in untreated municipal wastewater. CSOs exhibit a blend of the untreated characteristics of municipal wastewater and urban stormwater runoff.

(1998 MB FSEIR, p. V.K.4.)

The 1998 Mission Bay FSEIR characterizes the "impairment of Central San Francisco Bay" as follows:

6 [HYD-5] cont.

> The State Water Resources Control Board (SWRCB) has listed central San Francisco Bay as impaired on the basis of field surveys of the water column, sediments, sediment toxicity, bivalve bioaccumulation, and water toxicity. The determination relates to mercury, copper, selenium, diazinon, and polychlorinated biphenyls (PCBs).
> • Mercury. The main source of mercury in the Bay is erosion and drainage from abandoned gold and mercury mines. Other sources include natural sources, atmospheric deposition, and various industrial and municipal sources.
> • Copper. Copper enters the Bay through municipal sources, stormwater runoff (primarily through automobile brake pad dust), and other nonpoint sources (such as soils and abandoned mines). These are the three main sources, and they contribute roughly equivalent amounts.
> • Selenium. Selenium enters the Bay through industrial point sources (e.g., oil refineries), agriculture, and natural sources. Control programs are in place to address selenium discharges from oil refineries
> • Diazinon. Diazinon is a pesticide that enters the Bay as runoff from agriculture and, to a lesser extent, residential land uses. Diazinon is a primary component of insecticides. Homeowner pesticide use peaks in late spring and early summer.
> • PCBs. Although PCBs are no longer manufactured in the U.S., PCBs previously released to the environment enter the Bay through stormwater runoff and transport through the food chain. PCB levels in fish have resulted in health advisories for fish consumption.

(1998 MB FSEIR, p. V.K.8-9.)

The above information shows the existing environmental harm (or "preexisting cumulative effect" in the words of *Communities, supra*) is severe, and this Project will make it worse. Therefore, the DSEIR's finding that the Project's cumulative CSD impacts on the Bay are less-than-significant is erroneous as a matter of law. It is based on two legal errors: (1) the exclusion of CSD *quantity* from its threshold of significance, which reflects the "de minimis" and "ratio" rationales rejected in *Communities, supra* and *Kings County, supra*; and (2) the DSEIR's reliance on another agency's regulatory standards (i.e., the NPDES permit) to determine significance under CEQA. 6 [HYD-5] cont.

As discussed in the attached reports by Matt Hageman and Erik Ringelberg, the Project's CEQA documents (i.e., the 1998 Mission Bay FSEIR, 2014 NOP/IS, and 2015 DSEIR), fail to analyze or develop mitigation measures to reduce the Project's likely contribution of a suite of toxic chemicals, including PCBs, to San Francisco Bay in amounts deleterious to the Bay's biota. 7 [HYD-2]

Further, it is impossible to place the discussion of this entire issue (at DSEIR pages 5.9-34 to 5.9-36) in a meaningful context, because the DSEIR does not inform the reader if the discussion assumes construction or expansion of permanent wastewater treatment facilities by the SFPUC. 8 [HYD-5]

Also, the DSEIR says: "the [Hydroconsult] model estimated the annual average frequency, volume, and duration of CSDs that would occur once the Mariposa wet- and dry-weather pump stations reach the combined capacity of 11.2 mgd under existing and project conditions. The model estimates that under existing conditions, CSDs from the Mariposa sub-basin occur approximately 10 times per year with an average volume of 5.34 million gallons and duration of 17.2 hours." (DSEIR, p. 5.9-35.) This text implies that the "Hydroconsult" model includes wet-weather flows and wet-weather CSDs. But the only Hydrocunsult memo cited and included in Appendix HYD states:

9 [HYD-5]

> Three scenarios were analyzed: base case, project, and cumulative. The base case scenario includes existing conditions plus developments and improvements expected to be substantially complete previous to occupancy of the GSW arena. The project scenario adds the DWF from the arena only and the cumulative scenario adds the project DWF plus DWF from reasonably foreseeable projects in the basin. In all three scenarios, the wet weather flow (stormwater runoff) is assumed to not contribute to the CSS; rather is treated and pumped directly to the Bay. All DWF from the proposed GSW arena is assumed to flow to the Mariposa pump station (MPS), therefore Mariposa is the only basin analyzed.

(DSEIR, Appendix HYD, p.1.) The statement "wet weather flow (stormwater runoff) is assumed to not contribute to the CSS; rather is treated and pumped directly to the Bay" makes sense if it refers only to stormwater from the Mission Bay Redevelopment Area, because all of that stormwater will be separated from wastewater flows when the separate stormwater system for Mission Bay is completed in 2015. (See DSEIR, p. 5.7-4.)[4] But the DSEIR also states that storm water from areas outside Mission Bay will continue to combine with wastewater flows to the Mariposa Pump Station and will contribute to wet weather CSDs. (DSEIR, p. 5.7-7.)[5] If this is correct, then the Hydroconsult dry-weather analysis is beside the point. 9 [HYD-5] cont.

Also, the numbers for Mariposa Pump Station capacity and wastewater or stormwater flows are confusing. For example, DSEIR page 5.9-35 says the Mariposa wet- and dry-weather pump stations have a "combined capacity of 11.2 mgd." DSEIR page 5.7-7 also refers to "the combined capacity of the Mariposa pump station and transport/storage structure (11.2 mgd)."[6] But DSEIR page 5.9-34 says: "The potential effect would be greatest in the reconfigured Mariposa sub-basin, which has a *wet weather capacity of 12 mgd* (italics added)." Which is correct? 10 UTIL-3]

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[4]"The separate stormwater system for the Mission Bay South Plan area is currently being implemented by the master developer and includes four drainage zones within the geographic boundaries of the reconfigured Central sub-basin that have already been constructed and one drainage zone within the geographic boundaries of the reconfigured Mariposa sub-basin which is currently under construction. Stormwater in each of the drainage zones flows by gravity to one of five stormwater pump stations in the locations shown on **Figure 5.7-2**, including Pump Station SDPS-5 near the east end of 16th Street. When construction of the fifth drainage basin is completed (anticipated in 2015, prior to construction and operation of the proposed project), all stormwater runoff from Mission Bay South will be conveyed through the separate stormwater system and discharged to the Bay and China Basin Channel (Mission Creek)." (DSEIR, p. 5.7-4 (pdf151).)

[5]"The 240-acre reconfigured Mariposa sub-basin of the combined sewer system is divided into two tributary areas that direct flow to the Mariposa Pump Station. Tributary B includes Potrero Hill to the south of Mariposa Street and is outside of the Mission Bay Plan area; this tributary area directs both rainwater and wastewater to the pump station. Tributary A includes areas to the north of Mariposa Street that are located within the Plan area; in this area, stormwater flows are directed to the separate stormwater system constructed for the Mission Bay South development, and only wastewater flows are directed to the Mariposa Pump Station." (DSEIR, p. 5.7-7.)

[6]"In the event that wet weather flows in the Mariposa subbasin exceed the combined capacity of the Mariposa pump station and transport/storage structure (11.2 mgd), the excess flows are discharged to the Bay as a combined sewer discharge after receiving flow-through treatment in the transport and storage structure."

III. The DSEIR Is Not Sufficient as an Informational Document with Respect to Project Impacts on Biological Resources, Including Wetlands and Wildlife.

A. The City's decision to exclude the Project's impacts on biological resources from the DSEIR is erroneous.

The City's decision to exclude the Project's impacts on biological resources from the DSEIR (see DSEIR, p. 5.1-1) is erroneous as a matter of law. Both the NOP/IS and the DSEIR announce that their analyses are "tiered" to the 1998 Mission Bay FSEIR pursuant to CEQA Guideline 15168(c). (IS, p. 23-24; DSEIR, pp. 1-1, 5.1-2, 3.) Both the NOP/IS and the DSEIR also announce that the standards used to exclude resource topics from the DSEIR are the standards used to determine if a subsequent EIR is required under CEQA section 21166 and Guideline section 15162. (See NOP/IS, pp. 23-25; DSEIR, p. 5.1-3.) 11 [ERP-7, BIO-1]

Based on these predicates, the City decided to prepare a focused EIR, and to conduct no environmental review with respect to the following resources: Biological Resources, Aesthetics, Land Use Cultural Resources, Paleontological Resources, Geology and Soils, Recreation, Hazardous Materials, and Population and Housing. As discussed in more detail in the July 27, 2015, letter from the Mission Bay Alliance's legal counsel regarding "tiering," the City's assumption that it may prepare an EIR for this Project that tiers to the 1998 Mission Bay FSEIR is legally incorrect. As discussed in several comment letters submitted on behalf of the Mission Bay Alliance, and below regarding the Project's impacts on biological resources, the evidence relating to these excluded resource topics meets both the "fair argument" standard, as well as the CEQA section 21166 standards. Therefore, the City must prepare and recirculate for public review a Revised Draft EIR addressing all of the Project's environmental impacts.

B. There is substantial evidence supporting a fair argument the Project will have a significant adverse effect on biological resources.

While the NOP/IS give short shrift to on-site biological resources, there is substantial evidence, in the NOP/IS and the attached reports from Matt Hageman and Erik Ringelberg, supporting a fair argument the Project may have significant effects on (1) migratory birds; (2) off-site special status species downstream of the Project, including steelhead (Oncorhynchus mykiss); and (3) the on-site wetland and its ecology and associated wildlife. 12 [BIO-1]

With respect to migratory birds, the NOP/IS admits that the 1998 Mission Bay FSEIR did not assess the redevelopment Plan's effects on migratory birds. (NOP/IS, p. 81.) In addition, the NOP/IS concedes the Project may have significant impacts on migratory birds because it recommends the adoption of mitigation measures to substantially reduce these impacts, stating: "With implementation Mitigation Measures M-BI-4a, Preconstruction Surveys for Nesting Birds, and M-BI-4b, Bird Safe Building Practices, the project would not result in any new or substantially 13 [BIO-1, BIO-6] more severe significant impacts on resident or migratory bird species than those identified in the FSEIR." (NOP/IS, p. 81.)

This approach violates CEQA in a number of ways. First, as discussed above, the Project is a separate project from the 1998 Redevelopment Plan, or at a minimum, is not within the scope of the 1998 Mission Bay FSEIR. This fact precludes the City from "tiering" to the 1998 FSEIR for any resource, including impacts on biological resources such as migratory birds.[7] Second, trying to mitigate significant impacts before assessing their nature and extent puts the cart before the horse.[8] Third, as discussed above, the NOP/IS's concession that the Project may have significant impacts on migratory birds is substantial evidence supporting a fair argument the Project will have a significant adverse effect on migratory birds; therefore, the City is required to include an assessment of these impacts in the DSEIR.[9] Fourth, even if the City's assumption that CEQA section 21166 applies is correct, the addition of a 750,000 square foot sports arena and an additional 160 foot office tower to the Mission Bay Redevelopment Plan are substantial changes in the Redevelopment Plan that give rise to new potentially significant effects on birds that must be analyzed in the subsequent EIR. 13 [BIO-1, BIO-6] cont.

With respect to impacts on special status species, the NOP/IS states:

> At the time of preparation of the Mission Bay FSEIR, the project site contained several buildings and facilities and was noted as lacking any notable vegetative habitat, with no state listed threatened, endangered or rare plants, or rare, threatened or endangered animal species known to occur in the upland portion of the Mission Bay plan area, including the project site. Subsequent to that time, the project site has been subject to building removal, grading, excavation, and construction of paved surface parking lots, fencing and utilities on portions of the site. Other than the creation of the depression as a result of remediation actions, no other changes in the site since the preparation of the FSEIR have altered the characteristics of the site in relation to biological habitat. These changes in conditions on the project site have 14 [HYD-2, BIO-4]

[7] *Sierra Nevada Conservation, supra.*

[8] CEQA does not permit an agency to simply adopt mitigation measures in lieu of fully assessing a project's potentially significant environmental impacts because mere acknowledgment that an impact would be significant is inadequate; the EIR must include a detailed analysis of "how adverse" the impact would be. (*Lotus v. Department of Transportation* (2014) 223 Cal.App.4th 645, 655-56; *Galante Vineyards v. Monterey Peninsula Water Management Dist.* (1997) 60 Cal.App.4th 1109, 1123; *Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831.)

[9] *Protect the Historic Amador Waterways, supra*.

> not altered the fact that the site provides no suitable habitat for any sensitive or special status species due to the sparse and ruderal nature of onsite vegetation, as well as the site's location in a densely urbanized environment, as confirmed through the reconnaissance survey and database review of special status species occurrences within the vicinity of the project site. In addition, there have been no substantial changes with respect to the circumstances under which the project would be undertaken, nor has any new information become available that demonstrates new or more severe impacts associated with the proposed project.

(NOP/IS, pp. 78-79.) 14 [HYD-2, BIO-4] cont.

But as Mr Ringelberg points out:

> the potential project impacts to the closest federally designated critical habitat is steelhead Oncorhynchus mykiss are ignored. This habitat runs directly adjacent to the project area. In addition, San Francisco manzanita (Arctostaphytos franciscana) critical habitat is present approximately 2.6 miles to the west and should also have been identified and analyzed. The federal critical habitat analysis is missing, and the provided analysis itself is defective. The potential project's impact(s) to these listed species and their critical habitat are therefore unexamined. The project's dust, stormwater, surface flooding, and groundwater place those species at risk from hazardous chemicals.

(Exhibit 2, p. 11.)

As both Mr. Hageman and Mr. Ringelberg point out, none of the Project's CEQA documents assess the effects of toxic chemical runoff on Bay biota, including steelhead. Where, as here, the lead agency fails to study an area of possible environmental impact, a fair argument may be based on the limited facts in the record because deficiencies in the record may enlarge the scope of fair argument by lending a logical plausibility to a wider range of inferences." (*Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 311.) 15 [HYD-2, BIO-4]

Further, there is substantial evidence in the reports from Matt Hageman and Erik Ringelberg supporting a fair argument the Project may have significant effects on steelhead from toxic runoff. Again, even if CEQA section 21166 applies, CEQA requires including this issue in the subsequent EIR. The Phase 11 reports showing the site is contaminated with a suite of toxic compounds is significant new information showing the potential for new significant effects not previously

Ms Tiffany Bohee
c/o Mr. Brett Bollinger
Re: Mission Bay Alliance comments on the Warriors Arena Project DSEIR: Hydrology, Water Quality and Biological Impacts
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identified.[10] 15 [HYD-2, BIO-4] cont.

With respect to potential impacts on the on-site wetland, the NOP/IS indicates the DSEIR will not assess impacts on the wetland even though the 1998 FSEIR did not, and could not have, analyzed the wetland since it was apparently created sometime after 2005. (See Exhibit 2, Figure 1 and accompanying text.)

Typically if there is a potential wetland resource, there would be a formal delineation prior to release of the DEIR so the resource can be analyzed, and appropriate mitigation developed. Here, the NOP/IS claims it may not be jurisdictional (p. 80), and at the same time attempts to suggest mitigation (p. 81) in case it is. But the mitigation suggested is not enforceable, in violation of CEQA. Further, as discussed above, trying to mitigate impacts before assessing their significance puts the cart before the horse. (*Lotus v. Department of Transportation*, *supra*.)[11]

In addition, the NOP/IS' evidentiary basis for dismissing the wetland from the DSEIR is flimsy, stating: 16 [BIO-5]

> Because the excavation depressions on the site are small, isolated features resulting from recently completed hazardous materials remediation activities and are surrounded by paved areas and urban development, these features do not provide the important biological habitat functions and values that are typically associated with federally protected wetlands.

(NOP/IS, pp. 78-79.) But as Mr. Ringelberg points out:

> Conversely, and in rebuttal to their prior assertion that there are readily substitutable habitats nearby, small wetland features can have exceptional ecological value, in particular if they are one of the few remaining features in an urban setting.

(Exhibit 2, p. 6.)

Further, there is substantial evidence in the report from Erik Ringelberg supporting a fair argument the Project may have a significant effect by destroying the on-site wetland. Again, even

[10]See Letter to Marty Glick re: Phase 2 Subsurface Investigation Approval, Golden State Warriors Arena, Blocks 29-32, San Francisco, CA 94158; Phase II Environmental Site Assessment, Golden State Warriors Arena, Blocks 29-32, Mission Bay, San Francisco, California.

[11]Also, the NOP/IS fails to even mention the state wetland policy (WRAPP) under Porter Cologne (fn. 49).

Ms Tiffany Bohee
c/o Mr. Brett Bollinger
Re: Mission Bay Alliance comments on the Warriors Arena Project DSEIR: Hydrology, Water Quality and Biological Impacts
July 24, 2015
Page 15

if CEQA section 21166 applies, CEQA requires including this issue in the subsequent EIR because the presence of the wetland is a change in circumstances since certification of the 1998 FSEIR that gives rise to the potential for new significant effects not previously identified. 16 [BIO-5] cont.

IV. The DSEIR Is Not Sufficient as an Informational Document with Respect to the Project's Flooding Risk.

Chapter 5.9 of the DSEIR does not examine the potential for Project induced increases in storm water runoff to "contribute considerably" to cumulative risk of flooding. (See DSEIR p. 5.9-9 to 5.9-18.) Chapter 5.7 does not do so either. Instead, it analyzes whether the Project will require construction of new or additional storm drainage capacity. (See DSEIR, pp. 5.7-18, 19 [Impact C-UT-3].) But the question whether the Project will require construction of new facilities is different than the question whether it will cause the impact such new facilities are intended to avoid. (See e.g., Chapters 5.7 and 5.9 regarding CSD impacts, and the discussion of same in section 1 above.)

The DSEIR's analysis of cumulative stormwater (C-UT-3) states that the impact is less than significant because the capacity of the new, separated stormwater system is adequate. (DSEIR, p. 5.7-18.) This section of the DSEIR cites to "BKF, Mission Bay Blocks 29-32 - Stormwater Memorandum, January 6, 2015." (DSEIR, p. 5.7-18, note 20.) This Stormwater Memorandum, in turn, states: 17 [HYD-6]

> G. Major Storm Events
> The storm drain system and pump station are designed to handle runoff from a 5-year storm event. During larger events such as a 100-year storm event, runoff is conveyed through the streets to a controlled overflow to the Bay. The overland flow analysis was studied in the "Revised Summary Drainage Study for the South of Channel Watershed for Mission Bay Project", dated December 1, 2000. Based on December 2000 study, overland flow from drainage basin, where the Project is located (i.e., "Drainage Basin B"), currently enters the Bay via an existing overflow near Mission Bay Boulevard North (North Overflow). Overland flow in Project perimeter streets, except 16th Street, is conveyed to this North Overflow. Overland flow in 16th Street is conveyed to overflow located to the south of Project near park P24. Refer to attached Figure D for the location of the overland flow release.
> The Project will be sufficiently flood proofed to prevent 100-year overland flow in perimeter streets from entering below grade structures or inundating utilities and equipment. Flood proofing will include using protective measures to prevent storm runoff from inundating and/or damaging equipment such as furnaces, boilers, air conditioning compressors, air ducts, electrical system components, electrical wiring, dry conduits, electrical and gas meters, utility rooms, septic tanks, control panels, HVAC systems and fuel systems."

(BKF, Mission Bay Blocks 29-32 - Stormwater Memorandum, January 6, 2015, p. 6.)

There are two missing pieces of this analysis. First, the memorandum tells us "The Project will be sufficiently flood proofed to prevent 100-year overland flow in perimeter streets from entering below grade structures or inundating utilities and equipment." This may be good news for the Project itself, but it tells the reader nothing about the extent to which this Project will contribute to increased flood risk to surrounding properties. The DSEIR does not examine the potential for Project induced increases in storm water runoff to "contribute considerably" to cumulative risk of flooding around the Project. (See DSEIR p. 5.9-9 to 5.9-18.) Second, the DSEIR does not describe the "flood proofing" measures that it says will avoid inundating below grade structures of the Project.

17 [HYD-6] cont.

V. The DSEIR Is Not Sufficient as an Informational Document with Respect to Inundation Impacts of the Project.

The DSEIR concedes the Project will be vulnerable to inundation and flooding as a result of a combination of climate change induced sea level rise and storm surge. (DSEIR, pp. 5.9-10-16.) The DSEIR also describes several government initiatives to plan for and protect against such inundation. (DSEIR, p. 5.9-17-18.)

This discussion makes it clear the Mission Bay area, and the Project site in particular, will need to be protected from inundation in the foreseeable future. Therefore, the construction of protective measures is a reasonably foreseeable consequence of Project approval, and the construction of protective measures will change the nature and extent of the Project's environmental impacts. Therefore, the DSEIR must describe these measures and their environmental effects. (Laurel Heights I, supra.)

18 [HYD-7]

Thank you for your attention to this matter.

Very Truly Yours,

Thomas N. Lippe

List of Exhibits

Exhibits 1 and 2 are referenced in this letter.
Exhibits 3 through 8 are referenced in Exhibit 1 to this letter.
Exhibits 9 through 13 are referenced in Exhibit 2 to this letter.

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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July 21, 2015

Thomas N. Lippe
The Law Offices of Thomas N. Lippe
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Comments on the Event Center and Mixed-Use Development Project at Mission Bay Blocks 29-32

Dear Mr. Lippe:

We have reviewed the June 5, 2015 Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center and Mixed-Use Development Project ("Project") at Mission Bay Blocks 29-32. GSW Arena LLC (GSW), an affiliate of Golden State Warriors, LLC, which owns and operates the Golden State Warriors National Basketball Association (NBA) team, proposes to construct a multi-purpose event center and a variety of mixed uses, including office, retail, open space and structured parking on an approximately 11-acre site on Blocks 29-32 within the Mission Bay South Redevelopment Plan Area of San Francisco. The proposed event center would host the Golden State Warriors basketball team during the NBA season, and provide a year round venue for a variety of other uses, including concerts, family shows, other sporting events, cultural events, conferences, and conventions.

We have found significant shortcomings in the DSEIR in identifying impacts on Hydrology and Water Quality. A revised DSEIR should be prepared to address these inadequacies and to incorporate mitigation to reduce impacts which otherwise would degrade the water quality of San Francisco Bay.

Hydrology and Water Quality

The DSEIR acknowledges that the San Francisco Bay is impaired under Section 303(d) of the Clean Water Act for chlordane, DDT, dieldrin, dioxins, furan compounds, mercury, polychlorinated biphenyls (PCBs), invasive species, and trash (p. 5.9-22). Of these, PCBs are of the greatest concern for Project water quality impacts. A total maximum daily load (TMDL), limiting PCB discharges, has been issued by the San Francisco Bay Regional Water Quality Control Board (RWQCB) for PCBs in San Francisco Bay and it is proving very difficult and very costly for Bay Area cities, who are responsible for limiting PCB discharges,

19 [HYD-2]

to meet. According to the RWQCB, Bay Area municipalities will spend millions of dollars to achieve the ten-fold reduction in PCBs required by the TMDL.[1]

The DSEIR utterly fails to evaluate how Project construction may result in discharge of PCBs to San Francisco Bay, leading to further impairment. Failure to conduct this analysis flies in the face of the TMDL mandate which requires reduction of PCB discharge to the Bay and ignores guidance issued by the San Francisco Bay Regional Water Quality Control Board (RWQCB) on reducing PCB discharges at sites that require cleanup and where buildings that likely contain PCBs in construction materials will be torn down.

The Project poses significant threats to water quality of San Francisco Bay from the release of PCBs upon construction from two sources: (1) contamination in soil at sites that will undergo cleanup; and (2) PCBs used in former building materials at the Project site.

Contaminated Sites Pose Potential PCB Impacts

The DSEIR fails to acknowledge the PCB-contamination threat posed from numerous sites that will require cleanup prior to Project construction. The Initial Study (IS), in summarizing information in the Mission Bay SEIR, stated that land uses at Blocks 29-32 included crude oil storage, offices, railroad tracks, trucking-related activities, maintenance and repair facilities, junk yard, stock corral, a gravel plant, bus company facility, equipment rental, storage yard, auto body shop, and a warehouse (p. 108). No evaluation of these sites for PCB-containing equipment was included in the DSEIR and no analysis of any spills that would have originated from such equipment was conducted.

19 [HYD-2] cont.

The RWQCB has identified PCBs originating from sites undergoing cleanup on the margins of San Francisco Bay are a major threat to water achieving the TMDL, stating:

> Stormwater runoff from sites containing residual PCBs in soils after state and federal ordered cleanups contribute to PCB sediment concentrations in the Bay and such contributions must be essentially eliminated in order to achieve the TMDL target. For cleanup sites, the TMDL calls for implementing "on-land source control measures, to ensure that on-land sources of PCBs do not further contaminate in-Bay sediments."

The IS acknowledges the potential threats that contaminants pose during Project development, stating:

> The Mission Bay FSEIR discussed various types of construction activities, including excavation, grading, trenching, soil movement/transport, pile installation, building demolition and removal of underground storage tanks that would potentially expose workers and the public to contaminated soils, dust, soil gases and other hazards. The Mission Bay FSEIR also noted the potential for construction dust-related effects on the aquatic and terrestrial environment.

However, the Mission Bay FSEIR pre-dates the issuance of the RWQCB TMDL for PCBs in San Francisco Bay and mitigation in the Mission Bay FSEIR make no provisions for ensuring that PCBs are not mobilized and transported to the Bay during Project construction. As stated by the RWQCB:

[1] San Francisco Bay Regional Water Quality Control Board, September 2013, San Francisco Bay PCBs TMDL Implementation at Cleanup Sites: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/SF%20Bay%20PCBs%20TMDL%20-%20Considerations%20for%20Cleanup%20Sites%20September%205%202013.pdf, p. 1

> Of particular concern, and often overlooked, is the fact that PCBs in surface soil can be mobilized by stormwater runoff and flow to the Bay.

The RWQCB's concerns are justified by the failure of the DSEIR in identifying how Project construction might contribute to the PCB impairment of San Francisco Bay. The DSEIR, in ignoring this issue, provides no PCB-specific mitigation to prevent the flow of PCBs to the Bay upon construction. Mitigation identified in the Mission Bay FSEIR specified only minimum parameters to be included in a Risk Management Plan for the addressing contaminated soils and groundwater prior to and during construction of individual development projects.

PCBs, when spilled and released to soil, stick strongly to the soil particles that is entrained with stormwater when mobilized during rain events and which leads to PCB deposition in the Bay. The DSEIR offers no mitigation to address this likelihood, and only provides tepid assurance that stormwater will be managed consistent with "San Francisco Stormwater Design Guidelines" (p. 5.9-25). The cited San Francisco Stormwater Design Guidelines makes no special provisions for PCB contamination other than to say:

> Control of PCBs and mercury will be implemented through design measures that limit the mobilization of these pollutants in contaminated soils.[2]

19 [HYD-2] cont.

The San Francisco Stormwater Design Guidelines make no further statements about what the PCB design measures would entail and how specifically PCB discharge in stormwater will be limited. The San Francisco Stormwater Design Guidelines are mute on the urgency that faces San Francisco in preventing PCB discharges, in stark contrast to the language use by the RWQCB in issuing the following edict in eliminating all PCB discharges from cleanup sites:

> … it is important that cleanup sites do not contribute any PCBs to surface water runoff. Remedial actions should be conducted so as to eliminate all means of conveyance of PCBs from cleanup sites, including sediment runoff, vehicular drag out, and airborne dust.

Because the issue of PCBs is not specifically addressed, the DSEIR offers an inadequate basis for making the following statement on stormwater contamination:

> Implementation of BMPs and other stormwater control measures required by the updated Phase II General MS4 NPDES Permit; Article 4.2 of the San Francisco Public Works Code, Section 147; and the City's Stormwater Design Guidelines would ensure that the project does not contribute to an increase in discharge of stormwater pollutants to the Bay in discharges from the separate stormwater system. Therefore, impacts related to degradation of water quality and providing an additional source of stormwater pollutants are less than significant in relation to direct stormwater discharges.

Without mitigation and specific measures to address PCB contamination in the Project area, the impacts from Project construction on the already impaired San Francisco Bay may be significant. The DSEIR should acknowledge the PCB contamination potential and offer concrete mitigation to address the

[2] San Francisco Stormwater Design Guideline, September 2009 http://www.sfwater.org/Modules/ShowDocument.aspx?documentID=2779, p. 14

stormwater transport of PCB-contaminated soils to the Bay. Concrete steps to incorporate, as mitigation in a revised DSEIR and prior to Project construction, include:

- A thorough parcel-by-parcel review of the potential use of PCB-containing equipment;
- Site inspections of each parcel which used electrical equipment and sampling of soil where PCB-containing equipment is identified; and
- Cleanup of PCB-impacted soil at concentrations that exceed 25 ug/kg, consistent with RWQCB guidance.[3]

PCBs in Originating from former land uses at the Project Site have not been Adequately Evaluated

Polychlorinated biphenyls (PCB) contamination originating from materials used in building construction is receiving intense scrutiny from regulatory agencies. The U.S. EPA has acknowledged that demolition of 1950s- to 1970s-era buildings, or cleanup of those sites, may disturb PCB-containing materials used in caulking and as a plasticizer in paints and other coatings.[4] In fact, a recent report has found that PCBs are prevalent in the caulk in Bay Area buildings constructed from 1950 to 1980. PCBs were detected in 88% of the caulk samples tested; 40% of the samples contained greater than 50 ppm PCBs and 20% contained greater than 10,000 ppm PCBs.[5] PCBs were used in electrical transformers manufactured between 1929 and 1977 and are a well-recognized source of soil contamination when fluid is leaked.[6] 19 [HYD-2] cont.

According to the US EPA[7]:

> PCBs do not break down in our environment and can have severe health effects on humans. PCBs in the air eventually return to our land and water by settling or from runoff in snow and rain. In our water, PCBs build up in fish and can reach levels hundreds of thousands of times higher than the levels in water. Fish consumption advisories are in effect for PCBs in all five of the Great Lakes. PCBs are the leading chemical risk from fish consumption.

Because PCBs do not break down, PCBs may be present at the Project site from former land uses which include:[8]

- Bulk fuel storage and distribution (approximately 1902 to 1966).
- Railroad operations (approximately 1904 to 1939).
- A machine shop (approximately 1904 to 1927).
- A boiler house (approximately 1904 to 1927).
- Steel mill (approximately 1906 to 1928).
- Well casing manufacturer (1907 to 1975).

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[3] San Francisco Bay Regional Water Quality Control Board, September 2013, San Francisco Bay PCBs TMDL Implementation at Cleanup Sites: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/SF%20Bay%20PCBs%20TMDL%20-%20Considerations%20for%20Cleanup%20Sites%20September%205%202013.pdf, p. 2
[4] US EPA, PCBs in Caulk in Older Buildings: http://www.epa.gov/pcbsincaulk/
[5] San Francisco Estuary Project, PCBs in Caulk Project: http://www.sfestuary.org/taking-action-for-clean-water-pcbs-in-caulk-project/
[6] US EPA, Polychlorinated Biphenyls (PCBs) http://www.epa.gov/reg3wcmd/ts_pcbs.htm
[7] Ibid.
[8] Letter from the San Francisco Department of Public Health to Golden State Warriors Arena, June 8, 2015, p. 2

- Warehousing, shipping, and receiving operations for a variety of products including agricultural chemicals, lumber, food, automobiles, metals, etc. (approximately 1910 to 2006).
- A fruit cannery (approximately 1935 to 1961).
- Junk yards, vehicle parking, and vehicle maintenance facilities (approximately 1950 to 2004).
- Ready-mix concrete facilities (approximately 1972 to 2010).

Of these uses, the 1950s-1980 land uses, which include well casing manufacturing, warehousing, a cannery, junk yards, and concrete manufacturing, could have been operated out of building that were constructed with PCB-containing materials and which were supplied with power by PCB-containing transformers. If PCB-containing building materials, such as caulking or paint, were weathered and disposed in soils adjacent to the former buildings, the could remain at concentrations that would serve as a source for contamination of San Francisco Bay, upon erosion by wind or stormwater.

In fact, a limited study conducted in January 2015 did detect PCBs in soil at the Project site. In this study, which took soil samples from only seven locations at the 10.9-acre site, PCBs were detected at 0.016 mg/kg or 16 ug/kg in one sample of the seven locations.[9] Although this is less than the 25 ug/kg RWQCB cleanup requirement, it is 16 times greater than the target PCB sediment concentration of 1 ug/kg in San Francisco Bay.[10] Given that the Project site is located less than 500 feet from the Bay, construction activities that disturb soil pose a significant potential for documented PCBs at the Project site to be transported to the Bay. 19 [HYD-2] cont.

I have found no analysis of PCBs used in the building materials of the previously existing structures at the site in the DSEIR or in the Mission Bay FSEIR or how PCBs, documented in soil at the Project site, may be mobilized by construction or by cleanup of contaminated sites, and transported to the Bay. The RWQCB has offered guidance on how to test for materials that may contain PCBs and how to evaluate sites undergoing cleanup on the Bay margin, guidance which was not mentioned in the DSEIR.

The failure to thoroughly analyze the presence of PCBs in the Project area and how Project construction activities would potentially mobilize the PCBs, leading to further impairment of San Francisco Bay, is a significant oversight which ignores a regulatory mandate for construction projects on the Bay margin to evaluate PCBs. A DSEIR should be prepared to include the results of a full evaluation of the potential of former Project site buildings to contain PCBs. A soil sampling study should be targeted to areas where PCBs may have been released or spilled. To ensure the adequacy of the PCB investigation, the study should be conducted under the oversight of the San Francisco Bay Regional Water Quality Control Board which should be engaged, specifically on the issue of potential PCB contamination to originate from Project construction.

The revised DSEIR should identify mitigation that would be necessary to protect PCB-containing materials from being mobilized though stormwater transport and aerial deposition to San Francisco Bay. The revised DSEIR should also include measures to protect construction workers and the health of adjacent residents who may be exposed to PCB-containing dust during demolition or renovation

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[9] Letter from the San Francisco Department of Public Health to Golden State Warriors Arena, June 8, 2015, p. 9
[10] San Francisco Bay Regional Water Quality Control Board, September 2013, San Francisco Bay PCBs TMDL Implementation at Cleanup Sites: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/SF%20Bay%20PCBs%20TMDL%20-%20Considerations%20for%20Cleanup%20Sites%20September%205%202013.pdf, p. 1

activities. The DSEIR should also identify proper disposal practices that are compliant with 40 CFR § 761.62 of the Toxic Substances Control Act. Under this provision, PCB bulk product waste must be disposed in a permitted solid waste landfill or through regulatory approval of risk-based process.[11]

19 [HYD-2] cont.

Other Contaminants Pose Risks to the Bay

Recent sampling[12] at the Project site has detected soil contaminants, in addition to the PCB contamination noted above, that include:

[11] US EPA, Contractors: Handling PCBs in Caulk During Renovation: http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/caulkcontractors.htm

[12] Letter from the San Francisco Department of Public Health to Golden State Warriors Arena, June 8, 2015, pp. 8-10

- 1.2.4-Trimethylbenzene
- Acetone
- Carbon disulfide
- Ethylbenzene
- 2-Butanone
- Xylenes
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(k.)fluoranthene
- Chrysene
- Dibenz(a,h)anthracene
- Fluoranthene
- Fluorene
- Indeno(l,2,3-c,d)pyrene
- Naphthalene
- Phenanthrene
- Pyrene
- Antimony
- Barium
- Beryllium
- Cadmium
- Cobalt
- Copper
- Mercury
- Molybdenum
- Silver
- Vanadium
- Zinc

19 [HYD-2] cont.

Of these compounds, mercury is identified in the DSEIR as an impairment in San Francisco Bay under Section 303(d) of the Clean Water Act (p. 5.9-22). Mercury, along with the other contaminants listed above, may sorb tightly to soil and be mobilized and transported to the Bay when eroded by stormwater, further degrading water quality.

No specific provisions to manage these contaminants to prevent discharge to the Bay are included in the DSEIR. The DSEIR provides only vague assurance that stormwater will be managed consistent with “San Francisco Stormwater Design Guidelines” which do mention mercury (along with PCBs, as noted above) but offer no specific mitigation to manage these contaminants (p. 5.9-25).

A revised DSEIR should be prepared to identify specific stormwater best management practices (BMPs) to prevent the discharge of contaminated sediment during rain events. The BMPs should be tailored to the each of the contaminants documented in soil at the Project site to prevent discharge and should include consideration of the use of sorbent or flocculent materials, retention basins, berms, silt fences, and bales.

Sincerely,

Matt Hagemann, P.G., C.Hg., QSD, QSP

O-MBA11L5
Exh 2

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July 21, 2015 BSK Project Number E0906601S

Soluri Meserve
1010 F St, Ste. 100
Sacramento, CA 95814

Subject: DRAFT Biological Resources Review
Mission Bay Subsequent Environmental Impact Report
San Francisco, California

Dear Mr. Soluri:

Per your request, BSK Associates (BSK) reviewed publicly available documents associated with the Draft Subsequent Environmental Impact Report (SEIR) on the Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32. BSK assessed these documents for potential project impacts on biological resources (following the California Environmental Quality Act [CEQA] Appendix G). The Draft SEIR (DSEIR), the associated 2014 Notice of Preparation-Initial Study (NOP-IS), and the prior Mission Bay Final Subsequent Environmental Impact Report (1998 FSEIR [FSEIR]) were compared to each other, as well as to State of California and federal Geographic Information System (GIS) databases, scientific and technical resources prepared by others, as well as current and historic aerial photographs.

SUMMARY

In our opinion, the SEIR, in several key areas related to biological resources, failed to adequately characterize the nature and the extent of the site's resources; failed to identify the full range of potential significant impacts from the proposed project on those resources; failed to examine those impacts at a sufficient level of detail to understand the project impacts; and, failed to provide adequate mitigation for those resources, both during construction and cumulatively. Specifically, key species and sensitive habitat(s) were left out of the discussion, and mitigation measures were missing, or inadequate, to reduce the impacts of the project on those species below the threshold of significance; and finally, significant changes have occurred at the site affecting both the applicable policies and the relevant resource use since the original analysis. 20 [BIO-1]

O-MBA11L5
Exh 2

ECOLOGICAL CONDITIONS REVIEW

The project area has two boundaries, the larger "Mission Bay Redevelopment Plan Area Boundary," (Plan Area) which is described in the 1998 FSEIR and the current "site" boundary (site), which includes Blocks 29-32 within that larger planning boundary (Figure 1). Both boundaries will be used for the purposes of discussion as they relate to the corresponding environmental analysis documents and the project's potential impacts on biological resources. A current aerial photo is provided for detailed site context (Figure 2).

The Plan Area's near surface soils are the result of mixed fills and have been identified by the Natural Resource Conservation Service as: 134, Urban land-Orthents, reclaimed complex, 0 to 2 percent slopes (Figure 3). The soils are the result of historic filling of the Mission Bay with debris, earthquake waste spoils, and other material to reclaim the site from the San Francisco Bay (ESA 2014; Pg. 1). This soils information is consistent with other analyses, developed by others, discussed later.

The U.S. Fish & Wildlife Service, National Wetlands Inventory (NWI) identified several features adjacent to the Plan Area, but none within the site (Figure 4). The relative elevation of these features both within (and nearby) the project boundary appear to correlate with the local shallow water table (ESA 2014; LTR 2015; Pg. 13-14 and Figures A-2 and A-3). 21 [BIO-2]

The site itself appears to be a largely ruderal area that has been subject to various anthropogenic disturbances, within an urban setting, containing two large surface parking areas. The site currently contains an open water feature, actively used by wildlife, and a narrow swale to the east (Figure 5). The site's current conditions are detailed in the following site observations.

SITE OBSERVATIONS

The Blocks 29-32 footprint consists of two large paved areas (Southwest parking lot approximately 79,910 sq.ft./1.83 ac. and Northeast parking lot approximately 91,776 sq.ft./2.11 ac.)[1] currently being used as paid parking lots; an area of soil stockpiles (31,066 sq.ft./0.71 ac) on the eastern edge of the property (Terry A. Francois Boulevard); and an adjoining large open field, open water (22,115 sq.ft./0.51 ac) and wetland swale complex, (904 sq.ft./0.02 ac.) (closest to the Southwest parking lot) shown on Figure 2. A series of photographs were taken of the site and the adjoining areas (Attached Photo Plates).

At the time of observation, the open water area encompassed the majority of the water feature, with a patchy, but substantial fringe of palustrine emergent (predominately alkali bulrush [*Bolboschoenus maritimus*]) and riparian plants (willows [*Salix sp.*]). The emergent plants and shrubs were concentrated on the two narrower ends of the water feature. The narrower channel and the seasonal wetlands

[1]2015 Google Earth

BSK

apparent from the aerial photographs (Figures 2a-i) were not clearly visible from the site perimeter fence(es).

Numerous native birds were observed within, and in some cases flying to and from the water body. Several Canada geese (*Branta canadensis*) were seen, including what appear to be adult plumage juveniles; three killdeer (*Charadrius vociferous*), including two juveniles; a female mallard and a juvenile (*Anas platyrhynchos*); several crows (*Corvus brachyrhynchos*); two non-native Eurasian collared-doves (*Streptopelia decaocto*); and numerous non-native rock doves/pigeon (*Columba livia*). The site has significant use for nesting and foraging by these bird species.

2015 DSEIR

The DSEIR uses an incomplete description of the environmental setting in its impact assessment. 21 [BIO-2] cont.

The DSEIR incompletely characterizes the site's biological resources in the project site description and existing uses. The sole description of the site as it related to its biological resources in the DSEIR is as follows:

"Immediately east of, and adjacent to, Parking Lot B is a depressed area (measuring approximately 320 feet by 280 feet) created by an excavation and backfill associated with a prior environmental cleanup of that portion of the site. A surface swale extends west within this portion of the site to allow for drainage of surface water into the depression." (Pg. 3-10)

This description fails to mention any of the site biological resources, such as plants or animal or habitats, or the fact that there is a large permanent pond and wetland features in the middle of the site. There is no mention of wildlife use and the existing habitat(s) on the site in the DSEIR. The site's biological resources, including waters, wetlands, wildlife habitat and species are then not discussed at all in the DSEIR (except for the Appendix containing the NOP-IS).

The DSEIR failed to protect species and identify the appropriate list of sensitive natural communities, as well as Critical Habitat designations

1. The potential for Western pond turtles and California red-legged frog is stated as "low" since by their estimation, "No suitable habitat present." However, the perennial pond feature (and for the frog a constructed water feature in particular) is not ideal, but it is certainly suitable habitat. In particular, the analysis (and inferred conclusion) is faulty since low potential does not mean "no" potential, and therefor reasonable steps should be taken to establish or reject the presence of the species and as needed, mitigation. These simple mitigation measures are commonly applied to similar activities 22 [BIO-3]

BSK

throughout California, and include rare plant surveys, and targeted (focused) species surveys.[2, 3, 4] The rare plant surveys must be timed to the appropriate season, and the focused surveys for the right life stage of the target species. In our experience both in preparing EIRs, and supporting similar construction projects, that in virtually every case, where natural(ized) features exists that can potentially support species of concern, there is an additional mitigation measure that provides a preconstruction survey (or surveys); and if species of concern are likely to occupy the site, the preparation and implementation of a Worker Environmental Awareness Plan (WEAP). The DSEIR solely has a pre-construction breeding bird survey. 22 [BIO-3] cont.

2. The potential use (given the habitat values present and prior observations by others) of the site for at least foraging habitat is identified for Peregrine falcon[5], Red-tailed hawk, American kestrel[6], Great blue heron[7], American goldfinch[8] but its loss is not mitigated for (NOP-IS Appendix A. Table 2 A-8). Note: Two species that do not appear to meet the section 3503.5 Eggs, Nests, and Nestlings Protected under the California Department of Fish and Game Code provisions are identified as such in the text. 23 [BIO-6]

3. There is significant new information related to the federal designation of Critical Habitat for the listed anadromous fish, the steelhead (*Oncorhynchus [Salmo] mykiss*)[9]. The DSEIR failed to identify that the project has the potential to impact the defined Critical Habitat for the steelhead. This designation was completed in 2005 and was not described in the 1998 Mission Bay FSEIR. Neither the potential of the project activities to impact the steelhead (*See*: Other Biological Resource Issue Areas), or the designation of the status of this plan area was identified in the DSEIR. 24 [HYD-2, BIO-4]

The Project's impacts adequately are not fully disclosed in the DSEIR

1. The project fails to identify, assess, and mitigate for the proposed project impacts on the biological resources associated with the site water bodies. 25 [BIO-5, BIO-6]

2. The DSEIR analysis restates that there are no new or significant changes to biological resources and appears to rely entirely on the NOP-IS (Pg. 1-9; Pg. 5.1-1; Pg. 1-58/59). Despite these statements, there is in fact a significant new impact identified in the DSEIR from the project to birds identified in the text on Pg. 3-28, "The project sponsor proposes to incorporate bird-safe design measures that would reduce

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[2] http://www.cnps.org/cnps/rareplants/pdf/cnps_survey_guidelines.pdf
[3] http://www.fws.gov/sacramento/es/Survey-Protocols-Guidelines/Documents/rare_plant_protocol.pdf
[4] https://www.dfg.ca.gov/biogeodata/cnddb/pdfs/Protocols_for_Surveying_and_Evaluating_Impacts.pdf
[5] Identified as "present" in 1998 FSEIR Table K.2
[6] Identified as "present" in 1998 FSEIR Table K.2
[7] Identified as "present" in 1998 FSEIR Table K.2
[8] Identified as "present" in 1998 FSEIR Table K.2
[9] Federal Register / Vol. 70, No. 170 / Friday, September 2, 2005 / Rules and Regulations

BSK

the potential effects of the proposed buildings, signage and lighting on birds." And, that impact requires and was provided a new mitigation measure: The project sponsor shall design and implement the project consistent with the San Francisco *Standards for Bird-Safe Buildings* and Planning Code Section 139, as approved by OCII. OCII shall consult with the Planning Department and the Zoning Administrator concerning project consistency with Planning Code Section 139." (Pg. 1-59)

Nowhere in the DSEIR is there an analysis of which bird species would be subject to these strike impacts, what time of year, or which types of impacts they were subject to. There was no discussion of the determination of thresholds for the bird injury and/or death associated with the project, and no explanation about how or why the mitigation proposed would be sufficient to reduce those injury and/or deaths below a specified threshold. 25 [BIO-5, BIO-6] cont.

The Project's impacts are not appropriately mitigated in the DSEIR

The DSEIR analysis, at a minimum, should have been fully developed to reflect the 2015 federal Wetland Policy modifications, the observations of its own wetland experts, and the numerous state and federal wetland policies and regulations that apply to this site. It is our opinion that the DSEIR fails to mitigate for impacts to waters and wetlands at the site; as well as the potential impacts to biological resources within and around the site through contact with hazardous waste. Effective mitigation measures are available to reduce the impacts below significance. These comments are more fully explained under the NOP-IS analysis below. 26 [BIO-5]

2014 NOP-IS

The 2014 NOP-IS Applies the Prior Impact Analysis to the Modified Current Setting

1. The NOP-IS (Pg. 76) re-characterizes the 1998 FSEIR in order to minimize the type, extent and value of current ecological features of the site. The analysis conflates the prior CEQA analysis with the current ecological conditions, without fully assessing the significant changes that currently exist under and the impacts of the project on the biological resources. The analysis further parses the "upland" species and habitat from the aquatic species and habitat, without identifying and relating the project impacts associated with each of those contexts. For example, the proposed project has both direct (loss of habitat) and indirect environmental impacts (potential contamination) to both terrestrial and aquatic resources, within and adjacent to the site (dust, groundwater and stormwater), but these impacts are not fully identified (impacts identified only to nesting and flying birds). The project must be evaluated with an associated impact analysis that defines the specific project impacts on the site's (and Plan Area) biological resources. 27 [BIO-1]

2. There are <u>substantially new ecological conditions</u> at the site that differ from the description provided in the FSEIR, the project analysis under the NOP-IS newly identifies water bodies as wetland features, but fails to provide analysis of the project impacts on those features, define their regulatory status, and 28 [BIO-5]

identify suitable mitigation according to its regulatory status (NOP-IS, Pg.78; ESA 2014; WRA 2014). For example, if the features are only determined to be regulated by the State there is typically one set of mitigation measures similar to those identified in the IS-NOP, if they are both state and federal, additional measures may be required, however those measures are dependent on a series of tests, and since the project may be subject to CWA 404(b)(1) provisions, significant additional analysis and mitigation may be required.

Instead, the analysis claims that the habitat is: "…limited due to the sparse and ruderal nature of onsite vegetation, as well as the site's location in a densely urbanized environment. While several bird species were observed foraging and hunting onsite, these species are common to San Francisco and would continue to be supported by vegetation communities and water features found in the project vicinity." By its own admission the analysis states that these features would be permanently lost, but that impact doesn't matter because there is some other place for the species to go. It fails to fully define what the biological impacts are, and then identify where (to which nearby features) these species would go.

Further the analysis states: "Because the excavation depressions on the site are small, isolated features resulting from recently completed hazardous materials remediation activities and are surrounded by paved areas and urban development, these features do not provide the important biological habitat functions and values that are typically associated with federally protected wetlands." Conversely, and in rebuttal to their prior assertion that there are readily substitutable habitats nearby, small wetland features can have exceptional ecological value, in particular if they are one of the few remaining features in an urban setting. 28 [BIO-5] cont.

This biological resource information in the NOP-IS was only analyzed in a cursory manner, simply recapitulating the site observations, without fully identifying and evaluating the CEQA-required biological resource impacts from the project. Without a full technical understanding of which resources are impacted, mitigation cannot, and indeed was not, adequately developed- as these measures depend on the nature and extent of the resources impacted. The standards of significance are not identified, and fail to show the application of thresholds to the project impacts for wetlands and other special ecological habitats.

For example, on Pg. 78 of the analysis, the NOP-IS identifies use of the site's open water and wetland by a variety of native plants and animals:

"Site reconnaissance revealed the deepest part of the excavation within this area contains standing water with a mixture of ruderal vegetation described above, and wetland plants, including alkali bulrush (*Bolboschoenus maritimus*), brass buttons (*Cotula coronopifolia*), fat-hen (*Atriplex prostrata*), and saltgrass (*Distichlis spicata*), present around its perimeter. The standing water supports common wildlife as evidenced by a snowy egret (*Egretta thula*) hunting at the water's edge and a black phoebe (*Sayornis nigricans*) sallying insects from a vegetative perch."

Despite these observations, the analysis fails to accurately characterize the site habitats, and reconcile the appropriate list of species regulatory concern (Table 1, Attachment 1). The habitats observed by BSK (2014) and ESA (2014) at the site appear to include: open water, shallow water with emergent vegetation (alkali wetland), mud flats, riparian fringe (locally called scrub), ruderal grassland, seasonal wetlands, and open/disturbed shrubland. California identifies one of these habitat types as sensitive: *Bulboschoenus maritimus* (Salt marsh bulrush marshes) Alliance, status S3[10] (S3 = Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state.)

For illustration of the biological resources analysis defects, as they related to waters and wetlands, the following section provides a site waters and wetland feature history and summary analysis of how the provided data and analysis are insufficient or incorrect.

WATERS AND WETLAND FEATURE HISTORY

The term "wetlands" from a Clean Water Act (CWA) 404 perspective generally means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands typically include swamps, marshes, bogs, and similar areas. These are typically identified using a three-part test, examining the presence of water, wetland (hydric) soil, and wetland dependent (hydrophytic) vegetation, following specific guidance(s). The federal CWA section 404(b)(1) Guidelines list both wetlands and mud flats as types of "special aquatic sites."

28
[BIO-5]
cont.

A wetland under California's regulations contains the following features, an area that is covered by shallow water or where the surface soil is saturated, either year-round or during periods of the year; where that water coverage has caused a lack of oxygen in the surface soil; and, has either no vegetation or plants of a type that have adapted to shallow water or saturated soil. Some examples are fresh water marshes, bogs, riparian areas, vernal pools, coastal mud flats and salt marshes. In this case, there are both a permanent water body and a seasonal feature (possibly a small complex) with wetland characteristics by the admission of the experts who prepared the environmental documentation for the project. These characteristics meet the definitions contained in the various regulations, including 14 CCR 13577(b), Cal. Pub. Res. Code § 30121. The open water feature and its wetland (hydrophytic) vegetation were verified in the field, and through the use of aerial photos, showing their presence over time, both by season and by year.

The site is within the footprint of the historic Mission Bay, which has been filled in over time (ESA 2014; Pg. 1). The original Bay muds are still found below the site, as evidenced by the site soil borings (LTR 2015; Pg. 13 and Figures A-2 and A-3). The excavation intercepted local shallow groundwater and is

[10] https://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/natcomlist.pdf

evidently maintained by that natural source (LTR 2015; Pg. 14). The site also has seasonal wetland features which appear to be dominated by stormwater. It is not clear that these seasonal features would not be maintained for far longer in the spring, but they have been captured through an excavated trench apparently intended to drain them to the open water body (ESA 2014; Pg. 2). The site "remedial" activities thus captured the local water table and allowed for the expression of open water and wetland features (ESA 2014; Pg. 2). The ESA analysis goes on to specifically identify that the: "…deeper excavation and surrounding shallow depressions within the proposed project site are features that exhibit hydrology and vegetation characteristics of wetlands. Hydric soil is presumed present due to the year-round inundation and presence of obligate wetland plants." (ESA 2014; Pg. 3)

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[BIO-5]
cont.

Federal Jurisdiction-Wetlands created by human actions fall under discrete classes under Federal jurisdiction. Most typically these are agricultural features that are caused by the movement of water from one location to another, such as a dam providing water to a canal constructed in uplands. In this case however, the site was originally a tidal mudflat or estuary wetland which has since reverted back to a wetland (ESA 2014). In addition, even if it was not originally a water or wetland, it currently meets those adjacency, and direct hydrologic connectivity requirements under the Final Clean Water Rule (2015; 33 CFR Part 328 and 40 CFR Parts 110, 112, 116, 117, 122, 230, 232, 300, 302, and 401); and, even manmade wetlands and water bodies have restrictions on discharges under 33 CFR 323.4(b).

There are Federal exemptions for specific construction associated activities. These exemptions (33 CFR 323.4 - Discharges not requiring permits) are invalidated, however: "If any discharge of dredged or fill material resulting from the activities listed in paragraphs (a) (1) through (6) of this section contains any toxic pollutant listed under section 307 of the CWA such discharge shall be subject to any applicable toxic effluent standard or prohibition, and shall require a section 404 permit." (33 CFR 323.4(b)).

The site's water and soils include several chemicals identified under CWA section 307 as toxic pollutants (BBL 2006; LTR 2015).[11] Those chemicals include the following 12 Priority Pollutants found in the Phase II (LTR 2015; Table 4 and Table 5):

29
[BIO-5]

1. Benzene
2. Naphthalene
3. Cyanide
4. Antimony
5. Arsenic
6. Chromium
7. Copper
8. Lead
9. Mercury
10. Nickel

[11] http://water.epa.gov/scitech/methods/cwa/pollutants-background.cfm

11. Selenium
12. Zinc

Therefore, the site is *not exempted* under 33 CFR 323.4 because it contains 12 of the chemicals identified as priority pollutants under section 307.

The proponents' consultant, WRA, in a separate analysis, claims exemption from the CWA under yet a different test (without identifying that any exemption is *invalidated* by the section 307 test described above (WRA 2014; Pg. 2)). WRA states that: "1986 (51 Fed. Reg. 41206) (e) Water-filled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the United States."

The site owner's continuing failure to backfill the excavation and its abandonment for the past decade, despite being under Order No. R2-2005-0028 and its RRMP, constitutes abandonment and its clear reversion to the definition of waters, wetlands and/or other special aquatic site. WRA's explanation, contrary to demonstrating how the site may be exempted as an incidental construction feature, documents how that feature has been abandoned. Therefore the exemption also does not apply on that basis. 29 [BIO-5] cont.

Indeed, there is no merit to the further argument made by WRA (Pg. 4) that: "As described in the RWQCB Order No. R2-2005-0028, the Project Area was to be excavated and backfilled in preparation for future development as part of the overall Mission Bay redevelopment plan." The site was not backfilled. It should be noted by WRA's argument there could never be a case for reversion under the CWA, because any naturalized feature would simply 'be ready' for some postulated future backfilling. The provided analysis fails to show: 1. How the feature has not reverted and 2. How the exemption override under 33 CFR 323.4 does not apply due to the presence of section 307 toxic chemicals. Regardless, WRA is silent on the open water and wetland features in context of the State water and wetland policy and applicable regulations.

California Jurisdiction-California does not have the same exemptions in its waters and wetland framework as exist under the CWA. California derives its authority from different sources (Porter-Cologne Water Quality Control Act and various other Acts) for its policies, and includes all man-made features under its jurisdiction. Therefore the site's water features, regardless of origin, appear to be regulated and protected waters and wetlands of the State.

The NOP-IS acknowledges that the project would result in the fill of a wetland (and without identifying it Pg. 76, its associated fringe riparian zone), however, the proponent has not yet (and does not propose to) characterized the wetlands to determine their jurisdictional status (Pg. 78). The failure to prepare the jurisdictional determination prior to public comment eliminates full public disclosure and the ability to assess the potential reasonableness and efficacy of mitigation measures. Moreover, the specified 30 [BIO-5]

failure to establish specific (offsite) mitigation may violate CEQA's mandate to impose all feasible mitigation measures, and may fail to meet both Porter Cologne and the Clean Water Act permitting requirements for filling wetlands and waters. 30 [BIO-5] cont.

SITE ABANDONMENT AND NEW EXPOSURES

The Site's Failure to Fill the Excavation Has Led to Wetland Formation and New and Unanalyzed Exposures

The site petroleum-related remedial activities exposed the local water table and allowed for the expression of wetland characteristics and the site which have become naturalized over time (ESA 2014; Pg. 2). These activities have resulted in the creation of stockpiles of material adjacent or near to these wetland features that in some cases: "…contains contaminants that exceed hazardous waste threshold concentrations and will require special handling and disposal," (LTR 2015; Pg. 1). These activities took place over several years culminating in a Phase II remedial action that left the excavated area open and abandoned in 2005 (LTR 2015; Pg. 6). The Revised Risk Management Plan (RRMP, BBS; Pg. 2-3 and 2-3) infers that the excavation was backfilled, however, it was not. 31 [HAZ-4, BIO-5]

The RRMP further identifies that: "1. Because North Terminal, Parcel X4, OAS and 16th Street East OUs are currently under development, interim risk management measures (IRMMs) designed for undeveloped parcels are not relevant to the protection of human health on those OUs. If development ceases or areas are created with uncovered native soils, IRMMs may again be necessary." (BBS 2006; Table 1) The development of the site still has not occurred, and there is no evidence that the IRMMs have been applied.

The site's open water and wetland features are thus a direct result of the abandonment of a site cleanup allowed to revert back to a 'natural state' for approximately a decade. Not only did natural features evolve in response to this abandonment, but the very abandonment created conditions that may have exposed wildlife to a variety of hazardous chemicals through their use of that habitat (LTR 2015).

The Project Impact Evaluation Modifies the Appendix G Question in a Manner that Eliminates Critical Analysis

The project Impact Evaluation BI-1 fails to follow the language of Appendix G by removing the second half of the question, and reduces the subject matter and detail of its impact analysis accordingly (Pg. 77). The current (2015) Appendix G states: 32 [BIO-4]

IV. BIOLOGICAL RESOURCES -- Would the project:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Instead the NOP-IS states:

"Impact BI‐2: The proposed project would not have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations. (No Impact)"

The result of this text deletion is that the potential for the project to impact U.S. Fish and Wildlife Service designated critical habitat is not analyzed. Therefore, the potential project impacts to the closest federally designated critical habitat is steelhead *Oncorhynchus mykiss* are ignored. This habitat runs directly adjacent to the project area. In addition, San Francisco manzanita (*Arctostaphytos franciscana*) critical habitat is present approximately 2.6 miles to the west and should also have been identified and analyzed. The federal critical habitat analysis is missing, and the provided analysis itself is defective. The potential project's impact(s) to these listed species and their critical habitat are therefore unexamined. The project's dust, stormwater, surface flooding, and groundwater place those species at risk from hazardous chemicals. This issue is discussed in detail in Other Biological Resource Issue Areas.

32 [BIO-4] cont.

OTHER BIOLOGICAL RESOURCE ISSUES

The DSEIR is silent on the potential project impacts on offsite fish and wildlife issues associated with stormwater and other discharges from the site to the surrounding area, Mission Creek Channel, and the San Francisco Bay. The DSEIR Appendix MIT Mission Bay FSEIR Mitigation Measures: Applicability to Proposed Project K. Hydrology and Water Quality section (MIT-27 through -29) states that the project would fall under different mitigation measures under different programs (such as the General Stormwater Permit) and that the detailed mitigation requirements from the 1998 FSEIR would not be used. The site's hazardous material history show that the proposed project construction activities pose risks to the environment and its biological resources through the release of hazardous chemical to surface waters, through wind redeposition, stormwater drainage, or unabated stormwater sheet flow above a 5-year design rain event (BBL 2006, LTR 2005). The RMP has not protected these resources because it was not intended to covers these features, followed superseded analytical methods, and even if it was applicable and current, has had implementation failures. Some of these issues are identified in greater detail in a separate document, SWPPP Memorandum BSK Associates, 2015.

There is a direct route from the site to the surrounding area, including the Bay, from dust and stormwater. Stormwater can take several routes off the site, and may enter a sediment trapping system, or not, and flows over a 5-year event run unabated into neighboring properties and the Bay. Currently, there are what appear to be multiple failures to implement and maintain effective Best Management Practices (BMPs) for dust and stormwater. The DSEIR fails to identify these risks and conditions, and fails to identify the potential environmental impacts from the substantially changed new

33 [HYD-2, BIO-4]

environmental conditions as a result of the site remedial activities. The DSEIR further identifies that there were detailed mitigation measures for these potential impacts as they related to stormwater (but not biological resources) in the FSEIR, but that they deleted the hazardous material protective elements and simplified the sediment management. The site stormwater operations have management issues that need reconciliation, but the evidence shows a likelihood of these contaminants reaching surface waters, despite the prior BMPs and this must be fully analyzed and the mitigation measures modified correspondingly to reflect those significant new conditions in order to protect biological resources, designated critical habitat and listed fish and wildlife.

33 [HYD-2, BIO-4] cont.

CUMULATIVE IMPACTS

In our opinion, the project's impacts on listed species, waters and wetlands, and their loss, were not analyzed in sufficient detail or context to be able to understand what the likely cumulative impacts would be on those and other biological resources. It seems probable that there would be cumulatively considerable impacts from the project given the limited availability of those habitats, and that there are mitigation measures available for those impacts. However, the IS-NOP analysis discusses some broadly applicable mitigation measures for wetlands, then fails to identify or apply any of those mitigation measures in Table 1-2 (NOP/IS Pg. 1-58) Appendix MIT (Pg. MIT-30). There are only two mitigation measures described as applicable to biological resources at the site in the DSEIR, breeding bird use protection and bird strike impacts.

The DSEIR's cumulative impact analysis lacks the degree of detail that the 1988 DEIR completed and fails to apply that analysis to the current waters and wetlands, and contradicts the current DSEIR's findings:

"Wetland habitats in the San Francisco Bay Region continue to be eliminated and altered. Wetlands provide a continuity of habitat between the open waters of the Bay and upland areas. Wetlands increase the wildlife diversity by providing additional habitats, and by providing many of the animals' life history requirements (e.g., feeding, mating, and nesting) in one area." (1988 FEIR Pg. VI.M.12)

According to the project analysis: "The proposed project could potentially result in adverse effects on various bird species through disruption of nests, collisions with buildings, or disorientation from night lighting. These impacts, in combination with other projects along the San Francisco waterfront, could potentially result in cumulative impacts to birds." (NOP/IS Pg. 84) There is no assessment of how many birds or which species would be impacted and how the mitigation would achieve that reduction below the unstated threshold. The document then fails to identify how the mitigation measures would result in a less than significant finding over the cumulative impact analysis area. There is also no supporting analysis for these bird impacts in the 1988 FEIR or 1998 FSEIR.

34 [BIO-5, BIO-6]

1998 FSEIR

HABITAT ANALYSIS

No Prior Interior Wetland Presence and Analysis

The 1998 FSEIR states: "This section focuses on the aquatic and wetland habitats of China Basin Channel. Terrestrial habitats in the remainder of the Project Area do not support any significant biological resources, as discussed in the Initial Study (see Appendix A)." At the time of that analysis, there were no documented interior water and wetland features at the site, and therefore the project impacts on waters and wetlands were not analyzed (Pg. II.30). It also is important to note that the mitigation used for the China Basin Channel may, and in some cases may not, be applicable to the project impacts on the current interior wetlands, and thus require significantly new and more detailed analysis for both the impact to these features, and the impacts on their associated species. 35 [BIO-5]

HAZARDOUS CHEMICALS

Hazardous Chemical effects on Biota

The FSEIR identified that for the purposes of analyzing wastewater impacts from the project, that "Near-Shore Effects-Treated combined sewer overflows currently occur at Bayside discharge facilities, including facilities at China Basin Channel, at the end of Mariposa Street, and in Islais Creek. The proposed project would marginally increase treated combined sewer overflows and direct stormwater discharges to near-shore waters of the Bay, including China Basin Channel and Islais Creek. Near-shore discharges are not subject to the same rapid mixing and dilution as the deep-water discharges from the Southeast Plant." (Pg. II.27) This effect is generally correct and holds for both wastewater, and typically to an even greater degree, most particulate or soluble chemicals that would come off the site through the groundwater, aerial re-deposition or stormwater/surface transport. 36 [HYD-5]

However, in the immediately following section, Effects of Stormwater Discharges, it states that "Under the project, the volume of stormwater directly discharged to near-shore waters of the Bay from the Project Area would increase about 2%. The concentrations of pollutants in the stormwater discharge would change, because the project would intensify land use in the Project Area. Neither the increase in stormwater flow, nor the change in pollutant concentrations would constitute a significant effect on aquatic biota." (Pg. II.28) The recent findings of Class 1 and Class 2 hazardous waste is not taken into account for these analyses and comprise significant new information that requires analysis in the 2015 SEIR because of the different and <u>significantly greater biological impacts</u> of these hazardous materials (LTR 2015).

The FSEIR identifies an analysis of potential adverse ecological effect associated with the current conditions at the site in 1998 (Pg. I.54). It states: "As noted by ENVIRON, no criteria have been 37 [HAZ-1]

developed for the assessment of risk to ecological receptors in the aquatic environment based on comparisons to groundwater chemical concentrations. However, ambient water quality criteria for the protection of marine (saltwater) organisms are used as a conservative means of evaluating the potential risk to surface water organisms." (Pg. I.57) However, since 1998, the San Francisco Regional Water quality Control Board has developed these very criteria as described below.

The 1998 analysis relied on Preliminary Remediation Goals (PRGs) for its analysis, however the San Francisco Regional Water Quality Board (SFRWQB) states in its current guidance document that: "The U.S. EPA Regional Screening Levels or RSLs (formerly PRGs; U.S. EPA, 2013d) address human health concerns associated with direct exposure to chemicals in soil, but do not address ecological concerns. Exposure routes and receptors not addressed by the RSLs, but included in the ESLs [Environmental Screening Levels] are listed below: …groundwater screening levels for the protection of aquatic…habitats/surface water quality…soil screening levels for urban area ecological concerns; (SFRWQB 2013; Pg. 1-3). These exposure routes which apply and are specific to the site are identified in the current Environmental Screening Levels (ESLs). This is <u>new and substantial information</u> that affects the potential environmental impacts to biological resources which was not used in the DSEIR.

Further, the ESLs (the PRGs for that matter) are not legal limits, but they are intended to inform decision-making. However, they may not be protective enough in particular for "…sediment or sensitive ecological habitats (such as wetlands or endangered-species habitats). The need for a detailed human health or ecological risk assessment should be evaluated on a site-by-site basis for areas where significant concerns may exist (SFRWQB 2013; Pg. ES-1 and 2). 37 [HAZ-1] cont.

The prior FEIR analysis identifies that in their opinion there were no significant species or habitats at the site, and therefore the analysis was specifically intended not to be protective of terrestrial habitat or interior wetlands, and therefore does not apply to the current conditions: "As previously described, chemicals present in the soils could potentially impact the health of the ecological environment if terrestrial or nesting avian species come into direct contact with soils which contain elevated levels of chemicals, or if the chemicals in exposed soil were to be released into China Basin Channel or San Francisco Bay through surface water runoff. Additionally, chemicals present in the soil and groundwater could potentially impact the aquatic environment if the chemicals leach from the soil into the groundwater and subsequently migrate to China Basin Channel or San Francisco Bay. As discussed in the Mission Bay Final Environmental Impact Report (FEIR), the current and future conditions within the Project Area do not provide a habitat capable of supporting a significant terrestrial or nesting avian wildlife community. Accordingly, potential exposures that terrestrial species could have with soils would not represent a significant effect on the terrestrial wildlife community." FEIR 1998; Pg. I.54) The current conditions are <u>significantly different</u> and specifically excluded from the prior 1998 analysis and the current ESL methods do apply to these conditions.

The 1998 "risk analysis" applies the PRG criteria for impacts on biological resources in the Bay as a result of offsite groundwater movement only. It also uses average values and only for selected contaminants.

This is an artificial narrowing of chemicals that can have biological impacts, and likely a major reduction of the risk by not using the maximum observed concentration and the biologically relevant risk drivers. For example, species are exposed to actual concentrations, not site averages. By using the observed peak concentrations, it establishes the appropriate worst case scenario and sets the upper limits for the purposes of developing mitigation.

However, groundwater is but one of several potential routes by which contaminants can leave the site. Wind can blow contaminated dust and stormwater (containing both fine sediment and dissolved contaminants) can also run off the site. The RMP and RRMP also do not apply and cannot be relied upon because they specifically rely on the previous risk analysis, which does not look at terrestrial or interior wetlands.

Additional Mechanisms of Impacts to Biological Resources

Some of the mechanisms for biological impacts from the project's contribution to contaminants are through bio-accumulation, as well as the unanalyzed bio-concentration: "These contaminants could be directly lethal to smaller organisms, and could accumulate in the food chain and become successively more concentrated in a process known as bio-accumulation. Through bio-accumulation, the toxic concentrations could reach levels in which they are lethal to larger organisms, such as birds or marine mammals. Turbidity and toxicity from re-suspended sediments could also interfere with beneficial uses of the channel, such as spawning of Pacific herring." (1998 FSEIR Pg. II.31) The FSEIR analysis describes just one of the potential mechanisms for biological impacts from the project-associated hazardous chemicals, then identifies that it is significant and mitigatable, but then simply ignores that potential mechanism for other species that would potentially come in contact with the same material. The analysis should instead examine the various chemical of concern, their individual and joint biological impacts (chemicals can have additive (or counteracting) or multiplicative effects) and their routes of exposure (wind, groundwater or stormwater) and asses the risk drivers for each species (or trophic surrogate). 37 [HAZ-1] cont.

There are newly identified Class 1 and 2 hazardous waste materials at the site, the newly identified use of the site by diverse biota, the designated Critical Habitat, and similar release pathways off of the site. These changed conditions require analysis of both onsite impacts and offsite impacts. The lines of reasoning, based on high contaminant concentrations at/close to the site, poor mixing in the shallows, and bio-concentration/bio-accumulation should also be applied to the current physical conditions and the elevated contaminant concentrations.

Mitigation for Hazardous Materials

The analysis provided above in the 1998 FSEIR relied on the dilution effect of the Bay, despite its own earlier analysis that there would be significant impacts which required mitigation, but cumulatively there would be no impact (1998 FSEIR Pg. II.27). General stormwater impacts are not the same as

impacts from solid phase and dissolved phase hazardous materials. Specific analysis must be developed to identify which capture or treatment systems are required for which hazardous constituent in which phase. For example, large particles traveling in the stormwater system could be trapped through a conventional filtration system, however, overflow of that system (and/or poor maintenance) by design flow above a 5-year rain event could cause that material to be flushed directly into the Bay. Very fine size and dissolved phase chemicals typically require specific treatment technologies to stop their direct movement to the Bay during mobilizing rain events. The mitigation does not appear to be sufficient to protect biota from hazardous materials identified at the site in the LTR 2015 report.

Cumulative Hazardous Issues

The same failure to identify, and therefore analyze cumulative impacts, as a result of newly identified hazardous materials also applies to cumulative impacts from these chemicals: "To put this in context, City discharges are a very small portion of the region-wide discharges to the Bay. Considering the contribution of the project and of the cumulative Bayside projects in the context of all the other pollutant inputs to the Bay, the cumulative pollutant loading from the Bayside projects would be extremely small." (1998 FSEIR Pg. II.29) The cumulative impacts of hazardous materials (not just generalized pollutants) would be specific to certain species in the Bayside proximate to the site, not generically in the context of the entirety of the Bay. It is inappropriate to consider the entirety of the Bay in the cumulative impacts specifically because of the mechanics of chemical redistribution identified in another section in the FSEIR (1998 FSEIR Pg. II.27, and see above). The analysis provided in the FSEIR does not cover the hazardous materials and fails to look at the appropriate biological context, including resident and locally foraging migrants, and must be reanalyzed in light of the new cumulative impact information. In our opinion, because of the new analysis methods and standards, and the lack of mitigation for soluble or stormwater transportable hazardous materials, the project's impacts on aquatic biological resources is cumulatively significant after mitigation. Mitigation measures are readily available for these potential impacts, but they require a careful analysis of the specific hazardous constituents and what levels of contamination are acceptable to develop. 37 [HAZ-1] cont.

REFERENCES

BBL Environmental Associates [BBL], 2006. Revised Risk Management Plan, Former Petroleum Terminals and Related Pipelines Located at Pier 64 and the Vicinity, City and County of San Francisco, California. (August, 2006)

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Exh 2

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LIMITATIONS

Our review was limited to the Ecological-related aspects as they are identified in the project environmental documents provided or otherwise made available for review. Additional information related to the project may be available through other sources, but were not reviewed for the purposes of this analysis.

The observations, assessment and recommendations submitted in this report are based upon the data obtained from listed reports prepared by others, limited field investigation, and site observations. The report does not reflect variations which may occur beyond the assessed area. BSK's services were be performed in a manner consistent with the level of care and skill ordinarily exercised by other professionals practicing in the same locale and under similar circumstances at the time the work is performed. No warranty, either expressed or implied, is included. The findings of the field observation may have a potential for negative impact(s) on the value or suitability of the site for some purposes. BSK cannot assume liability for any such negative impact(s). Permitting requirements or permit interpretations may change over time. The findings of this report are valid as of the present. However, changes in the conditions of the site can occur with the passage of time, whether caused by natural processes or the human-induced changes on this property or adjacent properties. In addition, changes in applicable or appropriate standards or practices may occur, whether they result from legislation, governmental policy, or the broadening of knowledge.

We appreciate the opportunity to be of service to Soluri Meserve and trust that this correspondence provides you with the information necessary at this time. Please contact us with any questions regarding the review comments presented this letter.

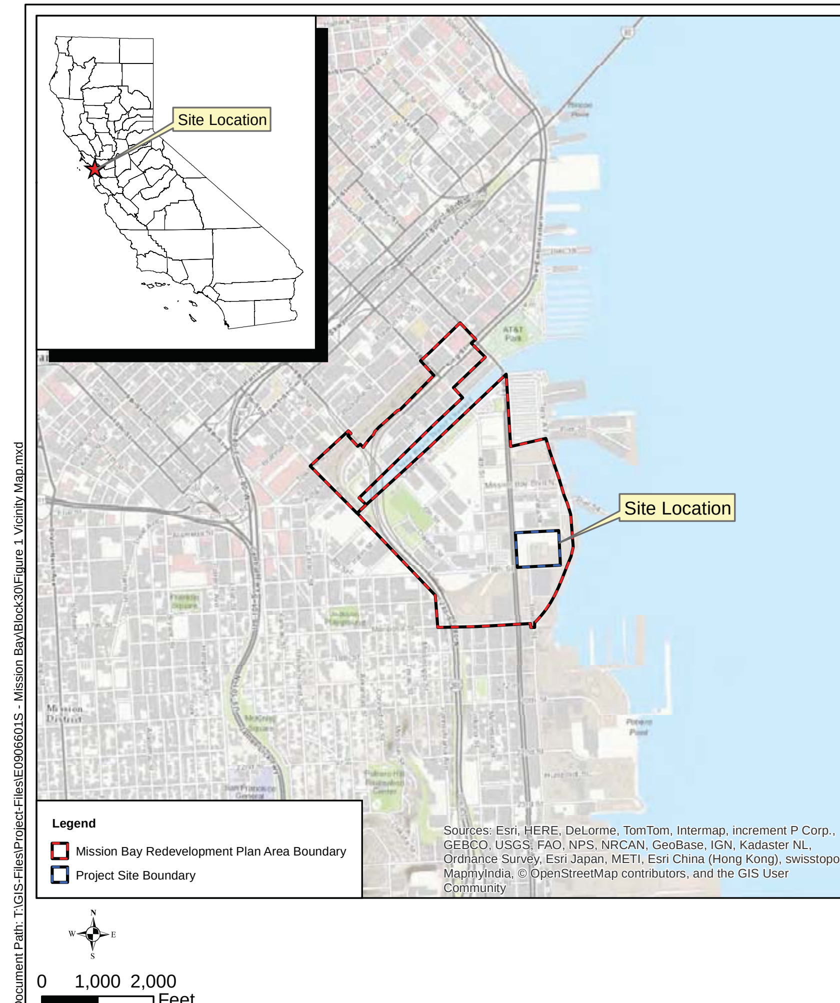
Respectfully submitted,
BSK Associates

Erik Ringelberg
Senior Scientist
Ecological Services Group Manager

Kurt Balasek, PG, CHg, CSD
Senior Hydrogeologist

BSK

O-MBA11L5
Exh 2



BSK Associates Engineers & Laboratories

Review - Mission Bay Subsequent Environmental Impact Report San Francisco, California	Figure 1 Vicinity Map

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October 7, 2015

SENT BY U.S. MAIL AND EMAIL (warriors@sfgov.org**)**

Tiffany Bohee
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Supplemental Comments on Environmental Review for Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 – Clean Water Act 404 and CZMA Consistency

Dear Ms. Bohee:

This firm represents the Mission Bay Alliance ("MBA") with respect to the Warriors Event Center Project ("Project"). These comments supplement MBA's prior comments on the Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("DSEIR").

As described in the July 24, 2015, comment letter submitted by the Law Offices of Thomas Lippe regarding Hydrology, Water Quality and Biological Impacts ("Hydro Comments"), the Project site contains a wetland feature that is likely jurisdictional and will require permits from the U.S. Army Corps of Engineers ("Corps") and/or the State Water Resources Control Board in order to lawfully fill. (See Hydro Comments, pp. 11-15, and Exhibit 2, pp. 2-3.) Specifically, the Project site contains a wetland area consisting of a large, permanent pond created by a narrow channel that seasonally contains surface waters and creates further, seasonal wetland features. (Exhibit 2, p. 2.) The area is replete with shrubs and riparian plants, and it serves as habitat for various species, including nesting and foraging sites for native birds. (*Id.* at pp. 2-3.) 1 [BIO-5]

Despite the existence of likely jurisdictional wetlands on the site, the DSEIR does not include the Clean Water Act ("CWA") 404 fill permit that will be needed to fill the wetland in the list of project approvals. (DSEIR, pp. 3-51 to 52.) The need for a 404 fill permit also requires the Corps to prepare a Coastal Zone Management Act ("CZMA") consistency finding, as required by the Bay Conservation Development Commission

("BCDC") Management Program (see 16 U.S.C., § 1456, subd. (c)(3)), which should also be on the list of project approvals. (See CEQA Guidelines, § 15124, subd. (d).)

Under the CZMA, any applicant for a federal permit to conduct an activity, regardless of its location, will be required to certify its consistency if that activity will affect a land use, water use, or natural resource of the coastal zone. (See, e.g., *Amber Res. Co. v. United States* (Fed.Cir. 2008) 538 F.3d. 1358, 1363-1364; *Southern Pacific Transp. Co. v. California Coastal Com.* (N.D.Cal. 1981) 520 F.Supp. 800, 802-803.) Effects on coastal uses and resources need not be direct, but may include "any reasonably foreseeable effect," including "indirect (cumulative and secondary) effects which result from the activity and are later in time or further removed in distance, but are still reasonably foreseeable." (15 C.F.R., § 930.11, subd. (g).) It is likely that this Project will have effects on coastal resources, as the area to be filled is adjacent to the coastal zone. Coastal resources include biological and physical resources, such as vegetation and animals that are found in the state's coastal zone on a regular or cyclical basis. (15 C.F.R., § 930.11, subd. (b).) This Project site provides nesting and foraging habitat for several such species of birds. (See Hydro Comments, Exhibit 2, p. 3.) Thus, a consistency determination is necessary. 1 [BIO-5] cont.

In summary, the DSEIR omits necessary project approvals and overlooks impacts associated with the Project's inconsistency with the BCDC Management Program. These omissions from the Project description and lack of analysis must be corrected prior to certification of the EIR. Thank you for considering these supplemental comments. Please feel free to contact my office with any questions.

Very truly yours,

SOLURI MESERVE
A Law Corporation

By: [signature]
Osha R. Meserve

From:	Mary Miles
To:	Warriors, PLN (CPC)
Subject:	Public Comment on SDEIR
Date:	Monday, July 27, 2015 5:01:05 PM

FROM:
Mary Miles, Attorney at Law (State Bar # 230395)
364 Page St # 36
San Francisco CA 94102
(415) 863-2310

TO:
Tiffany Bohee
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission St., Ste. 400
San Francisco CA 94103

BY E-MAIL: to warriors@sfgov.org

DATE: July 27, 2015

RE: "Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32" OCII File No. ER 2014-919-97; San Francisco Planning Department No. 2014.1441E

PUBLIC COMMENT ON DRAFT SUPPLEMENTAL EIR

This is Public Comment on the Draft Supplemental Environmental Impact Report ("DSEIR") for the "Golden State Warriors Event Center and Mixed Use Development at Mission Bay Blocks 29-32" ("the Project"). The Project proposes placing a championship basketball team drawing capacity crowds of more than 18,000 for every game in a new sports arena and "event space" with drastically inadequate parking and access for vehicles, inadequate public transportation, less than one mile from the AT&T baseball stadium with overlapping events and already-existing severe traffic congestion. The proposed Project location is directly adjacent to the largest medical facility in San Francisco, creating blocked access for both existing staff, visitors, and emergency vehicles. 1 [ERP-9]

The Project proposes a sports arena for the Golden State Warriors in San Francisco, relocating that arena and "event center" from its present location in Oakland California to the Mission Bay complex adjacent to new medical centers and residential developments, where the Warriors would then host capacity crowds of 18,000 from all over the Bay Area. (DSEIR, pp.1-8; 5.2-235.) The "events" would be held 225 times per year. (DSEIR p. 1-8.) Even the severely flawed SDEIR admits the Project will generate significant traffic and transit impacts affecting travel throughout the City and the entire region "at multiple intersections and freeway ramps" with "regional transit providers exceeding capacity," "noise and crowd noise affecting sensitive receptors," air quality impacts, wind impacts, and impacts on public utilities, including wastewater facilities with existing already-"inadequate capacity to serve the project's wastewater demand." (SDEIR, p. 1-9.) The SDEIR proposes no 2 [ERP-9]

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effective or publicly enforceable mitigation for those significant impacts. 2 [ERP-9] cont.

Instead of improving severely congested traffic and already substandard air quality conditions, the Project proposes to make them worse throughout the Project area, which includes the entire downtown area cumulatively, freeway ingress and egress, and AT&T Ballpark. The Project therefore directly and facially conflicts with the mandates of the California Environmental Quality Act ("CEQA," Pub. Res. Code [PRC] § 21000 *et seq*.) to "enhance the environmental quality of the state," to mitigate the Project's impacts, and to "consider alternatives to proposed actions affecting the environment." (PRC § 21001.) The DSEIR fails propose feasible mitigation measures or alternatives for the admitted impacts of the Project, and therefore violates not only those mandates but the legal requirements of CEQA to inform the public of the Project's impacts and mitigate them. The DSEIR fails propose feasible mitigation measures or alternatives for the admitted impacts of the Project, and therefore violates not only those mandates but the legal requirements of CEQA to inform the public of the Project's impacts and mitigate them. 3 [TR-2j]

The SDEIR fails to accurately identify the magnitude of the obvious congestion, transportation and parking impacts of the proposed Project, has no coherent or accurate cumulative impacts analysis, and no accurate direct or cumulative analysis of the Project's impacts on air quality, and fails to meet other requirements of the California Environmental Quality Act ("CEQA"), Public Resources Code ("PRC") §§21000 *et seq.*

The DSEIR does not comply with CEQA's requirements to accurately state existing (baseline) conditions of traffic, thus negating the impacts analysis, the mitigations analysis, and the alternatives analysis on these crucial impacts affecting traffic, transit, air quality, safety, and human health throughout the affected area. The DSEIR contains *no* traffic counts or other traffic indicators and inadequate analysis of operational air quality impacts from the congestion inevitably caused by removing traffic lanes and parking. 4 [TR-2c] The DSEIR's disingenuous conclusion that the Project will have no impact on emergency services is false and dangerous. With the gridlock created by bottlenecked traffic, those emergency vehicles will not be able to climb over the backed up cars and buses. 5 [TR-9] The DSEIR also fails comply with CEQA's mandate to mitigate the Project's impacts by proposing in a separate section of the EIR feasible, effective, and enforceable mitigation measures for each impact identified, and to present a full range of alternatives, including off-site alternatives, to the Project to eliminate or reduce the Project's impacts. 6 [IO-2, ALT-1]

These defects make the DSEIR legally inadequate, since it fails to inform the public and decisionmakers of the Project's true impacts and fails to mitigate them. Further, the DSEIR's conclusory statements are in many instances unsupported. The large number of references to other EIR's and documents on other projects make the document user-unfriendly and its conclusions unsupported. The minimal public comment period on the DSEIR from June 5 to July 27, 2015, is inadequate for a Project of this size, regional importance, magnitude, and severity of impact, and a DSEIR of this complexity. The location of the Project area in downtown San Francisco and the large number of affected travelers and residents in the area make this Project of regional and statewide importance. Therefore, this public comment is necessarily incomplete, and other comment may be submitted later on issues not addressed here. The following are some inadequacies of the DSEIR. 7 [ERP-6]

1. Traffic Impacts Are Neither Adequately Analyzed Nor Mitigated.

Even though it drastically underestimates the vehicle traffic generated by the Project, 8 [TR-4] the DSEIR concludes that the Project will have significant "project-specific" impacts at seven study intersections, including King/Fourth; Fifth/Harrison; I-80 westbound off-ramp; Fifth/Bryant/I-80 eastbound on-ramp; Third/Channel; Seventh/Mission Bay Drive; and seventh/Mississippi/16th. (DSEIR 5.2-128.) The DSEIR then claims that it will not provide proposed mitigation measures for the Project's gridlock-creating mess throughout downtown San Francisco and on major freeways in violation of CEQA's fundamental mandate, claiming that any mitigation of the Project's impacts would have to increase lane capacity, which the DSEIR claims would "generally be infeasible," providing no substantial evidence to support the conclusion of infeasibility. (DSEIR 5.2-128.)

The Project description in the DSEIR fails to include an accurate description of The Project area, since the Project's impacts extend far beyond the Project site and will affect citywide and regional streets, freeways, and transit lines.

There appears to be no accurate traffic count data supporting the baseline (existing) conditions from which the impacts analysis proceeds. Further, even if only seven of the analyzed intersections streets were impacted by the Project, the backup from those intersections would affect many entire streets and other intersections that the DSEIR claims would not be degraded. An EIR that fails to inform the public and decisionmakers of the Project's impacts is legally defective.

8 [TR-4] cont.

The DSEIR proposes admittedly ineffective "mitigation," such as on-site "PCO's that shall be deployed," without saying where and when they would be "deployed," who would pay for them (the public), and how they would affect the intersections where impacts are identified. (DSEIR 5.2-128.) Instead of proposing effective mitigation measures for the identified impacts, the DSEIR then claims that "strategies to reduce traffic congestion" "could" include more ineffective "outreach" to urge people not to drive, urging the project sponsor to buy up more parking spaces, and other vague "strategies." (DSEIR 5.2-129.) The DSEIR then proposes a "Strategy to Enhance Non-auto Modes," which also would not mitigate the Project's impacts on traffic, including traffic that is not attending a basketball game or a "special event," which is not even considered in the DSEIR. (DSEIR 5.2-129.) The "Non-auto Mode" strategy includes, *e.g.*, a "promotional incentive…for public transit use and/or bicycle valet use at the event center." (*Id.*) The "Non-auto Mode" strategy, however, again fails to address the traffic impacts of the Project, and does nothing to mitigate them.

Regardless of whether the City provides additional Muni "Special Event Transit Service," a central assumption of the DSEIR, the document admits that traffic impacts will affect the entire Project area, freeway ingress/egress, and Bay Bridge travel. (DSEIR 5.2-118 - 129, 5.2-191-207.)

The DSEIR's analysis and the proposed "mitigation" fall far short of the requirements of CEQA to identify significant impacts and mitigate them.

2. The Cumulative Traffic Analysis Is Factually and Legally Defective.

Even though its cumulative analysis is severely flawed, the DSEIR admits that the Project will cause cumulative traffic impacts at 16 "study intersections" including I-80 and I-280 freeway ramps. (DSEIR 5.2-219-221.) The DSEIR then fails to propose any effective mitigation measures for those impacts.

9 [TR-2h]

The DSEIR's cumulative traffic impacts analysis legally inadequate and unsupported. The document claims that it assessed cumulative impacts "by calculating the project-generated traffic conditions at intersections that are projected to operate at LOS E or LOS F under 2040 cumulative conditions for the No Event scenario for the weekday p.m. and Saturday evening peak hours." (DSEIR 5.2-212-213.) However, that "methodology" is irrelevant to, and does not meet the legal requirements of, CEQA for assessing cumulative impacts. Rather, the DSEIR was required to identify the Project's impacts in combination

with other past, present, and reasonably foreseeable future projects that would also result in traffic impacts. The baseline for assessing cumulative traffic impacts is not conditions existing in 2040 but is conditions existing now. The DSEIR's pointless computer exercise thus does not comply with CEQA. (DSEIR 5.2-212-215.) Further, the DSEIR fails to include in the cumulative analysis many other reasonably foreseeable future projects that will also result in traffic impacts, such as the "Second Street Bicycle Plan project," a major project that will eliminate two traffic lanes, turning facilities, and all parking on Second Street from Market Street to King Street to create raised separated bicycle lanes, and similar bicycle plan "road diet" features proposed by the City in the "Central Soma Plan" on Third, Fourth, and Fifth Streets and the closure of Market Street to vehicles in August, 2015, and large private development projects in the project area, all of which should have been included in the cumulative analysis. In short, the Project's impacts today and in the future will contribute significantly to the creation of severe congestion and gridlock throughout the downtown area, the freeway system, and the Project area. The failure to identify and mitigate these foreseeable cumulative impacts violates CEQA.

9 [TR-2h] cont.

3. The Project Will Overwhelm Transit Capacity With No Effective Mitigation.

There is no accurate analysis of transit impacts in the SDEIR. The SDEIR says that "the project sponsor is working with the City to secure funding for the Muni Special Event Transit Service Plan as part of the project improvements." (SDEIR 5-2.191.) That vague promise is not a legally adequate project description or baseline assumption. The SDEIR then engages in an argument to secure that funding, which requires public subsidy in an unstated amount, with a series of claims showing how much *worse* vehicle traffic will be if that funding isn't provided. However, that strong-arm tactic is irrelevant to CEQA's required analysis and mitigation of the Project's transit impacts. (DSEIR 5-2-192 - 194)

10 [TR-5a]

The DSEIR fails to properly identify and propose mitigation for the Project's specific impacts on Muni, concluding that "the project would result in no new or substantially more severe significant effects than those identified in the Mission Bay FSEIR related to transit impacts." (DSEIR 5.2-224.) That conclusion improperly relies on an EIR that is both outdated and irrelevant to the Project, which was not included in that EIR.

Transit will also be delayed by queuing and gridlock caused by the project, since buses and vehicles will have to share the congested streets resulting from the Project.

The DSEIR admits that the Project will cause significant impacts due to exceeding capacity on other transit services, including BART, proposing no mitigation. (DSEIR 5.2-226.)

11 [TR-12b]

The SDEIR also admits that the Project would result in significant cumulative transit impacts on BART, Caltrain, Golden Gate Transit, and WETA, particularly with overlapping events, again proposing no mitigation. (DSEIR 5.2-226.)

4. Direct, Indirect, Secondary, and Cumulative Parking Impacts Are Not Analyzed or Mitigated

The DSEIR claims that it need not analyze or mitigate the Project's direct, indirect, secondary, and cumulative impacts from creating a shortfall of thousands of parking spaces throughout the area, falsely claiming that the Project is either a "residential, mixed-use residential, or employment center project on an infill site within a transit priority area." (DSEIR 5.2-233, citing PRC §21099(d).) The Project fits none of those categories, and the DSEIR must therefore analyze and propose effective mitigation for the Project's significant parking impacts.

12 [TR-13]

The parking analysis understates the drastic parking shortfall created by the Project and misleadingly overstates the number of available parking spaces outside the Project area on which it irresponsibly relies.

Warriors games will always draw peak attendance of 18,000 (DSEIR, pp.1-5 [stadium capacity of 18,064 seats]; 1-8.) with most attendees driving and parking at the arena. The Project admits that it will supply only 1,082 parking spaces, including 950 in the "on-site parking garage" and 132 "within the 450 South Street Parking Garage for which the project sponsor has acquired parking rights to serve the project." (DSEIR 5.2-235.)

Admitting that the Project's proposed on-site parking is grossly inadequate and that there are few metered parking spaces in the Project area, the DSEIR claims to include parking lots within a mile of the Project, and still comes up drastically short of the parking capacity needed for the "events" in the stadium.

The parking availability baseline is outdated and inaccurate, particularly since it incorrectly lists in its offsite parking inventory the "SF Giants Facilities," which are slated for removal and development under the "Mission Rock Project." Therefore, where the DSEIR claims there are "2,530" available parking spaces at "SF Giants facilities," no such spaces will be available under the planned development, and those spaces are not available when Project "events" overlap with "events" at the AT&T stadium. (DSEIR 5.2-236-238.) The baseline (existing conditions) thus grossly overestimates the existing parking supply, disregarding the reality of ongoing development throughout the downtown and Project area.

The baseline also grossly underestimates existing parking demand for its proposed "events," claiming without support that, with 18,000 event attendees, the parking space "demand" would be only 5,937 spaces for midday events, and 9,614 spaces for evening events. (DSEIR 5.2-242.) The DSEIR does not state how those baseline "demand" figures were derived. The failure to set forth either an accurate baseline supported by evidence and an accurate description of the Project demand not surprisingly results in the DSEIR's implausible and irresponsible conclusions that it need not realistically assess and effectively mitigate the Project's significant parking and traffic impacts due to a lack of parking.

Instead, we are told that by creating a parking shortfall, attendees "may instead use transit to arrive at the site because the perceived convenience of driving is lessened by a shortage of parking" (DSEIR 5.2-241) is completely unsupported, and evades the Project's impacts on other travelers who are not attending a Project "event" who must also contend with the secondary impacts of snarled traffic, congestion, delays, and lack of parking throughout the area. That conclusion is even more dubious in view of the DSEIR's admission that existing transit cannot accommodate Project demand. (DSEIR 5.2-140-147.)

The DSEIR concludes that, "By promoting carpooling, providing parking attendant services, providing clear direction to alternative parking locations in advance of events, and adjusting event parking rates (raising them), the parking supply would likely be more efficiently utilized during the event days and the potential parking deficit would be eliminated." (DSEIR 5.2-241.) That absurd conclusion is again completely unsupported.

The same error that flaws all of the cumulative impacts analyses in the DSEIR also applies to the cumulative parking impacts analysis, which again mistakenly begins with a baseline of "existing" conditions in 2040, instead of present existing conditions. (DSEIR 5.2-248.)

12 [TR-13] cont.

5. There Is No Accurate or Legally Adequate Analysis and Mitigation of the Project's Air Quality Impacts or GHG Impacts.

The DSEIR fails to quantify or coherently analyze air quality impacts, complaining, for example, that "it is difficult to predict the magnitude of health effects from the project's exceedance of significance criteria for regional ROG and NOx emissions. (DSEIR 5.4-40.) The DSEIR also admits that its proposed "mitigation" of reducing vehicle trips by not providing adequate parking or transportation capacity "would be difficult to quantify." The

13 [AQ-4c]

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DSEIR may not hide behind its failure to gather the necessary data to analyze these and other air quality impacts, because that failure also violates CEQA's requirement to inform the public and decisionmakers of the Project's impacts and to mitigate them.

13 [AQ-4c] cont.

6. The DSEIR Fails To Propose Effective And Feasible Mitigation Measures For The Project's Impacts.

Under CEQA, "An EIR is an informational document which will inform public agency decisionmakers and the public generally of the significant environmental effect of a project, identify possible ways to minimize the significant effects, and describe reasonable alternatives to the project." (14 Cal. Code Regs. ["Guidelines"] §15121(a); PRC §21002.1(a), (b).) CEQA requires specific content in the EIR, including either a separate chapter on mitigation measures proposed to minimize the significant effects or a table showing where that subject is discussed. (Guidelines §15126.) The DSEIR contains *no* chapter on mitigation and no table showing where mitigation, including feasibility analyses, are discussed. (*Id.*)

Proposed mitigation measures include "[a]voiding the impact altogether by not taking a certain action or parts of an action." (Guidelines, §15370(a).) The EIR should propose effective, enforceable mitigation measures for each impact it identifies. The effectiveness of proposed mitigation measures should be supported by substantial evidence.

Claiming a significant impact is "unavoidable" does not excuse the failure to propose effective mitigation, but that is what this DSEIR assumes it may do, including significant transportation and circulation impacts, noise impacts, air quality impacts, wind impacts, and utilities impacts. (DSEIR 6-1 - 6-4.) That does not comply with CEQA.

14 [IO-2]

7. The DSEIR Fails To Adequately Evaluate Alternatives To The Project, Including Offsite Alternatives.

The DSEIR fails to evaluate a "range of reasonable alternatives to the project, or the location of the project, which…would avoid or substantially lessen any of the significant effects." (Guidelines, §15126.6(a).) The DSEIR proposes instead analyzes only three alleged "alternatives": "Alternative A: No Project Alternative," "Alternative B: Reduced Intensity Alternative," and "Alternative C: Off-Site Alternative at Piers 30-32 and Seawall Lot 330."

The "No-Project Alternative" may not be counted as an "alternative," because it will be rejected as not satisfying the "Project-Sponsor's Objectives." The other two alternatives do not substantially lessen any of the significant impacts, and could even make them worse. (SDEIR 7-48, 7-73 - 109. Indeed, "Alternative C" met with such intense public outcry that it resulted in the land deal that moved the proposed Project to the present location. The only proposed alternative that should be considered is the No Project alternative, which is also the environmentally superior alternative.

15 [ALT-1]

8. There Is No Accurate Analysis or Mitigation of Impacts on Emergency and Public Services on the Directly Adjacent Major Medical Complex.

The DSEIR's conclusions that the Project will not cause significant impacts for emergency vehicles is false, dangerous, and irresponsible. The false implication that the entire area would not be gridlocked is silly, since the backup from gridlocked intersections would prevent any vehicles from moving anywhere during "events."

16 [TR-9]

9. There Is No Proposed Mitigation Of The Project's Impacts On Wastewater. 17 [HYD-4]

10. The SDEIR Fails to Address The Project's Direct and Cumulative Land Use 18 [LU-1]

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Impacts.

The DSEIR incorrectly claims that an "Initial Study" can substitute for the analysis and mitigation of the Project's land use impacts, claiming the Project "would not physically divide an established community; conflict with land use plans, policies, or regulation adopted for the purpose of avoiding or mitigating an environmental effect; or have impacts on the existing character of the vicinity." (DSEIR 6-4.) In fact, the Project it plainly incompatible with existing uses in the immediate vicinity, including a major medical center, research and hospital facility, and residential uses. The Project's significant impacts clash with and affect all of those other land uses. Indeed a "subsequent" environmental impact report is inappropriate for this Project, since it drastically departs from existing land uses. 19 [LU-1]

11. The SDEIR Lacks Objectivity.

The DSEIR fails to fulfill CEQA's requirement of objectivity, instead advocating for the Project sponsor. The lack of objective analysis flaws the DSEIR as an informational document and violates CEQA. (See *e.g., Citizens for Ceres v. Superior Court* (2013) 217 Cal.App.4th 889, 918-919.) 20 ERP-6

For the foregoing and other reasons, the DSEIR is legally inadequate in violation of CEQA. 21 [ERP-6]

O-PBNA

POTRERO BOOSTERS
NEIGHBORHOOD ASSOCIATION
SERVING THE HILL SINCE 1926

July 27, 2015

Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Potrero Boosters Comments to Warriors SEIR

Via Email

Dear Mr. Bollinger:

When the Golden State Warriors announced the acquisition of the rights to Mission Bay blocks 29-32, the Potrero Boosters Neighborhood Association was carefully optimistic that the City, with its stated desire to lure the Warriors to San Francisco, would provide additional transportation and transit infrastructure to our neighborhoods.[1] Indeed, we saw the Warriors as a tremendous opportunity, as the City has lagged in developing the infrastructure to accommodate the growth, both residential and commercial, experience by our neighborhoods over the last decade. 1 [TR-3a]

However, upon reading the Supplemental Environmental Impact Report (the "SEIR") for the Golden State Warriors Event Center and Mixed Use Development (the "Arena"), we have some significant concerns. We are distressed by the volume of identified impacts on traffic transit and parking identified as "significant and unavoidable." A failure to avoid significant impacts will directly reduce the day-to-day quality of life for the residents living and moving into the Potrero neighborhoods. 2 [TR-4]

As a result, we are compelled to comment on the SEIR. We do so not with an eye to preventing the Arena from being built. We do so based on our belief that the City is capable, with the right measures in place, of making this development an asset to not just the City as a whole, but to its direct neighbors as well. 3 [GEN-5]

This letter will consider two sets of impacts, those associated with (i) parking, transit, traffic and emergency vehicles, and (ii) air quality.

[1] The "Boosters" represent the Potrero neighborhoods of Potrero Hill, Showplace Square and Dogpatch, i.e., those neighborhoods directly adjacent to the Mission Bay site in question.

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Parking, Transit, Traffic and Emergency Vehicles

General Comments

For the Arena to coexist within its rapidly developing surrounding neighborhoods, the City must maintain dedicated funding of full time transit and transportation solutions and review the parking management programs throughout the adjacent areas. Proper attention must be paid to the travel needs of the populations that live and work (and who will soon live and work) in the area full time, and not be reserved for those few times a year when the confluence of San Francisco Giants and Arena events bring about the largest transportation challenges. New transit should be based on current data and SFMTA should be prepared to move away from more outdated transit planning. 4 [GEN-1a]

Impact TR-2b: Parking

Parts of northeast Potrero Hill and Dogpatch are currently part of Residential Parking Permit ("RPP") Zone X. RPP enforcement is from Monday to Friday, from 8:00 am to 6:00 pm reflecting the out-of-City commuter concerns RPP was designed to remedy. These hours do not correspond with the weekend and evening operations of the Arena. Due to proximity to the Arena and existing transit options, Zone X is well within the parking shed for the Arena.

Extension of RPP enforcement hours should be considered. Yet mere extension of enforcement may not be enough. RPP areas marked with four-, rather than two-, hour limits, which may serve local businesses well, would not generally provide protection from Arena parking. Areas in our neighborhoods not currently under RPP, but which are otherwise residential in character, cannot be allowed to suffer the pressures of Arena parking. And, of course, enforcement must have the resources behind it to provide appropriate ticketing and towing for violators. 5 [TR-13]

A plan needs to be developed to prevent our neighborhoods from becoming a free parking zone for Arena event attendees. Metering by itself will not provide an adequate solution given the day-to-day mixed uses of the areas in question. A meeting with community stakeholders would ensure the adequacy of a plan and help garner the support necessary to make it a reality.

We also believe that parking for the Arena should be bundled with the tickets sold. No person driving to an event at the Arena should have to guess about where they will be parking. Remote, satellite parking served by shuttles and taking advantage of mobile application technology should be required under the SEIR.

Impact TR-4: Transit

We would celebrate the introduction of ferry service to the Arena site, and would hope that an electrified Caltrain would provide additional service to and from the Peninsula. We consider both improvements to be part of the critical path to the Arena opening—that is, they must be operational prior to the Arena's first tip-off. That parochial interests on the Peninsula have tied-up Caltrain electrification is of great concern. Ridership is already at capacity levels throughout much 6 [TR-5d]

of the weekday schedule. Without additional trains on the schedule, we question the extent that Caltrain can be depended on in the Arena rideshare models. 6 [TR-5d] cont.

Transit improvements should be funded from dedicated sources, regardless of whether those funds come from the incremental property, sales or ticket taxes arising from the Arena. With a current estimate of $14 million being collected by the City annually, at least half that mount should be funding improvements to our transportation system intended to move people out of cars. Our neighborhood intersections are overburdened as they are, with many graded a "D" or an "F" under level of service standards. We do not have any excess capacity to accommodate more drivers.

Transit funding can go to infrastructure and operations that, when not deployed for the largest of events, can mitigate the day-to-day concerns of the neighborhood. We have identified the following necessary enhancements:

- Connecting the 11 North Point-Mission Bay line through to the commercial districts on 17th, 18th, and 20th streets in Potrero Hill, to the 22nd Street Caltrain Station, and terminating adjacent to the Pier 70 and NRG Power Plant development projects. This line can serve as an outlet for residents and business to move around, rather than through, the greatest Arena impacts. 7 [TR-12b]
- Increased running of the 10 Townsend to three times an hour during events.
- Making the E Embarcadero a seven-days-a-week line, turning south from its current 4th and King terminus to serve the Arena, with a terminus at the 25th Street Muni Yard.
- Moving the proposed Muni Turnaround from the congestion inducing 18th and 19th Streets to the 25th Street Muni Yard, where staging could be done more efficiently and more residents to the south of the Arena could be served on a daily basis.
- Keeping the 55 16th Street line as a dedicated connector from 16th Street BART to Mission Bay, and perhaps extending the line to incorporate transfers from the J Church.

This list of improvements is not intended to be exhaustive. But they represent the need for a global transit plan for the area—one with a growing population and growing businesses—and one that has additional transit *decreases* planned, exacerbating cuts made in 2008-2009.

Impact TR-5: Traffic

Traffic is perhaps the Boosters greatest concern; increased traffic drives every other discussion in this letter. The intersection of 7th and 16th Streets is already at an "F" grade for level of service, creating danger to bicycles and pedestrians at all hours of the day. New drivers, not familiar with the area, will only compound the difficulties of an intersection where four modes (Caltrain's tracks run adjacent to 7th Street) of traffic come together. Prior to the Arena's opening, this intersection should be reworked under the City's Vision Zero plan. 8 [TR-4]

Additional bicycle infrastructure may also be appropriate. Both 16th Streets and Mariposa Streets experience significant automobile traffic, and with dedicated bus lanes coming to 16th Street, neither are ideal for bicycles. A pedestrian and bicycle connector at 17th Street, including an 9 [TR-7] overpass over the Caltrain tracks, would extend the bicycle routes already on 17th Street through the Mission and the western part of Potrero Hill. Such improvements should be evaluated so that bicycling can be a safer, more prevalent means of reaching the Arena. 9 [TR-7] cont.

Impact TR-10: Emergency Vehicle Access

The SEIR should provide greater clarity as to how emergency vehicles, patients and hospital staff will access the UCSF medical facilities adjacent to the Arena. Mariposa Street between 101 and 280 has an increasingly residential character and a three-ton vehicle weight limit, and runs adjacent to a school and Jackson Park. It should not be depended upon as a route from the 101 Freeway to UCSF. Emergency traffic along this stretch would be dangerous and inconvenient to residents and patients alike. 10 [TR-9]

Early discussions on UCSF transportation showed Minnesota Street through the Dogpatch Historic District serving the hospital. The SEIR should make clear that this routing has been abandoned, and show an alternative route that allows ease of access to the hospital under the heaviest of traffic conditions.

Air Quality Impacts

Impact AQ-2 and Mitigation M-AQ-2b

The air quality mitigation disbursement plan described in AQ-2 and M-AQ-2b is not adequate to meet the needs of the Potrero neighborhoods and our neighbors to the south. Given our proximity to freeways, industrial activities (including a UPS distribution center and a Recology recycling facility), heavy trucking, and the historical uses of our neighborhoods (including a recently decommissioned power plant), we feel that this represents a significant environmental justice issue.

While the Bay Area Air Quality Management District ("BAAQMD") may be able to use mitigation funding anywhere in the counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara and portions of Solano, and the Arena is likely to draw automobile traffic from all of these areas, the bulk of the pollution by vehicles will be within two miles of the Arena. Mitigating pollution sources in Solano County will not go to reduce the impacts in our neighborhoods, which will experience additional car traffic at least 225 times per year. 11 [GEN-3]

As pointed out by the San Francisco Department of Environment, "The City's neighborhoods in the Southeast areas are heavily burdened by air pollution-not only from major industrial facilities, but also from the thousands of automobiles and heavy-duty diesel trucks that travel daily on nearby freeways and City streets."

The SEIR forecasts that 53% of Arena attendees on a weekday, and 59% on a weekend, will drive to the Arena. While those mobile sources of pollution will travel through other Bay Area counties, they will all arrive in our neighborhood, the analysis of the BAAQMD seems to equate moving efficiently at freeway speeds to idling on our neighborhood off-ramps and our poor level-of-service intersections.

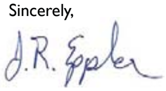
As Arena traffic is the source of the impact, money should mitigate pollution sources near the Arena. 11 [GEN-3] cont. If a stationary source of mitigation cannot be identified near the Arena, then mitigation could take the form of additional hybrid and electric buses for the SFMTA. 12 [AQ-7]

As a result, 80% of the funds called for in Mitigation M-AQ-2b should go to reducing the impacts in the area of the Arena itself. 13 [AQ-7]

Summary

The Potrero Boosters Neighborhood Association believes that, without mitigation, the Arena would significantly impact our neighborhoods for the worse. The SEIR, with its failure to identify reasonable mitigations to predicted impacts, causes us significant concern. That said, we are still optimistic that, with dedicated funding and enforceable agreements between the City and the Warriors, and with appropriate air quality management, there are opportunities to not only accommodate the Arena, but to address concerns with the context in which it is proposed to be built. 14 [ERP-9]

Sincerely,



J.R. Eppler
President

O-Sabelli

From: Martin Sabelli
To: Warriors, PLN (CPC)
Subject: Warrior Stadium
Date: Thursday, July 23, 2015 12:04:53 PM

Dear Mr. Bollinger,

I am a San Francisco resident and I am dismayed that the city would devote substantial resources, obstruct views, and congest an already highly over-used area for the sake of a sports franchise. I happen to be a major sports fan, but this type of municipal support (financial and political) is profoundly inconsistent with the needs of the vast majority of San Franciscans. 1 [GEN-5]

Thank you for your time and consideration.

Martín Antonio Sabelli
Law Offices of Martín A. Sabelli
1857 Market Street
San Francisco, CA 94103
(415) 817-9476 (Direct)
(415) 298-8435 (Mobile)
(415) 520-5810 (Facsimile)
msabelli@sabellilaw.com

O-SFBC

San Francisco Bicycle Coalition
833 Market Street, 10th Floor
San Francisco CA 94103

T 415.431.BIKE
F 415.431.2468

sfbike.org

PROMOTING THE BICYCLE FOR EVERYDAY TRANSPORTATION

Monday, July 27 2015

Tiffany Bohee
C/o Brett Bollinger
OCII Executive Director
San Francisco Planning Department
1650 Mission Street Suite 400
San Francisco, CA 94103

RE: Comments on the Draft Subsequent Environmental Impact Report for Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Dear Ms. Bohee,

Please accept the San Francisco Bicycle Coalition's comments on the Draft Subsequent Environmental Impact Report for Event Center and Mixed-Use Development at Mission Bay Blocks 29-32.

Background

Over the course of nearly a year, GSW Arena LLC, an affiliate of Golden State Warriors, LLC ("Warriors") and the San Francisco Bicycle Coalition ("SFBC") have had on-going discussions, outside of the formal EIR process, to address bicycle access and infrastructure at the proposed arena site. Discussions thus far between SFBC and the Warriors have led to strong plans and support of existing and future bicycle travel to and from the Project, as well as plans to address enhanced bicycle infrastructure in and around the Project site, including publicly accessible bicycle parking, bicycle valet and additional secure bicycle parking for special events, secure commercial bike parking for employees. These discussions have also led to the Warriors and SFBC's commitment to work with appropriate agencies to add public bike share to the project vicinity, intersection management during special events to maximize bicycle and pedestrian safety, ongoing bicycle encouragement for special events, and a commitment to expanding bicycle capacity if/when need increases over the life of the Project. 1 [GEN-5]

We would like to commend the Warriors for being receptive and responsive partners that have demonstrated a strong commitment to promoting bicycle trips to the Project site in this Draft Subsequent Environmental Impact Review document (DSEIR) and in their goals beyond this document. Both the Warriors and SFBC acknowledge that bicycle infrastructure and promotion on and near the Event Center site are critical and cost-effective investments for the immediate and long-term success of the project and help to reduce neighborhood congestion, improve local environmental quality, support positive health outcomes, and drive local economic development.

SFBC, working in close partnership with the Warriors, supports the following activities to create better biking at the Project Site. These recommendations, if not already included in the DSEIR, 2 [TR-7] should be addressed under Mitigation Measure M-TR-2b, Impact TR-7, or wherever appropriate in the DSEIR document:

New and Enhanced On-Street Bicycle Facilities
SFBC supports the Warriors' and this DSEIR's inclusion of new and/or enhanced on-street bicycle facilities, to be designed in coordination with SFBC, the San Francisco Municipal Transportation Agency (SFMTA), Port of San Francisco, Office of Community Investment and Infrastructure (OCII), and Mission Bay Development Group (MBDG). These priority streets for bicycle infrastructure include:

- **Terry Francois Boulevard,** two-way protected bikeway on the East side of the roadway from Lefty O'Doul Bridge to Mariposa Street;
- **16th Street between 3rd and Terry Francois Boulevard**: one-way buffered and/or parking-protected bike lanes on North and South side;
- **Enhanced intersection designs around the arena**, with special attention paid to bicycle and pedestrian safety at 16th and Illinois Streets and 16th Street and Terry Francois Boulevard and;
- **Managed intersections around the site during special events**, with special attention paid to 16th and Illinois Streets. 2 [TR-7] cont.

The Warriors should encourage Mission Bay Development Group and public agencies to construct or implement these improvements prior to the opening of the event center.

Bicycle Parking
Adequate bicycle parking is critical to support the mode share goals of the project. SFBC encourages the Warriors to provide ample bicycle parking at the Project for special events, as well as for everyday commercial and neighborhood use. SFBC appreciates the Warriors commitment in on-going discussions to expand bicycle capacity as needed over the life of the development to meet additional capacity requirements that may arise.

Valet Bicycle Parking
The Warriors and this DSEIR indicate a need for enclosed bicycle valet space with a minimum capacity of 300 bikes. SFBC supports and encourages the current allocation of roughly 2,000 square feet for the operation and management of on-site bicycle valet, which would allow proper space for expansion, as noted above. The valet space should be designed to maximize the amount of bike storage available and to be consistent with current and projected neighborhood transportation plans. The bicycle valet should be sited as close to a main entrance to the Event Center as reasonably possible and located along one of the new or enhanced on-street bicycle facilities described above. The bicycle valet space should be completed and fully operational in conjunction with the opening of the Project.

We are pleased that valet bicycle parking will be provided at special events at the Event Center, including concerts and performances throughout the year, and at other events with an expected attendance past a threshold size to be reasonably determined in consultation with the SFBC, and

O_SFBC

revisited annually, as needed. Bicycle valet services could also be scaled up or down based on expected attendance levels on a per-event basis.

SFBC could plan to promote the availability of bicycle valet parking in communications and in programs to drive use. This could include promotion on the SFBC website, newsletters and social media with a reach of over 30,000 San Franciscans, and through programs and events as outlined below.

Commercial Bicycle Parking
As indicated in the DSEIR, the Warriors should provide secure (Class 1) bicycle parking for commercial office tenants and short-term bike parking (Class 2) for retail tenants, customers and guests at or above the requirements of applicable law including the City of San Francisco Planning Code Section 155.2, which sets standards for the provision of bike parking in new commercial development.

Other Bicycle Parking and As-Needed Expansion
SFBC supports the Warriors' and this DSEIR's proposal for an approximately 100-bike "pop-up" corral in a publicly accessible and highly visible location at the Event Center for special events on an as-needed basis. The pop-up corral should be monitored by event security staff and should be set up no less than one hour before such events.

SFBC also supports the Warriors' intention to identify on-site locations for additional pop-up corrals and/or additional bike parking facilities if/when the need for expanded bicycle parking capacity should arise. This additional bike parking capacity should be provided as additional pop-up corrals, expanded valet, and/or other forms of secure, monitored bicycle parking. 2 [TR-7] cont.

SFBC is encouraged by the Warriors' plan to identify additional future bike parking capacity to achieve a total of up to 900 potential spaces available to the general public during full-capacity special events (the sum of on-site bicycle valet spaces, on-site Class 2 spaces, pop-up corral spaces, and other publicly accessible secure bike parking spaces in the project vicinity). The Warriors should assess the need for expanded event bicycle parking facilities up to this number on a yearly basis and in consultation with SFBC to meet projected growth in bicycle trips. These spaces would be in addition to the permanent bike rooms in each on-site office building, which together with expanded event bicycle parking as described above, may in the future exceed 1,000 total available bike spaces for varied users at the project site.

SFBC is committed to continue working with the Warriors to find secure, public, and appropriate locations and systems to accommodate future bicycle capacity at the Project site.

Bay Area Bike Share Stations
SFBC supports the Warriors and this DSEIR's inclusion of Bay Area Bike Share stations at and/or around the Project site.

Marketing and Bicycle Promotion
We are pleased that the Warriors and this DSEIR acknowledge that increasing the number of bicycle trips to and from the Project will support the Citywide goal of a 8% bicycle mode share by 2023. As such, trends in bicycle trip generation and mode split should be studied and

evaluated on at least a yearly basis, with bicycle parking expansion, marketing, and promotion adjusted, to support this goal.

The Warriors and this DSEIR discuss integrating bicycle transportation into marketing and promotional activities for the Event Center to support the above stated goals. SFBC is supportive and committed to work with the Warriors on an on-going basis to further develop, implement, and promote the programs outlined below.

The Warriors and this DSEIR note that marketing and promotion are possible mitigations under *Mitigation Measure M-TR-2b: Additional Strategies to Reduce Transportation Impacts* for enhancing non-auto modes. As consistent with on-going discussions with the Warriors, SFBC encourages the Warriors to also consider marketing the Event Center as a bicycle-friendly destination in other press and marketing materials that may include but are not limited to:

- Warriors players and employees on bicycles at Warriors events and at SFBC events
- Feature bicycle facilities and programs in sustainability or environmental promotional materials or media
- Encourage bicycle travel information in non-Warriors special event promotions and marketing, such as concerts and performances

2 [TR-7] cont.

Promotions to enhance the bicycle experience should also include a recurring, season-long program that encourages more people to arrive to basketball games by bicycle. Similar promotions could also be used to promote bicycle trips at other events at the Event Center throughout the year.

The Warriors should design a plan prior to the opening of the Project for promoting bicycling to the Event Center that may include but is not limited to:

- Regular "Bike to Game" nights that include group rides from various starting locations in San Francisco and the region, rides with GSW staff prior to the game, and/or special offers for people who bike to the game;
- Bike-related raffles or prizes for people who bike to games. Giveaways could include branded lights, stickers, discount tickets, etc.;
- Special services and programs for people who bike to games. These could include monthly free or discounted tune-ups and minor repairs, and other incentives for people who frequently ride their bikes to games, such as a Bike Fan of the Month/Year program, and;
- Special events leading up to and during NBA "Green Week", in coordination with the Green Sports Alliance.

SFBC could help organize, implement and promote bicycle-related events and promotions, ensuring strong attendance and participation. SFBC could promote the plan and the Warriors'

commitment through existing email and social media channels, through partners, and on our website.

The Warriors and SFBC, through both the EIR process and on-going discussions, are committed to continued refinement of the plans and roles described in this letter and in the DSEIR.

2 [TR-7] cont.

Thank you for considering these comments as part of a truly collaborative effort to make the proposed Mission Bay Arena and Event Center the most bicycle-friendly sports venue in the country and an addition to the neighborhood that supports current city and neighborhood transportation goals.

Sincerely,

Paolo Cosulich-Schwartz
Business and Community Program Manager
San Francisco Bicycle Coalition

July 27, 2015

Ms. Tiffany Bohee
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Warriors Arena Draft Environmental Impact Report (DEIR)

Dear Ms. Bohee:

The San Francisco Bay Trail is a 500-mile shoreline walking and bicycling path that will one day encircle the Bay. With over 340 miles complete, it follows the shoreline in nine counties, passes through 47 cities and crosses four-and-a half toll bridges. The Trail provides scenic recreation for hikers, joggers, bicyclists, skaters and wheelchair riders. It offers a setting for wildlife viewing and environmental education, and serves as an important commute alternative for bicyclists.

Several inaccuracies regarding the Bay Trail alignment and bicycle infrastructure were found in the DEIR, and it is our hope they can be corrected in the final.

Page 5.2-3, under "Local Access" states "As part of the Mission Bay Plan, Terry A. Francois Boulevard will be realigned to the west to be adjacent to the east side of Blocks 30 and 32, and a buffered two-way cycle track (Class II)3 will be provided as part of the San Francisco Bay Trail on the east side of the street." The term "Class II" is a Caltrans standard that refers to a striped bicycle lane as opposed to the buffered two-way cycletrack referenced here. Cycletracks do not currently have a Caltrans classification, though it is our understanding that one may be forthcoming. The footnote at the bottom of this page also erroneously defines both a bike lane and a cycletrack as a Class II bikeway. 1 [TR-1]

Page 5.4-4 states that Fourth Street between King and Mission is part of the Bay Trail alignment. It is not. The Bay Trail alignment in this area is on Terry Francois, Lefty O'Doul Bridge, waterside of AT&T Park, and north along the Embarcadero. See attached map. 2 [TR-1]

Page 5.2-28 states "At various locations, the Bay Trail consists of paved multi-use paths, dirt trails, bike lanes, sidewalks or city streets signed as bicycle routes." The vision and goal of the Bay Trail is a Class I, multi-use pathway for cyclists and pedestrians, separated from traffic, as close to the shoreline as possible. While in certain locations, on a case-by-case-basis, the Bay Trail can consist of Class II bike lanes and sidewalks where there is *no possibility* for a multi-use path, city streets signed as bike routes are never proposed or accepted as complete segments of Bay Trail. 3 [TR-1]

On page 5.2-43, the DEIR states that the Bay Trail is a 400-mile pathway, and that 338 miles are complete. Please note the Bay Trail's total length is 500 miles, and we are happy to report that 341 miles are complete. 4 [TR-1]

Signage and Wayfinding

The San Francisco Bay Trail should be included in wayfinding signage on and around the project site. We would be happy to provide either the physical signs or our logo in electronic format for incorporation into the Warriors Arena signage and wayfinding plans. 5 [TR-3a]

While the Bay Trail Project was a commenter on the Notice of Preparation for this project, we were not notified regarding the availability of the Draft EIR. Please add us to your list of interested parties so that we will be notified when the Final EIR is available for review. 6 [ERP-2]

If you have any questions regarding these comments or about the Bay Trail, please contact me at (510) 464-7909 or by e-mail at maureeng@abag.ca.gov.

Sincerely,

Maureen Gaffney
Bay Trail Planner

O-SFBT

O-Sierra

From: Sue Vaughan
To: Warriors, PLN (CPC); Bollinger, Brett (CPC)
Cc: Becky Evans; Arthur Feinstein; Karen Babbitt; John Rizzo
Subject: SF Group Sierra Club Comments on the Proposed Warriors project
Date: Monday, July 27, 2015 10:31:14 AM
Attachments: Warriors SC Comments to SEIR 07-27-2015.pdf

Dear Mr. Bollinger:

Please see the attached letter with comments from the Sierra Club on the proposed Golden State Warriors project in Mission Bay.

--
Susan Elizabeth Vaughan
(415) 668-3119
(415) 601-9297

SIERRA CLUB
FOUNDED 1892

San Francisco Group of the San Francisco Bay Chapter

July 27, 2015

Reply to:
Sierra Club, San Francisco Group
85 Second Street, 2nd floor
Box SFG
San Francisco, CA 94105

Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco CA 94103-2414

Dear Mr. Bollinger:

Please accept the following comments on the Draft Supplemental EIR for the Event Center and Mixed-Use development at Mission Bay, Blocks 29-32.

The Sierra Club does not agree that this project fits the definition of an AB 900 Leadership project. The state legislature passed, and the governor signed, AB 900 as an economic boost during the Great Recession. It was designed to fast track infill projects through any CEQA litigation proceedings if those projects created good permanent jobs while at the same time minimizing environmental impacts, including GHG emissions, as determined by the CARB. We are well past the Great Recession, and California's economy is booming. In this midst of this boom, the project sponsors have proposed constructing a venue to nearly match the current Oracle Arena in capacity. 1 [AB-1]

However, the project sponsors are proposing a project in Mission Bay without proposing adequate transportation infrastructure to match the capacity of BART in Oakland, especially when events are happening simultaneously at AT&T Park and in Mission. (*Volume 1, TR-2 through TR-6*). 2 [TR-5b]

The Sierra Club also believes there are other inadequacies in the SEIR. For example, the Warriors currently have about 150 full-time employees (Volume 3, Page 16). Have the project sponsors done an analysis of where these employees live, and to what extent GHG emissions will increase or decrease as a result of their commutes to the new location? 3 [GHG-2] Have the sponsors estimated how many FTEs will take advantage of the proposed transportation subsidies described in FSEIR Mitigation Measure E47.c: *Employee Transit Subsidies - Provide a system of* 4 [TR-12c]

4 [TR-12c] (cont.)

employee transportation subsidies for major employers? And will part-time employees who are not actually employees of the Warriors or other event sponsors (but who may work for food and souvenir concessions that have contracts with event sponsors) be eligible for these subsidies? 5 [TR-12c]

The SEIR notes that the roughly 1,000 day-of-game/event staff at the Mission Bay site will be assumed to be new hires (*Volume 3, Page 42*). The SEIR is inadequate because of this assumption. Project sponsors have not actually determined the number of events that will still be held at the Oracle Arena or surveyed current part-time employees to determine where they live and how many might transfer to the Mission Bay site in lieu of losing hours, if not their jobs, at the Oracle Arena. If roughly 1,000 part-time day-of-game employees will commute to events at the Mission Bay site from the East Bay, or anywhere else in the Bay Area, what are the GHG impacts? 6 [GHG-2]

The Sierra Club notes that project sponsors intend to rely on the availability of livery and TNC vehicles after events to transport people (*Volume 1 – TR-2)*. No analysis, to the knowledge of the Sierra Club, has ever yet been done on the environmental impact of TNCs in San Francisco. No one knows how many additional vehicle miles are being traveled in the City due to the availability of TNCs. No study, to the knowledge of the Sierra Club, has been done on the impact of TNCs on congestion or air quality, including GHG emissions. And yet the project sponsors propose to rely on TNCs for an unspecified portion of transportation needs of people going to and getting from events. Project sponsors should include an analysis of the GHG and other air pollution impacts of the TNCs they intend to rely on for transporting people to and from events. 7 [TR-2e]

The SEIR notes that there are many GHG regulations – both state and local – with which the project must comply. It credits these laws with reducing emissions of greenhouse gases in San Francisco. However, the Sierra Club notes that a large part of the reason the City's GHG emissions levels have dropped is because of the closure of the PG&E power plant in the Bayview a few years ago. (*Volume 2, 5-5-11*) 8 [GHG-1]

The Sierra Club does not agree that the purchase of carbon credits is an adequate method for reducing greenhouse gases, in this case, or that the purchase of carbon credits, in this case, render the project "GHG neutral." (*Volume 2, 5-5-11: As part of the AB 900 application, the project sponsor has committed to purchase carbon credits from a qualified GHG emissions broker in an amount sufficient to offset all GHG emissions from project construction and operations, as reiterated in Improvement Measure I-C-GG-1, Purchase Voluntary Carbon Credits.*) The Sierra Club believes mitigations should be implemented at the point of impact. 9 [AB-1]

The Sierra Club is also concerned that there is no requirement to purchase carbon credits until the site is 90 percent leased and occupied, and, for the arena, until 90 percent of the available booking dates are utilized. (*Volume 2, 5-5-12*). If more than 10 percent of the facility remains vacant and/or more than 10 percent of the available booking dates are never filled, the project sponsors will never have to purchase carbon credits – let alone mitigate for the impacts of all the additional car traffic and transit use on the ground. The Sierra Club believes that the project sponsors should mitigate for all GHG emissions. 10 [AB-1, GHG-2]

Additionally, the Sierra Club thinks that the requirement to mitigate for greenhouse gas emissions should not end after 30 years, as the project sponsors propose, but should continue as long as the facility is in use. 11 [AB-1, GHG-2]

The SC also notes many inadequacies in the 1999 and 2006 testing for hazard substances in the soil at the site, including the fact that the methodology used in 1999 and 2006 is outdated. 12 [HAZ-1]

The Sierra Club believes that the project sponsors should design a project that remains at the current site in Oakland but proposes conversion of the parking lot for the Oracle Arena into workforce housing – and then compare GHG emissions to current operations. 13 [ALT-4]

Sincerely,
Susan Elizabeth Vaughan
Chair
San Francisco Group, Sierra Club

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TABLE COM-4
INDIVIDUALS COMMENTING ON THE DRAFT EIR

Commenter Code	Name of Individual Submitting Comments	Comment Format	Comment Date
I-Alberts	Alberts, Bruce	Letter	09/22/2015 *
I-Anagnostou	Anagnostou, Sula	Email	07/13/2015
I-Anavy	Anavy, Ralph	Email	07/27/2015
I-Anon	Anon, Josh	Email	07/13/2015
I-Arack	Arack, Patricia	Email	07/24/2015
I-Bartlett	Bartlett, Maylou	Email	07/17/2015
I-Barton	Barton, Jason	Email	07/27/2015
I-Beals	Beals, Sharon	Email	07/27/2015
I-Bilodeau	Bilodeau, Lynda	Email	07/26/2015
I-Bookstein	Bookstein, Norman	Email	07/13/2015
I-Bullard	Bullard, Cathy	Email	07/24/2015
I-Bunn	Bunn, Jessie	Email	07/06/2015
I-Burkhart	Burkhart, Karen	Email	07/16/2015
I-Cale	Cale, John	Email	07/27/2015
I-Carpinelli	Carpinelli, Janet	Email	08/04/2015 *
I-Cehand	Cehand, Jadine	Email	06/30/2015
I-Collins	Collins, Erin	Email	07/17/2015
I-Corey	Corey, Marcus	Email	07/23/2015
I-Cornwell1	Cornwell, John	Email	07/28/2015 *
I-Crosson	Crosson, Michael	Email	07/23/2015
I-Cunningham	Cunningham, Micki	Email	07/23/2015
I-Dalere	Dalere, Marian	Email	07/27/2015
I-deCastro1	deCastro, John	Email	07/27/2015
I-D’Harlingue	D’Harlingue, Arthur	Email	06/22/2015
I-Dhillon	Dhillon, Ragina	Email	06/24/2015
I-Dickey	Dickey, Helen	Email	07/13/2015
I-Dieste	Dieste, Desiree	Email	07/27/2015
I-Dorrance	Dorrance, Jean	Email	07/13/2015
I-Ellingham	Ellingham, Lewis	Email	07/13/2015
I-Faye	Faye, Janessa	Email	07/13/2015
I-Finkle	Finkle, Dan	Email	07/23/2015
I-Fischer	Fischer, Alaina	Email	06/10/2015
I-Freedman	Freedman, Peter	Email	07/26/2015
I-Grabe	Grabe, Michael	Email	07/27/2015
I-Grant	Grant, Max	Email	07/13/2015

**TABLE COM-4 (Continued)
INDIVIDUALS COMMENTING ON THE DRAFT SEIR**

Commenter Code	Name of Individual Submitting Comments	Comment Format	Comment Date
I-Hansen	Hansen, Cassidy	Email	07/27/2015
I-Harvey	Harvey, Constance	Email	07/23/2015
I-Heath	Heath, Alison	Email	06/30/2015
I-Herda	Herda, Jay	Email	06/22/2015
I-Hestor	Hester, Sue	Email	06/22/2015
I-Hill_D	Hill, Dorothy	Email	07/27/2015
I-Hill_M	Hill, Mary	Email	07/01/2015
I-Hong	Hong, Dennis	Email	07/27/2015
I-Horn1	Horn, Stan	Email	07/10/2015
I-Horn2	Horn, Stan	Email	07/10/2015
I-Horn3	Horn, Stan	Email	07/10/2015
I-Hrones1	Hrones, Christopher	Email w/letter attachment	06/30/2015
I-Hurlstone	Hurlstone, Brynn	Email	07/23/2015
I-Hutson	Hutson, Richard	Email	06/29/2015
I-Hyde	Hyde, Kathryn	Email	07/15/2015
I-Jadeinsf	"Jadeinsf"	Email	07/23/2015
I-Jensen	Jensen, Lauris	Email	07/14/2015
I-Jones	Jones, Jackie	Email	07/01/2015
I-Kajiko	Kajiko, Jennie	Email	07/25/2015
I-Kornberg	Kornberg, Thomas	Letter	07/17/2015
I-Lange	Lange, Donna	Email	07/23/2015
I-Lanting	Lanting, Michelle	Email	07/20/2015
I-Laverdiere	Laverdiere, Amy	Email	07/27/2015
I-Leavitt	Leavitt, Rachel	Email	06/29/2015
I-Lee	Lee, Jeremiah	Email	07/20/2015
I-Lighty	Lighty, Michael	Email	07/27/2015
I-Lowe	Lowe, Denise	Email	07/26/2015
I-Ly	Ly, Tina	Email	07/02/2015
I-MacKenzie1	MacKenzie, Dennis	Email w/Letter Attachment	07/24/2015
I-Mason	Mason, Amber	Email	06/27/2015
I-McDougal	McDougal, Bruce	Email	07/27/2015
I-Mills	Mills, Russell	Email	07/13/2015
I-Mussetter	Mussetter, Jani	Email	07/27/2015
I-Osborn	Osborn, Kim	Email	07/27/2015
I-Pelly	Pelly, Steven	Email	07/23/2015

TABLE COM-4 (Continued)
INDIVIDUALS COMMENTING ON THE DRAFT SEIR

Commenter Code	Name of Individual Submitting Comments	Comment Format	Comment Date
I-Pezzuto	Pezzuto, Mary	Email	07/13/2015
I-Pierce	Pierce, Elaine	Email	07/23/2015
I-Pollak	Pollak, Robert	Email	07/23/2015
I-Ramsdell	Ramsdell, Kay	Email	06/24/2015
I-Rosa	Rosa, Jana	Email	07/24/2015
I-Rowitch	Rowitch, David	Email	07/23/2015
I-Rynne	Rynne, Gavin	Email	07/27/2015
I-Schreiner	Schreiner, Christoph	Email	07/27/2015
I-Shull	Shull, Mark	Email	07/14/2015
I-Siegel1	Siegel, David	Email	07/14/2015
I-Simpson1	Simpson, Todd	Email	06/18/2015
I-Simpson2	Simpson, Todd	Comment Card	06/30/2015
I-Smith	Smith , Christine	Email	06/19/2015
I-Springer	Springer, Matt	Email	07/16/2015
I-Steiner	Steiner, Amy	Email	07/23/2015
I-Sterling	Sterling, Kaylah	Email	07/13/2015
I-Stryker	Stryker, Michael	Email w/Letter Attachment	07/26/2015
I-Sullivan	Sullivan, Jill	Email	07/09/2015
I-Tan	Tan, Judy	Email	07/27/2015
I-Trossbach	Trossbach, Joanne	Email	07/24/2015
I-Tsai	Tsai, Richard	Email	07/23/2015
I-Tuialu’ulu’u	Tuialu’ulu’u, R.	Email	07/14/2015
I-Vyas	Vyas, Girish	Email	07/15/2015
I-Waldron	Waldron, Elizabeth	Email	07/13/2015
I-Watson	Watson, Joanne	Email	06/15/2015
I-Wheeler1	Wheeler, Priscilla	Email	07/24/2015
I-Wheeler2	Wheeler, Priscilla	Email	07/24/2015
I-Wife	Wife, Johns	Email	07/14/2015
I-Williams	Williams, JoAnne	Email	07/23/2015
I-Woods	Woods, Corinne	Letter	07/27/2015
I-Woody	Woody, James	Email	07/14/2015
I-Yost	Yost, Dave	Email	07/13/2015
I-Zboralske	Zboralske, James	Email w/Letter Attachment	07/27/2015

* NOTE: Comment letters with a date annotated with an asterisk were received after the close of the Draft SEIR public review period.

SOURCE: ESA, 2015

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UCSF
University of California
San Francisco

September 22, 2015

The Honorable Edwin M. Lee
City Hall, Room 200
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102

Re: Golden State Warriors Arena and Events Center in Mission Bay

Dear Mayor Lee,

We write as faculty members at UCSF who are also members of the US National Academy of Sciences. Many of us either are, or have previously been, leaders on this Campus. We have seen this University rise to true excellence over the course of the past 40 years, and we look forward to an even greater future for UCSF and the exciting private biotech and medical organizations that it has attracted to Mission Bay. But we are seriously concerned that this future is threatened by the plan to construct a very large sports, entertainment, and event arena in our midst.

As you know, the plan for Mission Bay approved by the Board of Supervisors (October 1998) states, as one of the major objectives of this visionary project:

> Facilitating emerging commercial and industrial sectors including those expected to emerge or expand due to the proximity to the new UCSF site, such as research and development, bio-technical research, telecommunications, business service, multi-media services, and related light industrial…

And indeed, Mission Bay has rapidly become one of the most prominent academic-industry biotechnology/medical complexes in the world. But we cannot stop here: we face increasing competition from other rapidly growing complexes of this type, both in the US and abroad. It will be critical to keep moving aggressively forward, if we are to continue to attract the very best talent – both academic and private sector – to San Francisco. 1 [LU-1]

It is absolutely clear to us that the planned new Golden State Warriors Arena and Events Center in Mission Bay would severely degrade the environment for the many thousands of researchers and private sector biomedical scientists who come to work at Mission Bay each day. It would also curtail the beehive-like, daily exchanges of personnel – from the South Bay and elsewhere – on which the success of the Mission Bay biomedical complex depends. Our major fear is that the Mission Bay site will lose its appeal – not only for the new biomedical enterprises that the city would like to attract here, but also for most of its current occupants. The result could critically harm not only UCSF, but also the enormously promising, larger set of biomedical enterprises that currently promises to make San Francisco the envy of the world.

Much attention has been properly focused on how traffic gridlock caused by the new stadium would affect access to the three new UCSF hospitals that are immediately adjacent to the site, one of which houses one of only two Children's Emergency 2 [TR-4]

rooms in San Francisco. It is unavoidable that terrible, and possibly even life-threatening, traffic congestion will be associated with the planned complex, given that it is intended to be the site of some 220 events per year, held both in the evening and during the day (*New York Times*, September 6, 2015; business section, pages 1, 4 and 5). Many of us have experienced the hours-long gridlock that paralyzes all Mission Bay streets before and after San Francisco Giants home games. The absolute paralysis that it creates is already a non-trivial problem, which the planned stadium promises to both greatly expand and intensify.

The presence of the 41,000-seat AT&T Park less than a mile (a 15-minute walk) from UCSF Mission Bay has not been sufficiently factored into the plans to build the Warriors' huge new sports/entertainment complex. The ballpark already significantly impacts life and work at Mission Bay, with nearly 50 San Francisco Giants home weekday games per season. Due to these events, it can take cars and UCSF shuttle buses over an hour to exit from the UCSF parking lot onto the streets, and a 20-minute trip may require two hours.

The widespread traffic impact of AT&T Park games is noted on the website for the San Francisco Municipal Transportation Agency (SFMTA):

> "Motorists are advised to avoid the increased congestion in downtown San Francisco related to these special events and advises commuters to use transit, taxis, bicycles or walk and to avoid using the Bay Bridge in the two hours before or after these games. ... As a reminder to fans, in order to reduce congestion on city streets after all events at AT&T Park, the SFMTA will close eastbound King Street between 3rd and 2nd streets from the seventh inning until after the post-game traffic has died down. Additionally, the northbound portion of the 4th Street (Peter R. Maloney) Bridge will be closed to all traffic except streetcars, buses, taxis and bicycles during the post-game period. (https://www.sfmta.com/news/press-releases/sfmta-weekend-transit-and-traffic-advisory) 2 [TR-4] (cont.)

Adding an 18,500-seat Warriors complex on top of what is already a transportation mess is asking for disaster. We are highly skeptical of any plan that proposes to segment traffic by restricting 4th street and other routes for "UCSF business only," since those of us at Mission Bay have experienced the unruly behavior of frustrated drivers stuck for long times in traffic jams. In fact, there is no believable transportation solution for two very large complexes placed in such close proximity at Mission Bay.

Imagine dropping a 41,000-seat stadium anywhere within a 1-mile radius of San Francisco City Hall, and then tripling the capacity of Bill Graham Civic Auditorium. It would make no sense, for the same reason that it makes no sense to squeeze the planned Warriors facility into the Mission Bay neighborhood. The resulting perfect storm of traffic would make it miserable for both the existing neighborhood and for sports fans – in addition to threatening the entire future of UCSF as the center of a world-class academic/ biotech/medical complex.

In summary, we urge you and the city to reconsider the wisdom of proceeding with 3 [GEN-5]

I-Alberts

current construction plans. 3 [GEN-5] (cont.)

Sincerely yours,

Bruce Alberts, Chancellor's Leadership Chair in Biochemistry and Biophysics for Science and Education
Elizabeth Blackburn, Professor of Biochemistry and Biophysics, and Nobel laureate
James Cleaver, Professor of Dermatology and Pharmaceutical Chemistry
John A. Clements, Professor of Pediatrics and Julius H. Comroe Professor of Pulmonary Biology, Emeritus
Robert Fletterick, Professor of Biochemistry, Pharmaceutical Chemistry, and Cellular and Molecular Pharmacology
Carol Gross, Professor of Microbiology
Christine Guthrie, Professor of Biochemistry and Biophysics
Lily Jan, Professor of Physiology, Biochemistry and Biophysics
Yuh-Nung Jan, Professor of Physiology
Alexander Johnson, Professor of Microbiology and Immunology, and Biochemistry and Biophysics
Cynthia Kenyon, Emeritus Professor, UCSF, and Vice President, Aging Research, Calico Life Sciences
Gail Martin, Professor Emerita, Department of Anatomy
Frank McCormick, Professor Emeritus, UCSF Helen Diller Family Comprehensive Cancer Center**,** David A. Wood Distinguished Professorship of Tumor Biology and Cancer Research
Ira Mellman, Professor (Adjunct) of Biochemistry and Biophysics
William J. Rutter, Chairman Emeritus, Department of Biochemistry, and Chairman, Synergenics LLC
John Sedat, Professor Emeritus, Department of Biochemistry & Biophysics
Michael Stryker, William Francis Ganong Professor of Physiology
Peter Walter, Professor of Biochemistry and Biophysics
Arthur Weiss, Professor of Medicine, and of Microbiology and Immunology
Zena Werb, Professor of Anatomy

Cc: Tiffany Bohee

I-Anagnostou

From: sulaa@comcast.net
To: Warriors, PLN (CPC)
Subject: warriors new stadium in San Francisco
Date: Monday, July 13, 2015 12:21:28 PM

Dear Brett,
I am very concerned about the new warrior stadium in San Francisco...The health and well being of patients and people are at risk here...
Please help with the new stadium NOT coming to San Francisco!!! 1 [GEN-5]

Thank you,
Sula Anagnostou

From:	rrraphy@aol.com
To:	Warriors, PLN (CPC)
Subject:	Comments and objections to the Warrior"s plans and EIR
Date:	Monday, July 27, 2015 3:53:48 PM

Dated July 27, 2015

From: Ralph A. Anavy
420 Mission Bay Blvd N #1503
San Francisco CA 94158
Phone 415 647-8093, cell 415 813-7457

Subject: Comments and objections to the Warriors' plans and EIR.

Mission Bay is a planned community with specific businesses allowed in the Master plan.
Mission Bay is subject to strict usage and zoning rules, in particular for type of business, building heights, density, open space. It is a planned community and all buildings must fit within the guidelines of the Master plan.
While the Mission Bay master plan should be respected in its entirety, one can visualize needs for minor modifications. Any requested for variances to the Master plan should be fully justified, and provide offsets. 1 [PD-1]

The EIR clearly shows that the proposed arena and the adjoining developments on blocks 29, 30, 31, 32 ignore this master plan, and will have major negative impacts that are inadequately or not addressed in the EIR.

Many have commented on parking, traffic congestion and the impact on nearby hospitals, UCSF and businesses. I fully concur and will not add to the discussion here, except in voicing my support for the filed objections. 2 [ERP-9]

This addresses specific design flaws that are totally ignored in the EIR and are in complete disagreement with the Mission Bay Master plan.
First the height issue: Lots 30 and 32 are zone 90 ft. Lots 29 and 31 are zoned 160 ft and height density is spelled out. Not all the lot surface can be built to 160 ft.
The Warriors could have put the arena that has a peak height of 130 ft on the lots zoned 160 ft max height. Instead they chose to located mostly of it to the east, on the lots zoned maximum 90 feet. 3 [PP-1]
This is counter to the Master plan for Mission Bay. Yet they chose to put it on the 90 ft max height lots asking for variances and offering no offsets by lowering the height of buildings on lot 29 and 32.
In order to get conditional approval to the plan, and stay within the Master plan intent for Mission Bay, they should either move the arena to lots 29 & 31(the lots zoned to the proper height for the arena) or offset their request for the height variance (necessitated by placing the arena on lots 30 & 32), by lowering significantly the remaining buildings.
Second the Usage issue: The Mission Bay plan is quite explicit about the type of businesses it allows. An arena and entertainment center are not considered as valid developments in the Master Plan. If an exception is granted, it should be for cause. And the impact on the rest of Mission Bay should be minimized.

But more that just an arena, aspects of the design, not properly addressed in the EIR are of great concern. In particular, the so called "viewing deck" or "sky bar" which it really is. 4 [PD-1]

Usage and reason for the "viewing deck" or "sky bar".
In addition to asking that the height limitations of the Master Plan be raised to 130 ft for the arena on lots zoned 90 ft, (understandable if an arena is to be built, as an arena does require a certain height), the Warriors plan adds a "viewing deck" at 110 ft elevation (on lots zone maximum 90 ft) for the sole purpose of gaining views of the downtown and bridge for their sky bar patrons. This would put the "sky bar", well above the adjacent buildings which are all built within code! Gaining views is an outrageous

I-Anavy

request for a height variance, one of at least 20 ft, and more like 30 ft! These views are not even guaranteed as the Giants may yet build higher than allowing them to the North! But the impact will not change!
No one gets to climb higher than allowed by code just to get views, especially if it impacts the nearby buildings! And for what? a "sky bar"! Are they also contemplating a restaurant, as it was once described during preliminary meetings? The plans are devoid of any specifics for it, and should be disallowed just for this cause alone. Its impact is not measured. It is being swept under the rug!
The views on the Bay are just as spectacular on the East side. If the Warriors want to add a "viewing deck" or "sky bar", justifying its use which is not allowed in the Mission Bay plan, it should not tower above adjacent buildings, encroaching even more than the arena on the 90 ft maximum height limit of lots 30 & 32.
Furthermore the open deck now looks straight into office and residential buildings windows next to it. These, built specifically within the Mission Bay Master Plan will now have this new invasive intrusion, a few hundred feets away. Above all it is not allowed in the plan. 4 [PD-1] cont.
And its stated usage occupancy of thousands of guests, its hours of occupation (conceivably until 11pm, 365 days per year), its ill-defined and open ended purpose, the bright light pollution impact and the potential noise pollution impact (it is an open deck) on nearby residences is just unjustifiable.
And it is totally ignored in the EIR study. No impact discussed, no offsets, no specifics... a quick underhanded way of trying to slip in this totally unjustifiable aspect of the project!
There are no "sky decks", "sky bars", "sky restaurants" or "sky lounges" allowed in the Mission Bay plan. That aspect of the Arena project should be cut out. Not modified. Just cut out! There are no functional justifications for it, except the Warriors wanting it, at the height they chose!

If the Warriors insist on a "viewing deck" or "sky bar", it should be strictly within the guidelines of the Mission Bay plan, its purpose stated, its limited usage defined and strict use restrictions should be agreed upon. And not subject to future appeal. It should be lower, topping at a maximum height of 90 feet (thus sheltering nearby buildings from its impact). It should face East. Its hours of operation should be pre-agreed upon.
And the EIR should address its specific impact.

Submitted respectfully on July 26, 2015

Ralph A. Anavy
420 Mission Bay Blvd N #1503
San Francisco CA 94158
Phone 415 647-8093, cell 415 813-7457

I-Anon

From: Josh Anon
To: Warriors, PLN (CPC)
Subject: Mission Bay resident concerns
Date: Monday, July 13, 2015 12:40:34 PM

Hi,
I own a unit in the Madrone and have lived here since December, 2012. I'm rather concerned about the traffic implications of the new Warriors stadium. Frankly, it feels like SF doesn't understand traffic flow and density in Mission Bay in general, and I'm concerned that the Warrior's impact is totally unknown/inaccurately-planned. For example:

* I frequently seeing fire trucks driving the wrong way on 3rd St so that they can get to China Basin St.
* Around game times, the traffic on 3rd st backs up so much it's faster to walk downtown and catch a cab than try to drive somewhere.
* The light timing, especially around Berry St and 3rd/4th, makes it very hard to get out of Mission Bay during games. I've had it take me 50 minutes to go from the Madrone to 4th & King because of the light timing.

Right now, during a Giants game, the only way to get out of Mission Bay is to head towards 3rd & 16th, and if the Warriors are there, with 200 events/year at least, we'll basically be trapped. Yes, I know if Salesforce had been there we would've had additional traffic, but I suspect the number of employees would be significant less than the people at a game, and tech busses + people biking to work take even more cars off the road. 1 [TR-4]

I can't imagine the fire department, police departments, and UCSF are terribly happy about having to get through even more traffic to get to an emergency, and in some emergencies, seconds can make the difference between life and death. It seems like a lack of foresight to have built this new station if they can't function at 100% efficiency. 2 [TR-9]

I've also heard the mayor wants to add additional public transit into the area, reducing road space, but I'm sure many people will still drive, and this will just make the roads more congested. 3 [TR-4]

Last, I have additional concerns about parking. We're fortunate enough to have 1 space per unit, but we don't have guest parking and some units have multiple cars. It's quite difficult to find parking during a game, and it's expensive for me to have a driving guest over given how expensive the meters are during games. That hassle will only increase with the Warriors. (Plus guests hate having to drive over here because of the game traffic!) 4 [TR-13]

Thanks,
Josh

I-Arack

From: Patricia Arack
To: Warriors, PLN (CPC)
Subject: Warriors Arena in Mission Bay--NO!
Date: Friday, July 24, 2015 10:58:15 AM

I think putting a sporting arena that close to a hospital with very sick people is not only bad planning, it is greedy and selfish. The hospital and the UCSF buildings were there first. 1 [GEN-5] The traffic, noise, pollution, and general crowding and confusion that this plan would bring should be obvious to everyone concerned. I vote no on the arena in Mission Bay. 2 [ERP-9]

Patricia Arack, ESL Faculty
City College of San Francisco
Ocean Campus; Office: 532 Batmale Hall,
Phone: 415-216-9221

"All experience is an arch where through gleams that untraveled world."
-- *from "Ulysses" by Alfred, Lord Tennyson.*

I-Bartlett

From: Maylou Bartlett <mayshinb@gmail.com>
Sent: Friday, July 17, 2015 10:05 PM
To: Warriors, PLN (CPC)
Subject: Warriors stadium should remain in Oakland where accessibility to the entirety of the Bay Area is best | 1 [GEN-5]

I-Barton

From: Jason Barton
To: Warriors, PLN (CPC)
Subject: Warriors Arena
Date: Monday, July 27, 2015 1:54:48 PM

Hello,

I live in the surrounding area, Potrero Hill, of the future Warriors Arena and I am writing this email in support of the new arena. I believe the stadium is the perfect choice for this neighborhood. The Mission Bay has been poorly planned up to this point as outlined in this video clip comparing SF and Vancouver https://vimeo.com/86566866. The Mission Bay has become a sterile business park without any character or life. It needs something that can give it some kind of character and a major NBA sporting arena can help do just that. The arena alone will not give it a character, but the businesses that will sprout up once it is developed to support the people coming and going should reflect more character than another office building that closes down at 5 pm. I am excited for the bars, restaurants, and other small businesses that will come to this area to support the weekend and after 5 pm events (note: I am a parent of two, not a single kid just looking for parties) 1 [GEN-5]

The arguments against the stadium do not hold water

-The traffic will be horrible
The traffic is already horrible because of the Giants game. The addition of additional cars are not going to make traffic worse it will just be traffic more frequently something that will happen no matter what is built there. The detractors make it seem like the traffic will be analogous to a flood where cars are going to pile on top of each other and block every nook and cranny preventing any kind of human movement 2 [TR-4, TR-9]

-The space is for bio science
I'd say there is an ample amount of research space provided for research between the hospital and UCSF campus. 3 [GEN-6]

-The original plan did not call for a stadium
While the very original plan did not include a stadium, the Giants have been kicking around the idea of putting a stadium across the ball park since 2001 4 [PD-1]

-Pregnant ladies and sick children will not be able to get to the hospital 5

I-Barton

If this were true why did they build it so close to the Giants stadium. The Giants traffic definitely reaches the Hospital. Furthermore, if this were true than I am curious if pregnant women are advised not to live in high congestion areas. Do they not like in the towers near the Baybridge on ramps where traffic is often gridlocked 5 cont.

-It will be difficult for employees to drive to work
SFMTA has been employing a policy of making driving worse for years and years.

-The infrastructure is not adequate to support this arena.
I am not aware of SFMTA being proactive in creating infrastructure for a neighborhood. You need to build it first and then use the funds to create the infrastructure 6 [TR-5a]

This is private land and it will be developed along with the traffic. Please approve this project so we do not get another borring business park and a neighborhood without character and turns into a ghost town on weekends and evenings. 7 [GEN-5]

Best Regards
Jason Barton

Jason Barton
Potrero Hill Resident

I-Beals

From: Sharon Beals
To: Warriors, PLN (CPC)
Subject: Warriors Arena
Date: Monday, July 27, 2015 11:41:43 AM

Hello,

As someone who has lived on Potrero Hill for over 25 years, I must comment on the proposed Warriors project. Traffic getting in and out of our neighborhood has already increased and slowed to a crawl during rush hour, and is even worse before and after Giant's games. Third to Cesar Chavez is impossible, and the other directions to 80 on 3rd and 5th are a half hour crawl to get on the freeway. All despite the promise of better public transportation that were made before the Giants moved into town. 1 [TR-4]

Can you imagine what it will be like with Warriors games and the events that will certainly be held their off season year round? I think this is absolutely the wrong place for a new stadium and yet another development to be built. 2 [GEN-5]
But I am sure that our current city father's will explain these problems away, and we'll no longer be living in what was once the best neighborhood in the city.

Has their been any consideration of putting them in the Candlestick site? 3 [ALT-4]

Sharon Beals
1454 Rhode Island Street

Beals

I-Bilodeau

From: Lynda Bilodeau
To: Warriors, PLN (CPC)
Subject: Warriors Stadium
Date: Sunday, July 26, 2015 3:44:39 PM

As a second generation San Franciscan, I am writing to voice my opposition to the building of the proposed Golden State Warriors Arena and Events Center at Mission Bay. This is the worst idea and it would not be a welcome addition to the neighborhood. 1 [GEN-5]

The area is already congested with traffic and this structure would only add more congestion. 2 [TR-4]

Regards,
Lynda Bilodeau
Lynda.bilodeau@yahoo.com

I-Bookstein

From: Norman Bookstein
To: Warriors, PLN (CPC)
Subject: arena not a welcome addition to the neighborhood or the Bay Area
Date: Monday, July 13, 2015 1:54:50 PM

As the most congested city in the US, we have seen what a mess ensues with each game by observing the ball park. 1 [GEN-5]
We really do not need a new stadium, especially in an area that impacts the whole bay area. 2 [TR-4]

I for one, and one of many oppose it.

-norman bookstein

I-Bullard

From: Cathy Bullard
To: Warriors, PLN (CPC)
Subject: Warriors
Date: Friday, July 24, 2015 12:25:53 AM

Please do not go forward with this project. It is not good for the neighborhood nor for the Warriors to move out of Oakland. Thank you for your time. 1 [GEN-5]

Cathy Bullard

--
Sent from myMail app for Android

I-Bunn

From: Jessie Bunn
To: Warriors, PLN (CPC)
Subject: Warriors Stadium
Date: Monday, July 06, 2015 4:21:12 PM

Brett Bollinger:

I'm writing to oppose the construction of the Warriors new stadium at the currently proposed site in Mission Bay. I'm a neighbor in the area, already affected by the great increase in traffic on game days from the Giants Stadium. We often have complete gridlock NOW on home game days. An additional arena for a very popular team (!) would make the area impassable on Warriors game days. I have read the traffic solution currently being considered by the City and the Warriors, and find it laughable. 1 [TR-4] The neighborhood simply doesn't have enough parking to support TWO major stadiums within blocks of each other. 2 [TR-13]

I'm also a nurse, and completely agree with the California Nurses Association's opposition to the new Warriors stadium. The traffic congestion will make it difficult or impossible for patients, families and emergency responders to reach the new UCSF Hospital on game days. Emergency access to the Hospital is critical to the survival of patients. The gridlock produced by the proposed Warriors stadium would result in patient deaths. 3 [TR-9]

Thank you for your consideration,
Jessie Bunn, RN, PNP
555 Missouri St

I-Burkhart

From: Karen Burkhart
To: Warriors, PLN (CPC)
Subject: Warriors
Date: Thursday, July 16, 2015 8:57:01 AM

They belong in Oakland!!! 1 [GEN-5]

Sent from my iPad.

I-Cale

From: John Cale
To: Warriors, PLN (CPC)
Subject: Warriors Arena
Date: Monday, July 27, 2015 3:34:53 PM

I'm a homeowner on Mississippi St and would love the Arena in my Neighborhood. For people who are concerned with parking issues maybe we can extend the permit parking hours. John Cale 1 [TR-13]

From: Janet Carpinelli <jc@jcarpinelli.com>
Date: August 4, 2015 at 12:06:53 PM PDT
To: warriors@sfgov.org
Subject: 2014.1441E DSEIR traffic/parking comments

Hello Brett Bollinger

Re: Comments on Warriors Traffic/transportation Management proposal DSEIR
2014.1441E Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Based on the transportation Management Plan presented to Dogpatch Neighborhood Association by the Warriors (Theo Ellington, and MTA Peter Albert) on July 14, 2015, the plan lacks sufficient plans/funding for congestion management.

There is a need for:

1 [TR-12a]

1. No added parking at 19th St./Illinois St because it will:
a. add to Dogpatch traffic congestion while not serving the neighborhood in any way.
2. It will draw game and function day Peninsula parkers through Dogpatch via 280 N. 23rd St off/on ramp, and THIRD St., crowd out the official Traffic route for trucks and bikes on Illinois St. and interfere with the planned but also opposed MTA turn-around loop at 19th and Illinois St as well as the proposed and opposed 19th St. extension and egress for 10 wheeler trucks from BAE ship repair business on SFPort land.
3. It will interfere with/cause safety issues for pedestrians, park users of the upcoming Crane Cove Park at 19th St./Illinois and Blue Greenway along Illinois St and Pier 70.

2 [TR-3b]

2. Need for more PCO's pre and post game/event located throughout Dogpatch and south to Cezar Chavez to avoid traffic going through neighborhood to/from 23rd St. on/off ramp at 280 N. Traffic should be kept off Tennessee, Minnesota, Indiana, 22nd St and 20th streets as these are mainly residential in nature.

3 [GEN-1b]

3. Dogpatch Neighborhood mitigation projects/ funds need to be identified and funded by the Warriors:
These could include:

a. 250 parking space garage located on Port land or south of 24th St. Dogpatch (with shuttle buses to the stadium). This lot would also serve workers and shoppers in Dogpatch while not sending traffic through the neighborhood. It could be designed such that it could be a park-like setting or off-leash dog park on non-game days.
b. Ongoing funds for Esprit Park maintenance and capital improvements
c. Ongoing maintenance and upgrading of neighborhood basketball court at the Historic Scott School (1060 Tennessee St) playground area on Minnesota St.
d. Ongoing cleaning/greening funds for public sidewalks and now neighborhood volunteer maintained spaces in and around Dogpatch.
e. Increased funding for more N/S T-Third cars and E/W MTA routes and ongoing funding/maintenance of these expansions

I-Carpinelli

3 [GEN-1b] cont.

f. Ongoing funding for Blue Greenway
g. Ongoing educational scholarship funds for underprivileged Dogpatch/Potrero neighborhood children to attend Dogpatch and Mission Bay pre-schools, after school programs, and charter schools

Thank you,
Janet Carpinelli
934 Minnesota St.
SF, CA 94107
415-282-5516

From: Cehand, Jadine
To: Warriors, PLN (CPC)
Subject: Letter of feedback re: proposed arena
Date: Tuesday, June 30, 2015 4:12:47 PM

Jadine M. Cehand
420 Mission Bay Blvd N.
#1003
San Francisco, CA 94158

June 30, 2015

Tiffany Bohee, OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear OCII and the Golden State Warriors:

I am writing to provide my feedback during the allowed period for the Draft SEIR. I live in Mission Bay with a direct view of the planned venue. Already a neighbor to the SF Giants let me briefly convey my concerns about the planned arena based on my lived experience living down the street from the SF Giants.

Quality of life:

- Noise- Intoxicated people being loud outside after games- after 10 pm and weeknights. 1 [NOI-6]
- Public urination and discarded trash/alcohol bottles- fans urinating on our building and landscaping. 2 [GEN-2]
- All public parking around the building taken up by sports fans. Try having friends over. 3 [TR-13]
- People driving the wrong way down *one-way* Mission Bay Blvd. North and South. 4 [TR-4]
- Full Muni cars as I am trying to get home from work. I now ride a Vespa because of this. 5 [TR-5a]
- Mission Bay shuttles stuck in traffic, mainly due to the next: 6 [TR-4]
- No traffic officers at Mission Bay Blvd N. and S.; cars blocking the intersection in bumper to bumper traffic. Cross traffic not getting through.
- Local traffic diverted off China Basin St. down Mission Bay Blvd. North to accommodate SFPD Southern Station during games.
- People double parked/idling in the "mews" on Bridgeview (our garage entrance).
- Cars idling across our driveway entrance- blocking access to our homes.

And now there will be "traffic lanes" with the new stadium? *Please make sure we can get across 3rd Street to get to our homes*. I strongly recommend/request stickers for our vehicles to make passing through traffic lanes an easier process. 7 [TR-12a] Also- anything you can do to route foot traffic away from our homes would be appreciated. 8 [TR-6]

Sincerely,
Jadine M. Cehand, RN
Mission Bay resident
The Madrone

Jadine M. Cehand, NP, CNS
415-503-4789

OBIC & COPE Clinics
1380 Howard St., 2nd Floor
SF, CA 94103

I-Cehand

phone: 415-503-4789
fax: 415-503-4791
UCSF Department of Psychiatry

I-Collins

From: Erin Collins <collins.erin@icloud.com>
Sent: Friday, July 17, 2015 8:10:53 PM
To: Warriors, PLN (CPC)
Subject: mission bay resident against warriors arena

keep the warriors arena out! We have enough congestion in our neighborhood as is....Wishing that the residents of mission bay have a voice in this! 1 [TR-4]

Sincerely,
Erin Collins
Resident @ Berry / 6th Street
Mission Bay

I-Corey

From: Marcus Corey
To: Warriors, PLN (CPC)
Subject: Warriors stadium
Date: Thursday, July 23, 2015 1:15:06 PM

We dont need a new stadium we need to help out earth nd community's survive and live 1 [GEN-5]

Sent from my iPhone

I-Cornwell1

From: Cornwell John
To: Warriors, PLN (CPC)
Subject: Fw: Comments on Draft EIR of Warriors Mission Bay Project.
Date: Tuesday, July 28, 2015 12:09:18 AM

July 27, 2015

John Cornwell
38 Bryant St #809
San Francisco, CA 94105

Re: Comments on Draft EIR for Warriors Mission Bay Project

I have significant concerns that the Draft EIR does not adequately address traffic impacts beyond the defined project area.

Specifically:

1) The additional auto trips generated by this project will have far-reaching impacts across the entire SOMA district, including on the Embarcadero, and the on-ramps to the eastbound lanes of the Bay Bridge from Bryant, Harrison and First Streets.These are already heavily congested freeway access points.

2) Indeed, it will have a regional impacts on highways, including the Bay Bridge/580/880 maze and 101/92 interchanges, much as Giant's games currently do. On dates with overlapping events at AT&T and the proposed project, traffic will likely be negatively impacted for 8+ hours, including the main auto egress points out of the Financial District. 1 [TR-4]

I believe a wider traffic study area needs to be defined for mitigation analysis. 2 [TR-2b]

abxahscx ahsc ashcv acsReceived: from [66.196.81.172] by nm44.bullet.mail.bf1.yahoo.com with NNFMP; 28 Jul 2015 07:00:00 -0000
Received: from [98.139.212.250] by tm18.bullet.mail.bf1.yahoo.com with NNFMP; 28 Jul 2015 07:00:00 -0000
Received: from [127.0.0.1] by omp1059.mail.bf1.yahoo.com with NNFMP; 28 Jul 2015 07:00:00 -0000
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j5H91fS6Qoj5yvYGvrqYsvCh_yIzceZVQcEeWPsuiEplg3E_1
Received: by 76.13.27.70; Tue, 28 Jul 2015 07:00:00 +0000
Date: Mon, 27 Jul 2015 07:00:00 +0000 (UTC).

I-Crosson

From: Michael Crosson
To: Warriors, PLN (CPC)
Subject: Warriors new stadium
Date: Thursday, July 23, 2015 12:05:24 PM
Attachments: 80247180-5411-4629-B21B-225F6C1E8167[177].png

What a total worthless crock of shit! 1 [GEN-5]

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Michael Crosson, Publisher
www.SocialMediopolis.com
Ph. 415.717.7600
Email: mcrosson@changetheworld.com
Personal website: http://www.MichaelPCrosson.com
LinkedIn profile: http://www.LinkedIn.com/mcrosson

I-Cunningham

July 23, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

I am San Francisco homeowner and a local (4th and Townsend) worker concerned about the impact of the proposed Golden State Warriors stadium on the future of the close-knit, surrounding neighborhood communities and the medical campus at Mission Bay. 1 [GEN-5, LU-1]

I believe that the proposed stadium will unequivocally add unbearable congestion and stress to the current neighborhood environment, besides creating an impossible situation for the local services including Fire Stations, and healthcare providers such as USCF and Kaiser Permanente.

My co-workers, many of whom are also homeowners in the Soma/Mission Bay have already been impacted by the traffic caused just by the SF GIANTS' home games! Many of us have had to adjust our work hours to avoid the traffic gridlock. This congestion has also impacted the health and welfare of our outside environment and has impeded our enjoyment of daily walks and outside 2 [TR-4] lunching— which we deem necessary to keep up our health and sanity. During home games, it is virtually impossible to navigate the sidewalks and cars around 4th and Townsend not to mention the continuous bombardment of pedestrians who have parked in Mission Bay for the game. This creates sidewalk congestion even when walking on the San Francisco Bay Trail (one of our favorite walking trails) that runs along the Bay near Terry A Francois Blvd, RIGHT at the site of 3 [TR-6] the proposed Warriors Stadium and other mixed-use buildings. This stadium project absolutely promises additional traffic logjams and parking nightmares. 4 [TR-4, TR-13]

This is area no longer a Healthy SF but a STRESS SF. This community is already impacted with very dense structures. This area should be PRESERVED and developed as a GREENSPACE PUBLIC PARK. As far as I have seen from walking this neighborhood for over 3 years, there is definitely not enough OPEN SPACE allotted for the population. Preserving this area should be a priority for 5 [REC-2] the City of San Francisco! I DO NOT HAVE ANY FAITH, that the City Officials will be able to provide any traffic control that will alleviate the hellish congestion created by this proposed project. 6 [TR-4]

I appeal to the Planning Department to step up, turn this proposition around and instead consider funding an OPEN SPACE 'Heritage' Project – one that this world-class city needs and deserves and an oasis to be enjoyed for many years by the surrounding neighborhoods, the guests and children of UCSF, local workers and visitors. I implore you to consider preserving what little is left of our beautiful waterfront by creating a gem to be enjoyed like Golden Gate Park on the western edge of our city. 7 [REC-2]

I-Cunningham

This project is not a welcome addition and will only burden the city in the years to come; creating an impossibly hellish situation in an environment that is already unlivable and unsustainable! Again, I appeal to you to you please DO NOT place your support behind this project. 8 [GEN-5]

Sincerely,
Micki Cunningham
823 41st Ave
San Francisco, CA 94121

Work address:
340 Townsend Street
San Francisco, CA 94107

I-Dalere

From: Marian Dalere
To: Warriors, PLN (CPC)
Subject: My concern with Warriors/Mission Bay Project
Date: Monday, July 27, 2015 2:09:57 PM

Dear Brett Bollinger,
I wish to comment on the Warriors/Mission Bay project. I was recently informed that Kaiser Permanente medical offices will be moving in the Mission Bay Area early 2016. My doctor and my elderly mother's doctor will be located there. My concern is the traffic especially during game days/special events. Yes, I can plan in advance my appointments but in case of an emergency or urgent care appointment I do not want to be stuck in traffic. I am not a basketball fan and I would not know when game days /special events are. I prefer to drive my mother to her appointments and I would not consider taking an 80 year old woman in a wheelchair on MUNI.
I was born and raised in San Francisco and I respect the development of The City. So I hope the necessary steps will be considered to make automobile traffic flow better in the areas of the UC hospital and Kaiser Permanente Medical offices in the Mission Bay Area most of the time and especially during game days and special events. 1 [TR-4]

Thank you for letting me comment on this and thank you for your attention to this important matter.

Sincerely,
Marian Dalere
mdalere@yahoo.com
Sent from my iPhone

I-deCastro1

From: John deCastro
To: Warriors, PLN (CPC)
Subject: Comments on Draft EIR for Warriors Arena
Date: Monday, July 27, 2015 10:03:15 AM

As a long time resident of Potrero Hill that will be impacted by the unmitigated effects of the Warriors stadium and event arena's proposed 205 days a year of activities.

I am disappointed that the City is calling traffic, transit and parking issues "significant and unavoidable". 1 [TR-2j]

First many of our blocks already have Residential Permits. What is the City going to do to keep people hunting for parking in our residential neighborhoods? We already suffer daily commuter parking problems cause by UCSF, Mission Bay and Caltrain that have not been addressed for years. 2 [TR-13]

Second, transit is promised to be improved as a result of the Warriors Event Center. However plans are very fluid and not well described to the neighborhood. The only minor improvement is the 55 line which is an interim measure until the only reliable bus line (22) is removed from 18th St. The 22 is proposed to
be replaced by the unreliable 33. 3 [TR-5a]

The concept of a "lock box" for ticket tax revenue is a good idea. However I am waiting for legislative action to make it a reality. Given that the Eastern Neighborhoods Plan called for improved transit 5 years ago. We have seen little progress on that front. 4 [IO-3]

Finally, traffic caused by on going development of thousands of units has not been addressed. How can I believe that the Warriors & City will follow through with their promises? 5 [TR-2h]

Potrero Hill is an island with only two east - west streets on the north slope of the Hill that cross the 101. Most of our intersections are gridlocked twice a day during morning and evening commute. Add a Giants game to the mix and we get a third rush hour gridlock.
I am not optimistic that the City is going to be able to implement an effective traffic management plan. The promised traffic officers will disappear during the next economic downturn, never to return unless the ticket tax money is in a "lock box" in the City budget.

If the City and the Warriors are going to build the Arena, traffic, transit and residential parking impacts can not be "significant and unavoidable". They must be mitigated and addressed before the Arena is built. 6 [TR-12a]

John deCastro
Past President Potrero Boosters Neighborhood Association

I-D'Harlingue

From: Art D"harlingue
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Monday, June 22, 2015 9:49:47 AM

Dear group reviewing the EIR for the Mission Bay Warriors stadium:

I am writing to express my concern about the proposed new stadium for the Golden State Warriors in the Mission Bay area. I feel that this new complex will have a huge negative impact upon the UCSF Mission Bay medical center and upon the patients which it serves. The traffic congestion created by this new sports complex will make it very difficult for patients and their families to reach the medical center, which could delay urgent or emergency medical care. [1 TR-4] It is far more important to be able to provide care for the children and families of San Francisco and the larger Bay Area, than to meet the needs of the Golden State Warriors. The Warriors already have an excellent facility for its games in Oakland. Why compromise the care of children for the sake of a basketball team? The City of San Francisco needs to get its priorities straight. The City needs to be more concerned about children and families, and not the financial goals of the rich owners of the Warriors. [2 [GEN-5]]

Arthur E. D'Harlingue, M.D.
Director, Dept. of Neonatology
UCSF Benioff Children's Hospital Oakland
President, East Bay Newborn Specialists, Inc.
Neonatology Office
747 52nd St.
Oakland, CA 94609
phone: 510-428-3838
mobile: 510-816-8938
fax: 510-428-3542
pager: 510-718-6627
email: adharlingue@mail.cho.org

I-Dhillon

From: Dhillon, Ragina
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Wednesday, June 24, 2015 4:37:52 PM

To whom it may concern,
I am concerned about the dangerous impact of having the warriors stadium/concert hall across the street from the ucsf childrens hospital. I feel like this part of the city already has issues during the baseball games at ATT park, sometimes hidering staff from getting where they are vitally needed in a timely manner. I also think its a burden stressed parents should not have to deal with. These streets cant handle much more congestion. I hope these concerns are looked at before anything is built because I think it will have a very negative impact on our facility. [1 [TR-4]]

R. Dhillon RN

I-Dickey

From: HELEN D
To: Warriors, PLN (CPC)
Subject: Warriors at Mission Bsy
Date: Monday, July 13, 2015 8:30:23 PM

I am writing to express my opposition to building a stadium at Mission Bay. It 1 [GEN-5]
would cause too much traffic for the area; is too remote and difficult to access; 2 [TR-4]
and is not a good fit with the surrounding medical establishment. 3 [LU-1]
Surely there is a more suitable piece of land available. 4 [ALT-4]
Helen Dickey

I-Dieste

From: Dieste, Desiree
To: Warriors, PLN (CPC)
Subject: UCSF Employee against Warriors Stadium at Mission Bay
Date: Monday, July 27, 2015 11:29:50 AM

Dear Tiffany Bohee,

I am an employee at UCSF and mother to a small child. I am writing today to share my very serious concerns for the Warriors stadium planned for the Mission Bay area of San Francisco. I commute every day to work along both the Bart and Muni lines (either T or 55). I have literally lost sleep about the commute home on days where the Giants are playing as it makes the commute home absolutely terrible and I am often late to pick my child up from daycare. Commuter trains are packed, late, or they get stuck after on a few stops due to the huge foot and car traffic that results on game days. Busses that were added that can sometimes avoid the Giant's stadium (55, Mission Bay Shuttle, UCSF Shuttles) are no better as cars in the area are desperate to find ways around the traffic and they clog up every side street and major through way for blocks around. 1 [TR-4]

Beyond the commute, imagine being in labor and getting stuck in the traffic or having a child critically ill and needing to get to ER immediately. I have heard of ambulances getting stuck in traffic and have noticed that families are very late to their appointments on days where there are day games. As a mother and patient, I cannot even fathom the anxiety this would produce and would never plan any of my care at UCSF Mission Bay if any additional traffic hazards (like the stadium) were added to an already clogged area. 2 [TR-9]

I feel like the planned stadium would be a huge liability to the City of San Francisco, the Warriors franchise, UCSF, and Kaiser (who is also building in the area) - imagine if the traffic held up an ambulance and a child died? Please consider the patients, employees, and families of San Francisco when considering this proposed development and the true cost it would have to our community.

Best,

Desiree Dieste, MSW, MPH
Pediatric Brain Center
UCSF Benioff Children's Hospital
Dept. of Pediatric Social Work
Phone: 415.514.2934
Fax: 415.476.4748

I-Dorrance

From: Jeanie Dorrance
To: Warriors, PLN (CPC)
Subject: Mission Bay Arena and Events Center
Date: Monday, July 13, 2015 1:01:54 PM

Kindly refrain from pursuing a plan to build an enormous arena and event center in such close proximity to UCSF Mission Bay. My daughter is a patient at UCSF Mission Bay and I can see that traffic congestion would likely impede patient access to critical care medical services. 1 [TR-4]

Thank you,
Jean Dorrance

I-Ellingham

From: Lewis Ellingham
To: Warriors, PLN (CPC)
Subject: mission bay project, sf
Date: Monday, July 13, 2015 3:55:21 PM

I oppose this project for two reasons: (1) height-limit increases and (2) congestion. 1 [PP-1] I am a frequent user of the UCSF Mission Bay campus, by public transportation. The 3rd Street MUNI line and local bus service is already strained. This huge add-on would be very damaging to both my concerns. 2 [TR-5a]

-lewis Ellingham
magicpool@earthlink.net
3850 18th Street, Apt. #306
San Francisco, CA 94114-2653

I-Faye

From: Janessa Faye
To: Warriors, PLN (CPC)
Subject: I SUPPORT the stadium :)
Date: Monday, July 13, 2015 1:18:43 PM

.......NOT!

don't do it. Please understand what the effects on our community would be. Specifically the destruction of the environment, and encouraging people to spend money they don't have.

What does the Warriors team, or the basketball league as a whole do for their community? How do they give back? I only see children who have been pummeled by their parents and coaches, happened to be the best of the best, to be paid exorbantly to "entertain" the crowds, only to piddle it away on childish things, go into debt, and be expected to be perfect spouses and parents as well as players. What kind of upside down world do we live in ?

Please see that we really don't need another stadium around. It is unfortunate football and soccer got their stadium around here but please respect where our lives are and our environment.
Please do not turn your cheek to the extremely fragile state the earth is in.
Please understand and choose to be the honorary example of a man who chooses to put the earth he lives on, the great great grandchildren he doesn't know yet, a fighting chance at survival.

1 [GEN-5]

Thank you for your consideration

JANESSA

I-Finkle

From: Dan J Finkle
To: Warriors, PLN (CPC)
Subject: Re: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors" Stadium
Date: Thursday, July 23, 2015 12:33:11 PM

Done!

On Thu, Jul 23, 2015 at 12:32 PM, Dan J Finkle <danfinklesf@gmail.com> wrote:

---------- Forwarded message ----------
From: **Alex Doniach** <alex@singersf.com>
Date: Thu, Jul 23, 2015 at 12:27 PM
Subject: RE: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors' Stadium
To: Dan J Finkle <danfinklesf@gmail.com>

Hi Dan,

Thanks for this! if you could forward exactly what you have below to warriors@sfgov.org it would be fabulous!

Thanks,

Alex

From: Dan J Finkle [mailto:danfinklesf@gmail.com]
Sent: Thursday, July 23, 2015 12:17 PM
To: Alex Doniach
Subject: Re: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors' Stadium

My comment on the proposed arena:

The traffic concerns that the nurses have raised are valid. Put the arena in the Bayview, they need it more than the residents of Mission Bay. 1 [ALT-4]

Dan J. Finkle

2040 Franklin St. #706
94109-2979

415-921-4045

On Thu, Jul 23, 2015 at 11:45 AM, Alex Doniach <alex@singersf.com> wrote:

Dear Concerned Resident:

An important deadline is only four days away! **Monday, July 27 is now the final day to submit your comments and concerns about the proposed Golden State Warriors' Arena and Events Center at Mission Bay.** The deadline was extended by one full week, giving the public more time to submit their feedback. Please ignore this email if you've already submitted your comments.

If you have not yet submitted your comments, this is your last chance to join us in letting the City of San Francisco know that the arena is not a welcome addition to the neighborhood.

Need help? We're happy to provide assistance. Email me (Alex) or call at 415-227-9700 for more information.

These public comments are incredibly important as any comment submitted by Monday, July 27, 2015 will become part of the City's decision-making process. Plus, submitting your comment is easy. Either we can submit your letter on your behalf, or you can email a comment of any length directly to:

Brett Bollinger of the San Francisco Planning Department at warriors@sfgov.org.

You can also submit your comments by mail at:

Brett Bollinger

San Francisco Planning Department

1650 Mission Street, Suite 400

San Francisco, CA 94103

I-Finkle

Thank you for your continued help and support. Every voice counts!

Sincerely,

Alex

415-806-8566

I-Fischer

From: Warriors, PLN (CPC) [mailto:warriors@sfgov.org]
Sent: Wednesday, June 10, 2015 8:06 AM
To: Joyce
Cc: Paul Mitchell
Subject: FW: warriors stadium

From: Alaina Goetz [mailto:alainagoetz@gmail.com]
Sent: Tuesday, June 09, 2015 2:04 PM
To: Warriors, PLN (CPC)
Subject: warriors stadium

Greetings,

Keep the Warriors in Oakland. This is an incredibly ill conceived plan and will result in traffic beyond belief! You propose a few traffic cops to help with the congestion and a few hundred parking spaces?

Surely you must be insane! Have you been in that neighborhood now with the gridlock? No point in directing traffic in complete gridlock.

1 [TR-4]

DO NOT BUILD IT IN SF!!! Please! Think of the families and the people that live there! 2 [GEN-5]

Alaina Fischer

15 year resident of Potrero Hill

I-Freedman

From: Peter Freedman
To: Warriors, PLN (CPC)
Subject: Danger
Date: Sunday, July 26, 2015 1:12:45 AM

Danger to Medical care. 1 [GEN-5]
Please relocate.
Thank you,
Peter

Sent from my iPhone

I-Grabe

From: Grabe, Michael
To: Warriors, PLN (CPC)
Subject: concerns over proposed Warriors Stadium
Date: Monday, July 27, 2015 1:55:41 PM

Dear Brett Bollinger,

I am writing to express my personal concerns over the planned stadium at Mission Bay. I am a professor and faculty member at the University of California, San Francisco, and my research lab and office are located on the Mission Bay Campus. The traffic in this region of the city is terrible on many days, especially those that have an event at the baseball stadium. A few months ago it took me 2 hours and 40 minutes to drive a car from Mission Bay across the Bay Bridge. This is completely unacceptable, and it highlights that the growth in this region of the city is outpacing the infrastructure for transport into and out of the region. As you know, this traffic problem is only going to get worse if this new proposed stadium is built in Mission Bay. Therefore, I oppose this new stadium, and I believe that the city should oppose this new construction also. 1 [TR-4]

I want to state again that these are my own opinions.

Sincerely,
Michael Grabe

Michael Grabe
Associate Professor
University of California, San Francisco
Cardiovascular Research Institute
Department of Pharmaceutical Chemistry
555 Mission Bay Blvd South, Room 452T, MC 3122
San Francisco, California 94158-9001
415-502-2874 (office)
415-476-8173 (fax)

I-Grant

From: Max Grant
To: Warriors, PLN (CPC)
Subject: RE: My Opposition to Move the Warriors to San Francisco
Date: Monday, July 13, 2015 2:39:07 PM

Dear Brett Bollinger,

I am greatly oppose to having the Warriors move to San Francisco. I am opposed to this move for several reasons, but more importantly the Warriors are where they are supposed to be. They are in a city that love them--win or loose, support them, and are very loyal to them, not a city that only want them when they are at there best for financial gains.

In addition, San Francisco is becoming overly crowded with parking being a major problem and the city is becoming a city only for the wealthy. And despite of the wealth in the city, no one wanted to spend the money to repair Candlestick park and keep San Francisco 49ers in San Francisco. So , it's an enigma to me as to why it is okay to spend the money to build a new arena to steal the Warriors from Oakland? 1 [GEN-5]

Vehicle manslaughter is on the rise in San Francisco, parking is a nightmare, and traffic is a nightmare so a Warriors Arena is not a welcoming addition.

~Max K. Grant

I-Hansen

From: Cassidy Hansen
To: Warriors, PLN (CPC)
Subject: No room for arena
Date: Monday, July 27, 2015 6:43:54 PM

3rd street is a parking lot when Giants' games get out. When the two seasons overlap, it will be catastrophic to the locals and those trying to reach the Bay Bridge. 1 [TR-4]

There is hardly room in this tiny city for one sports team. The 49ers move although sentimentally disappointing made sense which is proving to be beneficial for San Francisco, I believe. 2 [GEN-5]

Unless a way could be devised to inhibit/divert the majority of extra cars coming into the city with some sort of shuttle service (we know Muni cannot handle it), Mission Bay is going to suffer. Let's also remember there is a hospital with emergency capabilities there. It would be devastating to generate a bunch of gridlock right around a major hospital. 3 [TR-4]

--
Cassidy Hansen
cassidy.lee.hansen@gmail.com

I-Harvey

From: Constance Harvey
To: Warriors, PLN (CPC)
Subject: WARRIORS ARENA
Date: Thursday, July 23, 2015 12:10:45 PM

Do not build a new WARRIORS arena in SF; we have too much traffic, the Giants, and all the glorification SF needs! Oakland needs the Warriors, and it gives their young people role models to look up to. Do not take everything away from Oakland. 1 [GEN-5] The proposed arena would be a major contributor to an already overly congested area. 2 [TR-4]

I am a huge Warriors fan, and celebrated every moment of their 2015 CHAMPIONSHIP. I have been a Peninsula and San Francisco resident since 1957.

Sincerely,
Constance Harvey

June 30, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

I have serious concerns regarding the environmental impacts of the proposed Warriors Arena, which are not fully disclosed or fully analyzed in the Draft EIR.

Unmanageable Traffic and Incompatible Land Uses

The Draft EIR shows that the project would cause severe traffic gridlock, noise and air pollution in Mission Bay, right next to UCSF and other medical facilities. 1 [ERP-9] A new massive entertainment center is inconsistent with these current and previously planned future uses, previously proposed under the carefully developed Mission Bay Plan. Yet, the Draft EIR does not even discuss the land use impacts of the project, which were not analyzed in the Mission Bay Plan EIR. 2 [LU-1]

Additionally, the project will further hinder access to other parts of the City and the Bay Bridge to Mission Bay. Even with the improvements promised by the City, Mission Bay cannot handle up to 18,500 fans at 225 events per year, especially when both stadiums have games. Parking will also be a nightmare, with less than 200 dedicated parking spaces for the 18,500-seat entertainment center. While restricting the number of parking spaces may be considered a means of traffic management under the City's regulations, 3 [TR-4] the practical effect will be yet more gridlock and unhealthy air emissions. 4 [AQ-4b]

The traffic and parking impacts will reduce access for emergency and urgent care for patients seeking health care services and add to the existing commute challenges for the nurses, doctors and medical staff who work at the Mission Bay medical campus. The Draft EIR also ignores the health and safety impacts of interfering with access to essential medical facilities. 5 [TR-9]

Health Concerns

The project's traffic new massive gridlock and parking problems will also cause significant and unavoidable impacts on air quality. Increased car and truck emissions in the area will be unhealthy for residents, workers and hospital patients. This will have a disastrous impact on the health and welfare of Mission Bay residents and patients and families who rely on UCSF and other lifesaving services in Mission Bay. The Draft EIR fails to address and mitigate these health impacts, relying on vague plans and purchases of emissions offsets rather than effective mitigation measures as required by CEQA. 6 [AQ-4b]

The current health care and research center is a hub of care and innovation, the future of this world-class medical center should not be jeopardized by billionaires seeking to double the value of the Warriors as a sports franchise on the backs of San Francisco residents. 7

* * *

Overall, we are disappointed in the City's approach to environmental review of this project, which fails to fully assess the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR. Specifically, reliance on the 1998 EIR prepared for entirely different land uses for several important impact areas defies common sense and CEQA's review requirements. 8 [ERP-7] Moreover, the Draft EIR does not reflect a commitment to in innovative and sustainable development, and rather represents a step backward from environmental stewardship. 9 [PD-4]

Thus, we ask that the City of San Francisco avoid the disastrous impacts of the proposed entertainment center on the Mission Bay community, including the health and welfare of patients, families, employees and neighbors. 10 [GEN-5] The City should consider alternative sites, other than Mission Bay, for this environmentally damaging project and conduct a new and complete environmental review process before any decisions are made. 11 [ALT-4] Additionally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City with respect to this project. 12 [ERP-2]

Sincerely,
Alison Heath

333 Mississippi Street

San Francisco, CA 94107

I-Herda

From: jay herda
To: Warriors, PLN (CPC)
Subject: Public Comment: concern about street parking for residents
Date: Monday, June 22, 2015 5:17:50 PM

Hello -

While I'm very excited for the Warriors on their 2015 Championship - I am concerned with the impact that having their new stadium at their proposed SF location.
I live in the neighborhood nearby - Dogpatch - and street parking is already limited by the new hospital, university, private business and Giants fans (why use the paid parking when street is free?).

I would like to see the neighborhood parking restrictions extended later in the day for those without a permit to discourage game goers from using all the street parking before residents get home from work. We see this impact already with the AT&T stadium events and the continuing growth of the neighborhood - it will no doubt occur more with another event center nearby.

1 [TR-13]

Thank you for considering your impact on the residents of the neighborhood
- Jay Herda

I-Hestor

From: Sue Hestor
To: Bollinger, Brett (CPC)
Subject: Warriors EIR notice not given to area affected
Date: Monday, June 22, 2015 5:00:38 PM

In other words I can wait in line for an hour or so to pick up the EIR CDs at 1660. The people I talked to in Potrero Hill/Dogpatch had no mailed notice of this EIR even though the parking lots are in their neighborhood.

1 [ERP-2]

sue Hestor

I-Hill_D

From: jazzpix@pacbell.net
To: Warriors, PLN (CPC)
Subject: STADIUM
Date: Monday, July 27, 2015 5:37:56 PM
Importance: High

Please note that I am opposed to the building of a monster stadium in San Francisco's South of Market area. I moved to Potrero Hill in 1987 and, since then, every inch of land has been taken over by the developers and big money interests. 1 [GEN-5]

Meantime, our quality of living has suffered and it is now impossible to even go to the grocery store without encountering traffic jams. When there is a game at AT&T, traffic is a nightmare and getting worse every day. We were told that measures would be taken to alleviate traffic problems when that stadium was proposed – that has not happened. At the beginning, there were traffic cops to assist with the traffic flow but they disappeared pretty quickly. **My street has become a thoroughfare before and after the games and I take my life in my hands trying to back out with cars racing up and down the hill.** On Sunday, the cars used my street to bypass the runners during the San Francisco Marathon—one after the other coming up the hill from 3rd Street to get onto the 280 south freeway. They are not polite and slide through the stop signs! 2 [TR-4]

We are tired of broken promises!

I have no faith that this is going to be a good move. There is nowhere for the traffic to go. We have run out of land, folks, and also air space and all I see in the area now is one high rise after the other. Those movies now showing San Francisco destroyed are depicting what is going to happen when the next earthquake hits and it is not a pleasurable thing.

Ed Lee and the Board of Supervisors need to get back to taking care of the people who pay the taxes and love San Francisco for its unique qualities. Stop selling our streets to the highest bidder – remember the America's Cup... 3 [GEN-5]

I am a dedicated voter and I will not forget who voted for this disaster in the making!

Dorothy L. Hill
519A Pennsylvania Ave.
San Francisco, CA 94107
415-824-3502

I-Hill_M

From: Mary Hill
To: Warriors, PLN (CPC)
Subject: Support for Warriors
Date: Wednesday, July 01, 2015 2:33:12 PM

I live in Potrero Hill and totally support the new Warriors arena. 1 [GEN-5]

Mary Hill

I-Hong

From: Dennis Hong
To: Jones, Sarah (CPC); sarah.jones@sfgov.org
Cc: Bollinger, Brett (CPC); warriors@afgov.org
Subject: Case 2014.1441E - Event Center Mixed use DEIR
Date: Monday, July 27, 2015 1:06:23 PM

San Francisco Planning Department
Atten: Miss. Sarah B. Jones, Environmental Review Officer
1650 Mission Street, Suite 400
San Francisco, CA. 94103

July 20, 2015

Subject: Comments on the Draft Subsequent Environmental Impact Report
(Draft SEIR) Case Number: 2014.1441E – Event Center and Mixed Use
Development Mission Bay Blocks 29-32

Good morning Miss. Sarah Jones,

My name is Dennis Hong, I have been a resident and a private citizen residing in San Francisco all my life – Sixty five plus years and currently retired. Thank you the opportunity to review and comment on this exciting Project. I appreciate all the professional work/efforts made by both the OCII and the Planning Department made on this document. I realize that the original scope of work done on this project had changed several times including; a different site, including a number of positive community meetings with the Planning Department, the City, the sponsor (GSW), UCSF and many other stakeholders. In addition, a number of changes have been made (tweaked out) since the publication of the current Draft SEIR – June 5, 2015. To me this shows that progress is being made. As always; communication, collaboration works.

Below you will find my response and comments to this Draft SEIR - as requested by the Planning Department for consideration by the San Francisco Planning Commission, these comments are my personal views. These comments are based on the above Draft SEIR June 5, 2015 – Comment Period – June 5, 2015 to July 20, 2015 (July 27, 2015 @5pm-recently revised).

1. TRAFFIC- I am writing to express my sincere and significant concern with the impact of the additional traffic to this area; both pedestrians and vehicles; both during and after construction. Especially when the project is completed. I have been tracking this project as best as I could. Both the sponsor (GSW) and UCSF have been doing the best possible and with other involved stake holders to resolve some of these issues. This Draft SEIR captures some of that. However, it did not include some of the recent comments and or concessions that came up since it's publication. The recent concerns are mainly with traffic; during and after the games. The possibilities of these issues seem endless. But it looks like all stakeholders are on the same page and are closer than ever to resolving these issues. Most of these issues have been vented, but a compromised plan still needs to be made, the best part is, we are getting there. 1 [TR-12a]

2. My main concern is making sure that the traffic issues with pedestrian, vehicle, public transit (Muni, Cal Trains), are worked out with UCSF's master Plan. If the removal of the 280 freeway happens as proposed, it needs to be part of the EIR/plan. Removing this major link and rerouting it under ground as proposed may have a major impact to the project and this area. As I understand it a tunnel would be under Third street which happens to be land fill. 2 [TR-2h]

3. Under Cumulative Projects 5.1.5.2, were the following projects considered? HOPE, possible removal of the 280 freeway, Giants Project-Pier 70, 590 Minnesota-UCSF proposed Student Housing and 600 Minnesota-UCSF proposed Student Housing? Several of these Projects may be identified as another name – specifically the HOPE Project. For clarity purposes, could all of these cumulative projects be shown on a map, similar to fig 5-2-12? 3 [IO-3]

I-Hong

4. I realize that the control of Fugitive Dust and construction work is hard to handle. All to often the "best practices" does not work. But with all this work going on how will it affect/impact the ongoing adjacent projects, UCSF's adjacent facilities and their daily operations? The current project at Union Square, Central Subway Station is doing a better than usual job in controlling the dust from entering these high-end retail shops. This includes the California Pacific Medical Center along the Van Ness Corridor. (Use of semi- closed barriers with mesh screens). This may be an better option than some of the best practices. 4 [AQ-2]

5. The Draft SEIR does a good job trying to identify the Traffic issues. However, as I mentioned above, since it's publication additional thoughts from the community, MTA, UCSF and others came up are good, these comments should be part of the RTC / Final EIR. All stakeholders have done a relatively good job here. Most importantly the new Arena Facility needs to work with UCSF's Master Plan. 5 [TR-11]

6. More on traffic:

a. During the Events at the arena, add a MUNI shuttle/service to and from the two BART stations 16th and 24th Mission Street to the arena. 6 [TR-5a]
b. Provide additional traffic control officers before and after the events. 7 [TR-3b]
c. Possibly use other near by garages for additional parking. 8 [TR-13]
d. Restrict traffic along some of the main streets during the events for a smother flow of traffic.
e. During game/event time, work with Caltrans and the city to use a electronic freeway/street type of sign to help direct the traffic before they get in to the Mission Bay area, these events. They are doing this now when freeway sections and the bridge/s close and it works fine. 9 [TR-4]
f. Consider closing off some of the streets for emergency only access to the hospitals. 10 [TR-9]

7. Aesthetics of the project, both the sponsor and the architects have done an wonderful job. However, I do disagree with some of the comments made on the describing the Area. The use of color Photo-simulations has done an excellent job in showing what this arena may look like. As the design, color and material could have an impact on the visual skyline. I also realize CEQA does not require this step. 11 [ERP-8]

8. The new Arena will be an economic boom to both the city and local business, including UCSF, the Dogpatch area and others in the South Eastern part of town.

9.The proposed location is in an ideal part of town. The Sponsor has already done a diligent job in selecting this new site from the original Pier 30-32 which was voted down. 12 [GEN-5]

10. Include any other comments made to the (RTC) Response to Comments made during any of the public Planning Commission meetings, i.e., Planning Commission hearing held on June 30, 2015. 13 [ERP-3]

11. Construction Phase, request that the Final EIR provide time lines of this Project. 14 [PD-3]

a. A construction time line showing all ongoing/current, cumulatively or upcoming projects in the vicinity of this project must be considered. 15 [IO-3]
b. Provide the following for controls, signs and etc., for pedestrians and traffic during the construction; traffic control officers, signs, control barriers, etc.
c.Communicate with the local merchants, residences in the area of the dates, construction schedules. Especially if certain streets will be closed. A contact i.e., Project Manager to call if needed.
d. Provide provisions for dust controls, safety barriers and control signs.
e.Can the use of dust barriers be used to control the dust from getting in to the restaurants, business and residences and the hospital?
f.Can any of the recent/current legislation under consideration (regarding construction dust) be used here? I believe there was something the Board of Supervisors were looking at on this matter. 16 [PD-3]

12. Will this plan include some of Muni's "Traffic Calming" measures such as some of the intersections along Market Street? This might be a great project to include some of these concept along Market and the Van Ness Corridor. 17 [TR-3a]

I-Hong

13. It would be a true shame if the sponsor should abandon this Project. Lets not loose this opportunity of a life time. 18 [GEN-5]

In Conclusion: Based on my comments and evaluation of this Draft SEIR, case 2014.1441E of June 5, 2015; I have concluded there is sufficient information and I fully support this Project and this Draft SEIR. With all that said; a little more work needs to be done with communicating and working on the traffic issues, especially how this will or will not impact the Hospitals operations. 19 [TR-4]

If any additional information could be provided in the final Report (RTC), it would be appreciated by the many stakeholders who are personally interested in this project.

Thanks to you, the Office of Community Investment and Infrastructure (OCII), the Planning Department, the Board of Supervisors, the Planning Commission and the Mayors Office for working so hard on this project. I would like to see the process expedited so that construction can start.

Incidentally, I have also been working, I believe with UCSF's most recent Final-UCSF's Long range plan of – November 2014-State Clearing House Number 2013092047, chapter 5.

Thank you for your consideration of my comments as part of the DEIRIS and the process.
Should you have any questions regarding this email/letter, please do not hesitate to contact me at dennisj.gov88@yahoo.com.

Please: If there are any compelling reasons why you think this project should not continue or be delayed, I would be interested to understand why.

Respectfully Submitted,

Dennis Hong

Cc: B. Bollinger
T. Bohee

I-Horn1

From: Stan Horn
To: Warriors, PLN (CPC)
Subject: Public comment about Warriors June 5 SEIR
Date: Friday, July 10, 2015 9:15:02 AM

Below is a comment about the June 5 Warriors SEIR. I hope you can incorporate it into the public comments section of the next version. Thank you. Stan Horn

A WIN-WIN FOR WARRIORS-UCSF

There's a win-win way around a potential Warriors /UCSF-land-bankers quarrel whose aim is to thwart the basketball team's Third Street arena plans until a distant time when UCSF may need additional space for research -- and then junk the arena altogether.

1 [GEN-5]

In this win-win scenario, the **Warriors** would get an arena a year ahead of when they would have if the mysterious non-UCSF-affiliated group sued "until the cows come home," as they've threatened. Plus, the Warriors would have an assured income stream from office leasing, leading to the best financing rate available in the commercial real estate market; **UCSF and biotech firms** would get access to a half-million square feet of research space accommodating 2000 workers, at a timing of the university's or biotech companies' choosing; the **anti-arena crowd** would get to claim a victory plus save at least $228 million in cash in the first year and earn untold millions later in a few years; and **non-basketball-fan San Franciscans** wouldn't have to travel 100 miles to San Jose and back to see a concert.

Here's how the idea would work:

The property upon which the arena and two 250,000 square foot office/research buildings would be built was purchased by Salesforce in 2010 for $278 million, according to Bloomberg Business News. So UCSF's benefactors would presumably have to pay that sum or more to acquire and land-bank the property. But suppose they land-banked it by leasing all 500,000 square feet now and then sub-leased completed, ready-to-occupy space as researchers needed it over the next several years. At the going rate of $60 per square foot for Class A San Francisco office space, the benefactors would have an expense of $30 million a year. That's as opposed to a minimum $278 million cost of buying-and-banking it…a savings of at least a cool $248 million. The cream upon this cake is that the benefactors would almost certainly be able to sublease the space for more than they leased it, thereby making a neat profit on their good deeds.

1 [GEN-5] cont.

I-Horn1

In such a scenario, the only losers would be the delay-delay lawyers whose salivating over the prospect of years of fees would suddenly dry up.

1 [GEN-5] cont.

From: Stan Horn
To: Warriors, PLN (CPC)
Subject: Public comment about Warriors June 5 SEIR
Date: Friday, July 10, 2015 9:09:20 AM

Below is a comment about the June 5 Warriors SEIR. I hope you can incorporate it into the public comments section of the next version. Thank you. Stan Horn

Because San Francisco couldn't get its act together and build an arena 40 years ago -- the proposed arena site at 4th and Howard was turned into low-cost housing -- the Warriors defaulted to the nearest suitable place, the Oakland Coliseum. Oakland has had a good run. But now the party's over.

1 [GEN-5]

There are many good reasons why the Warriors belong in San Francisco.

- San Francisco has twice the population of Oakland. So it should have twice the fan base.

- San Francisco is much wealthier per capita, so it should

I-Horn2

provide the Warriors with a bigger potential.

- San Francisco's cachet alone will make the team more valuable as it basks in the reflections of one of the world's most popular cities.

- According to FBI statistics, fans visiting the Coliseum must forge through some of the nation's highest-crime zip codes. In San Francisco, the site is bounded by the bay, a world-renowned university, and some of the highest-priced real estate in America…none of which are known as high-crime breeders.

- Before and after games, there are nothing but acres of asphalt parking and concrete freeways and raw gray elevated train stations to greet fans in Oakland. Across the bay the arena would be surrounded by scores of cafes, night-spots, restaurants, bars, bayside parks, and pleasant walks in attractive, lively neighborhoods.

1 [GEN-5] cont.

But perhaps the main reason the Warriors belong in the City is that it will finally bring San Francisco a modern events center. San Francisco is the only big city in America that doesn't have one. San Franciscans who want to see a concert, for example, must make a 100-mile round trip to San Jose or a 40-mile round trip to Oakland. No other residents of America's principal cities have to go through that.

I-Horn2

Dozens of cultural, entertainment, artistic, educational, and sports experiences that are not now available to San Franciscans would be if there were an arena. In that sense, the events center would be as much a cultural addition to the region as our great museums. And not only San Franciscans would benefit: because of the new Muni-to-BART subway, Caltrain, future high-speed rail, ferry service, and thousands of parking spaces, the arena would be much more accessible to all Northern Californians than the freeway-and-parking-girded Coliseum is.

And don't cry for Oakland. The forever-wannabe has gone after -- and won -- virtually all of San Francisco's port jobs, more than a thousand former San Francisco BART headquarters jobs, more than a thousand former San Francisco Caltrans District IV headquarters jobs, more than a thousand former San Francisco federal government jobs, and more. Some would say that giving a little back is not unreasonable.

1 [GEN-5] cont.

I-Horn3

From: Stan Horn
To: Warriors, PLN (CPC)
Subject: Public comment about June 5 Warriors SEIR
Date: Friday, July 10, 2015 9:04:42 AM

Below is a comment about the June 5 Warriors SEIR. I hope you can incorporate it into the public comments section of the next version. Thank you. Stan Horn

A Chronicle letter-writer pointed out that more than a dozen cities have arenas near hospitals and co-exist well.

Perhaps the best such example is right here in San Francisco.

For three generations, the 60,000-seat Kezar Stadium was closer to the main entrance of the UCSF Hospital on Parnassus than the proposed 18,000-seat Warriors arena will be to the main entrance of UCSF Mission Bay. Yet never in those generations -- and thousands of 49er, USF, and high school games and traffic -- were there reported complaints about ambulance access. With 200 events per year scheduled and perhaps an hour or two of heavy traffic at each, that means that **96% of each year will be free of arena traffic that might affect ambulances.**

1 [GEN-5]

I-Horn3

As for parking, there was none at Kezar. The Warriors will build almost 1000 spaces and the Giants are about to build several thousand spaces virtually adjacent to the new arena. Several thousand spaces already exist in UCSF garages, largely empty at nights and weekends when events will be scheduled. 1 [GEN-5] cont.

Stan Horn, San Francisco

I-Hrones1

From: Christopher Hrones
To: Warriors, PLN (CPC)
Subject: Mission Bay Event Center DSEIR
Date: Tuesday, June 30, 2015 4:07:17 PM
Attachments: DSEIR comments 063015.docx

To Whom It may Concern,

Please see attached my comments on the Mission Bay Event Center DSEIR. Note that I provided an abbreviated form of these comments at the Public Hearing earlier today. This submission is to ensure that my full comments are submitted for the record.

Thanks very much,
Christopher Hrones

Public Comments

Draft SEIR - Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Submitted by: **Christopher Hrones, AICP**

Date: **June 30, 2015**

Good afternoon and thank you for the opportunity to comment on this draft SEIR. I am a new resident to San Francisco who has followed this project with interest. Prior to this year I lived and worked in Brooklyn, New York, where I had the opportunity to participate professionally in the planning and public discussion of the Barclays Center arena and associated Atlantic Yards development, which saw the relocation of the Nets basketball team from New Jersey to Brooklyn. Although there are obviously differences between that development and this proposal, there are also some interesting parallels, namely, the creation of a new 18,000 seat multiuse arena at an urban infill site accessible by transit, with major concerns initially expressed by some about traffic and parking impacts. 1 [ERP-9]

I would like to offer some observations on my experience in Brooklyn that can be instructive as we think about how to plan for the Warriors arena development.

First, the traffic congestion impact feared by many at the Barclays Center site for the most part did not materialize. As a transportation professional involved in the project from the government agency side, the biggest story for me was that the fear of congestion generated by the arena so greatly exceeded the actual impact that when the facility opened traffic congestion was more or less a non-story. This was due to a number of factors, but the two most important were that transit utilization did meet the project goals, and that vehicle arrivals to the arena were more spread out than projected, as many people who drove came early to the area to go to nearby restaurants, bars, etc. Given this, I am happy to see that this EIR does focus on transit investments. Also, developing retail at the site as proposed will encourage some people to arrive early and eat or drink before an event. This should among, other potential benefits, disperse traffic impacts 2 [TR-2d, TR-4]

A second observation from Brooklyn is that off-street parking supply provided by the project, combined with existing nearby off-street parking, far exceeded demand, and parking availability was therefore not an issue. The 541 parking spaces provided on site were never at full capacity and the lot was typically less than half full for major events such as basketball games. This was due, in addition to high transit mode share, to the availability of many nearby parking lots and garages that had capacity after the workday was over, as well as free and low cost on street parking. Many of the same conditions are present at the 3 [TR-13]

Warriors site and therefore I do not believe parking availability will be an issue here either. I will mention one negative impact associated with parking in Brooklyn -- there has been some concern from residents about parking becoming more difficult in surrounding neighborhoods as a result of arena patrons parking on street. The investigation into Residential Permit Parking zone expansion referenced in the EIR will be important if this type of impact is to be minimized in Mission Bay. 3 [TR-13] cont.

Third, inappropriate staging and idling by for-hire vehicles was a major community quality of life concern that the Barclays Arena plan did not in my opinion adequately address. Subsequent to the arena opening, a curbside area was designated for staging in response to this concern and efforts were made to reach out to the for hire vehicle industry. However, limousines and other vehicles idling in bus stops, no standing zones, etc. continues to remain an issue well after the arena opening. With this in mind, I was pleased to see that the SDEIR calls for a specific plan to stage these types of vehicles. Early and thorough communication with the for-hire vehicle industry will be important to ensure that utilization of the designated staging areas actually occurs. 4 [TR-3a]

Fourth, emergency vehicle access, which has been raised as a potential concern by some with this project, was effectively accommodated in Brooklyn, where police and fire stations are located immediately adjacent to Barclay's Center. There were no significant issues that I am aware of with fire or police vehicle response. However, close coordination between these agencies and the project owner was necessary to ensure things went smoothly. 5 [TR-9]

Fifth, management of pedestrian flows, especially immediately after events, can be challenging. Barclay's Center has an excellent pedestrian safety record; however, there was a need to make adjustments after the opening, which in addition to pedestrian management by operational personnel, included creating more effective sidewalk space, adding crosswalks, and installing barriers to prevent midblock crossing. The SDEIR is correct to propose solutions to prevent mid-block crossings to the southbound light rail platform at 3rd Street, and to acknowledge that the intersection of 3rd Street and South Street requires active operational management. I would suggest in addition to this that permanent physical infrastructure to adequately accommodate pedestrian flows, especially at 3rd Street and South Street, be included in the project. It is much easier to implement measures such as pedestrian bulbouts and additional crosswalks as part of the project than trying to create retrofits after the arena has opened. 6 [TR-6]

Finally, the phased nature of the buildout of the Atlantic Yards/Barclays Arena project led to prolonged and repeated construction impacts that overlapped with arena events. This including suboptimal temporary conditions for pedestrians, cyclists, and motorists. I was therefore pleased to see that the plan here is to 7 [TR-10] complete all construction on the site including the office towers prior to the opening of the arena, and I would urge that course of action be maintained. 7 [TR-10] cont.

Having recently lived through the planning, construction, and operation of an urban arena, I hope these observations and lessons learned are instructive. Thanks again for the opportunity to provide comments and best of luck with the project.

From: Brynn Hurlstone
To: Warriors, PLN (CPC)
Subject: Comments about Warriors Stadium Plan.
Date: Thursday, July 23, 2015 4:14:20 PM

Aren't things bad enough already? How can you consciously decide to add yet one more traffic creating, system clogging stadium to an area already mired by traffic jams. It should not take us 1.5 hours to get to the east bay during game time, or an hour and a half to get to the embarcadero from the Bayview if there is a game at any point that day, but it does and we endure. Now you're going to add to the infrastructural nightmare? And for what? We already know that the residents of the Bayview neighborhood factor the least in all city planning decisions, but to essentially ensure gridlock along the only pathway from it to the main segment of the city, and along the least efficient public transit line to boot (the T?) When do the concerns of the constituents finally stack up against the dollar signs? Where is the city planner who has chosen to do this to our city? Have they been to the neighborhood during game time? Have they commuted to and from the Bayview during a 6:00 Giants let-out? Only 2 months ago it took me two and a half hours to make it from the Bayview to the Exploratorium for a presentation, attempted arrival time 5pm. The game had let out at 3! If this city does not have the wherewithal to make it stop and improve our already laughable traffic conditions, can we not at least stop actively making it worse? Please, don't shut down transit for all. Find another location! 1 [TR-4]

Brynn Hurlstone

I-Hutson

From: Richard Hutson
To: Warriors, PLN (CPC)
Subject: Warriors Arena
Date: Monday, June 29, 2015 8:09:24 PM

Via Email: warriors@sfgov.org

Brett Bollinger

City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

I have serious concerns regarding the environmental impacts of the proposed Warriors Arena, which are not fully disclosed or fully analyzed in the Draft EIR.

I have lived on Potrero Hill for a long time, and while it is perhaps a better place to live now than it was 50 years ago, recent development has drastically increased traffic and threatens to make parking impossible for residents. Building the Warriors Arena in this neighborhood will only exacerbate these problems. We already have serious gridlock at certain times of the day at the bottom of Mississippi Street where 7th and 16th Street come together. Soon we will become prisoners in our own neighborhood. 1 [TR-4]

Overall, I am disappointed in the City's approach to environmental review of this project, which fails to fully assess the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR. Specifically, reliance on the 1998 EIR prepared for entirely different land uses for several important impact areas defies common sense and CEQA's review requirements. 2 [ERP-7] Moreover, the Draft EIR does not reflect a commitment to in innovative and sustainable development, and rather represents a step backward from environmental stewardship. 3 [PD-4]

Thus, I ask that the City of San Francisco avoid the disastrous impacts of the proposed entertainment center on the Mission Bay community, including the health and welfare of patients, families, employees and neighbors. 4 [GEN-5] The City should consider alternative sites, other than Mission Bay, for this environmentally damaging project and conduct a new and complete environmental review process before any decisions are made. 5 [ALT-4] Additionally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City with respect to this project. 6 [ERP-2]

I-Hutson

Sincerely,

Richard Hutson

347n Mississippi Street

San Francisco, California 94107

I-Hyde

From: Kathryn hyde
To: Warriors, PLN (CPC)
Subject: My comments: Warriors Stadium
Date: Wednesday, July 15, 2015 8:08:13 AM

Dear Mr. Bollinger-

I am a long time resident of San Francisco and I have worked in the Mission Bay/ Dogpatch area over the course of 7 years.

To be brief and to the point, I am totally opposed to the Warriors Stadium being located in San Francisco for these reasons:

OAKLAND
Oakland needs the Warriors and the jobs.
BART goes to Oakland, it is efficient and has long term sustainability
The City of Oakland and the Warriors can easily enhance the stadium with activities, shops, museums, and other businesses.

1 [GEN-5]

SAN FRANCISCO
SF does not need more congestion and traffic problems
Parking lots and a new bus line will not solve the problem 2 [TR-4]
Do not build on landfill 3 [PD-4, GEO-7]
The traffic has changed dramatically for the worse at Mission Bay 4 [TR-4]
Regular events at the stadium will have a negative impact for the neighborhood, businesses and UCSF hospitals in the area.
We do not need more sports and events in that area of the city. 5 [LU-1]

3 [PD-4, GEO-7]

If for some reason you are not able to keep the Warriors in Oakland, I encourage to build the stadium at the former Candlestick Park site. That neighborhood is growing and changing, they need jobs, activities, more businesses and the T - Line trains can be increased. The Warriors would receive recognition for improving the schools, sports activities in the area, and they could add museums and local light manufacturing businesses near the site. 6 [ALT-4]

Thank you,

Kathryn Hyde
Resident of San Francisco
94118

I-Jadeinsf

From: Jadeinsf
To: Warriors, PLN (CPC)
Subject: Fwd: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors" Stadium
Date: Thursday, July 23, 2015 4:03:46 PM

Hello,
Please see my message below:

Warriors owner Joe Lacob admits that SF waterfront arena is 'going to be a challenge'

and **"waterfront arena starting in 2017 might not be ... can not comply with the public trust doctrine . "** https://www.ecosia.org/search?q=An+arena+can+not+comply+with+the+public+trust+doctrine+governing+waterf

1 [GEN-5]

---------- Forwarded message ----------
From: **Alex Doniach** <alex@singersf.com>
Date: Thu, Jul 23, 2015 at 12:28 PM
Subject: RE: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors' Stadium

"An arena can not comply with the public trust doctrine governing waterfront development in the state, which requires public benefits and maritime use, and San Francisco has far better inland locations, opponents say."

Has an EIS been reviewed?

environmental impact report

n. a study of all the factors which a land development or construction project would have on the environment in the area, including population, traffic, schools, fire protection, endangered species, archeological artifacts, and community beauty. Many states require such reports be submitted to local governments before the development or project can be approved, unless the governmental body finds there is no possible impact, which finding is called a "negative declaration." (See: EIR, negative declaration)

http://www.sfgate.com/warriors/article/A-look-at-alternative-locations-for-Warriors-arena-5099137.php

Another persistent issue with the arena proposal is how to deal with **traffic on the Embarcadero**. Although the site is in close proximity to BART and Muni, a planned 500-space parking lot on-site would be for VIPs only. The arena could bring an additional 18,000 people to the waterfront on game days.

http://blog.sfgate.com/warriors/2014/01/23/warriors-owner-joe-lacob-admits-that-sf-waterfront-arena-is-going-to-be-a-challenge/

https://www.ecosia.org/search?q=An+arena+can+not+comply+with+the+public+trust+doctrine+governing+waterf

1 [GEN-5] cont.

On Thu, Jul 23, 2015 at 11:45 AM, Alex Doniach <alex@singersf.com> wrote:

Dear Concerned Resident:

An important deadline is only four days away! **Monday, July 27 is now the final day to submit your comments and concerns about the proposed Golden State Warriors' Arena and Events Center at Mission Bay.** The deadline was extended by one full week, giving the public more time to submit their feedback. Please ignore this email if you've already submitted your comments.

If you have not yet submitted your comments, this is your last chance to join us in letting the City of San Francisco know that the arena is not a welcome addition to the neighborhood.

Need help? We're happy to provide assistance. Email me (Alex) or call at 415-227-9700 for more information.

These public comments are incredibly important as any comment submitted by Monday, July 27, 2015 will become part of the City's decision-making process. Plus, submitting your comment is easy. Either we can submit your letter on your behalf, or you can email a comment of any length directly to:

Brett Bollinger of the San Francisco Planning Department at warriors@sfgov.org.

You can also submit your comments by mail at:

Brett Bollinger

San Francisco Planning Department

1650 Mission Street, Suite 400

San Francisco, CA 94103

I-Jadeinsf

Thank you for your continued help and support. Every voice counts!

Sincerely,

Alex

415-806-8566

--

Stewardship, in the Christian tradition, implies protection. Man should exist in harmony with the earth, not work against it as is noted in Colossians 1:16-17

--

Stewardship, in the Christian tradition, implies protection. Man should exist in harmony with the earth, not work against it as is noted in Colossians 1:16-17

I-Jensen

From: Lauris Jensen
To: Warriors, PLN (CPC)
Subject: Oppose!
Date: Monday, July 13, 2015 1:23:12 PM

I think the Warriors need a new home outside of SF...it wasn't okay to over-develop at the waterfront/ exceeding height limits, and it's not okay to bring huge crowds into an area that is rapidly becoming overcrowded and already houses a major new hospital, the access to which could easily become compromised when traffic backs up. I'm a native San Franciscan and a big fan but enough! The City needs to function as more than a playground. Sincerely, L. Jensen

1 [LU-1]
2 [TR-4]

I-Jones

From: Jackie Jones
To: Bollinger, Brett (CPC)
Subject: My comments re; Mission Bay
Date: Wednesday, July 01, 2015 4:17:39 PM

Dear Brett Bollinger - Here's the copy of my letter tp you.

Dear Planning Department - My comments in regard to the proposed Warriors stadium, and the UCSF Hospital.

This is an incompatible combination and should be allowed to proceed. The UCSF Medical Center is there already. Adding a sports stadium next to it would be detrimental to UCSF. It would be wiser to seek another location for the Stadium, not nextdoor to UCSF Medical center hospital. Sports games tend to attract a loud and rowdy crowd, which can be aggressive and sometimes violent. Also it monopolizes the waterfront. I object to this choice of location. It would best be put somewhere else. Let's stop it now before the trouble begins.

Please record me as being against the Warriors Stadium at the Mission Bay location. Thank You.

Jackie Jones, 82 1/2 Manchester St. San Francisco, CA 94110 jjonesaw@yahoo.com.
414-648-0117

1 [LU-1]
2 [NOI-6]
3 [GEN-5]

I-Kajiko

From: Jennie Kajiko
To: Warriors, PLN (CPC)
Subject: Objection to the Warriors Stadium Complex
Date: Saturday, July 25, 2015 2:14:27 PM

I would like to register my opposition to the planned Warrior Stadium Complex in Mission Bay. I work at UCSF and am a nurse in the outpatient department. I am concerned about the impact on traffic and access for our patients. I also live in the area and feel that one sports complex in a crowded urban area is enough. I am disappointed that the land set aside for this is not being used for the biotech or health science industry rather than entertainment. Thank you for reading this. 1 [GEN-5] 2 [TR-4] 3 [LU-1]

Sincerely,

Jennie Kajiko
690 Long Bridge St.
San Francisco, CA
94158

I-Kornberg

University of California
San Francisco

UCSF

Cardiovascular Research Institute
Department of Biochemistry and Biophysics

THOMAS KORNBERG, PHD
PROFESSOR
tkornberg@ucsf.edu
PHONE: (415) 476-8821

SMITH BUILDING, ROOM 252Z
555 MISSION BAY SOUTH
UNIVERSITY OF CALIFORNIA
SAN FRANCISCO, CA 94143

July 17, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center draft Environmental Impact Report

Dear Mr. Bollinger,

I have serious concerns regarding the traffic flow projections for the proposed Warriors Arena, which appear to not have been adequately analyzed in the draft Environmental Impact Report (dEIR).

Unmanageable Traffic Flow

Based on the dEIR, I have significant concerns about how the traffic will be monitored, handled, and directed around the proposed stadium. The idea that busses will transport people from more distant parking structures ignores the immediate problem of the complete gridlock in the area that blocks all movement in and around Mission Bay for 2-3 hours after Giants games. In looking at another recent stadium example that was also executed poorly, the busses that transport people to the train station from the 49ers Levi's stadium are overcrowded, infrequent and delayed by gridlock, making the trip between Santa Clara and San Francisco a four-hour journey after events. I fear that the proposed Warriors stadium will devolve into a similar unmanageable outcome.

I believe that two dedicated traffic lanes will be insufficient to handle the surge of traffic to this small, landlocked site. I recall all too well that the traffic lanes at Candlestick Park that were specifically directed and reconfigured to handle pre- and post-game traffic did not solve the problem of gridlock and congestion. And Candlestick had direct access to the freeway with no traffic contributing other than game traffic. In contrast, traffic along 3rd Street is already a problem. There is a major traffic flow every afternoon through the area along 3rd Street toward the Giants stadium that contributes significantly to the gridlock that follows every afternoon Giants games. Traffic congestion in the Mission Bay area is certain to continue to worsen as other already approved construction projects are completed and is likely to be devastating to our environment if the Warriors project is approved. I am aware of businesses that have already moved from the area to escape the existing traffic problems, and it is certainly not wise public policy to contribute further to them. 1 [TR-4]

The dEIR appears to assume that scheduling events in the evening will avoid traffic issues, but this seems unlikely if projections of traffic flow have not considered the contributions of all the approved projects that bring new residents and new businesses to the area, or the many occasions when there are coincident events at both the Giants and Warriors stadiums. Does the planning anticipate that attendees will arrive earlier and earlier as traffic and parking problems increase, so that the traffic to night games will inevitably encounter afternoon rush hour traffic? Does the planning address whether TV networks will be able to require earlier

I-Kornberg

than normal Warriors game times? Will there be a stipulation that no event can be scheduled earlier than a certain night hour?

Other major cities with stadiums and sports arenas in urban centers have infrastructure to handle traffic. Madison Square Garden in New York City is serviced almost entirely by public transport. Cincinnati, which has adjacent football and baseball stadiums in its downtown, has adjacent ample parking lots with direct freeway access. By contrast, Mission Bay has no infrastructure to support the increased traffic. The claim recently made on the Michael Krasny forum that the number of attendees to Warriors games is 20% of Giants games does not compute—18,500 is closer to 50% of 42,000. The notion that Warriors' games would only overlap with Giants games on rare occasions ignores the larger number of other events the facility will host – and the combination of other events happening in the City in large spaces such as the Moscone Center that draw traffic through this area. It is not just the Giants games that impact the area and must be considered.

It must be understood as a given that traffic and parking issues will reduce access for emergency and urgent care for patients seeking health care services and will add to the existing commute challenges for the nurses, doctors and medical staff who work at the Mission Bay medical campus. The dEIR ignores the health and safety impacts of interfering with access to essential medical facilities. 1 [TR-4] cont.

Additionally, the project will further hinder access to other parts of the City and the Bay Bridge to Mission Bay. Even with the improvements promised by the City, Mission Bay cannot handle a surge of up to 18,500 fans, especially when both stadiums have games. Parking will be a nightmare, with less than 200 dedicated parking spaces for the 18,500-seat entertainment center. While restricting the number of parking spaces may be considered a means of traffic management under the City's regulations, the practical effect will be yet more gridlock and unhealthy air emissions.

I am disappointed by the City's failure to realistically consider the inevitable traffic problems and the compatibility of the project with the homes, businesses and hospitals already located in the area. There is already a major problem with traffic that the City has not addressed and the modest improvements to public transport and efficiency of existing traffic lanes that have been proposed solution seem to be woefully insufficient. Certainly, the claim that there is already ample infrastructure and public transport to handle traffic is false, and the problem will only be exacerbated by the growth that is already approved.

No new major projects should be approved unless and until a solution to the existing problem is solved. 2 [GEN-5]

I ask that the City of San Francisco recognize the health and welfare of patients, families, employees and neighbors of the Mission Bay area and avoid the disastrous impacts of the proposed entertainment center. The prudent course would be for the City to consider alternative sites other than Mission Bay for this quality of life damaging project, and conduct a new and complete review process before any decisions are made. 3 [ALT-4] Additionally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City with respect to this project. 4 [ERP-2]

Sincerely,

T Kornberg

Thomas Kornberg, Ph.D.

I-Lange

From: dmlsf94109@yahoo.com
To: Warriors, PLN (CPC)
Subject: Warriors Stadium at Mission Bay
Date: Thursday, July 23, 2015 1:13:38 PM

The stadium would impact the already overloaded traffic/parking and level of crime in the city. Regardless of proposed income incentives from this project, I feel we have too many outsiders coming into the city and they only add to the traffic/parking and crime level. 1, 2 [TR-4, PS-1]

I have lived in the city for over 40 years and it has only gotten worse with the addition of sports venues.

Thank You,

Donna Lange

Sent from Windows Mail

I-Lanting

From: Michelle Lanting <claypotmassage@comcast.net>
Sent: Monday, July 20, 2015 7:47 AM
To: Warriors, PLN (CPC)
Subject: Keep mission bay clean

To Brett Bollinger of the San Francisco planning department,

The Golden State Warriors have given new inspiration to sports fans this year.

This inspiration will be even more appreciated when the team decides to build their arena elsewhere, rather than at Mission Bay.
That is an unwelcome addition and will supersede the needed protection of the bay.
Please ask the warriors to choose another site and leave Mission Bay alone.
Thank you,
Michelle

1 [GEN-5]

Sent from my iPhone

I-Laverdiere

From: Amy Laverdiere
To: Warriors, PLN (CPC)
Subject: Warriors should not come to SF without proper traffic and parking mitigation
Date: Monday, July 27, 2015 2:55:21 PM

Hi there,

I fully agree with John deCastro's position on the Warriors project (I've pasted a copy of his letter below). I am already concerned with the level of traffic and congestion in our neighborhood and on the highway exits that bring us home. The city has not presented solutions to our current problems, and so I have no confidence in any action in the future. Also, these traffic and parking troubles won't only affect the residents here, they will affect the potential ticketholders and event-goers. If the arena develops a reputation of being difficult to get to and relentlessly hard and expensive to park at the attendance numbers will be affected. I currently oppose the new arena because of the lack of planning for transit.

1 [TR-4]

Thank you for taking my concerns into account.

Amy

John deCastro's Letter:

As a long-time resident of Potrero Hill that will be impacted by the unmitigated effects of

****

Amy B. Laverdiere
Sr. Manager, Commercial Planning
Cytokinetics, Incorporated
280 East Grand Avenue
South San Francisco, CA 94080
(p) 650-624-3026

I-Leavitt

From: Leavitt, Rachel
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Monday, June 29, 2015 9:56:39 AM

To Whom it May Concern,

I am writing you today to express my concerns regarding the proposed Warriors stadium on 3rd Street in San Francisco.

I am a Registered Nurse at UCSF Benioff Children's Hospital, and I love the Warriors. I do, however, value the safety and well-being of my patients, and their families more than a new sports arena directly across from the hospital.

The infrastructure is not in place to accomodate the immense increase in traffic to the area, if a new stadium is built in the proposed location. I am concerned that staff, patients and families will have an undue amount of stress and increased travel time to and from the hospital on game days (already experienced on Giant's home game days). It took more than an hour to go 2 miles on the last Giant's home game day, and I would expect this issue to occur routinely if the proposed stadium is built. 1 [TR-4]

Having a sick child is stressful enough, I would hope that adding this extra burden to families and staff caring for them, is something you would consider as a serious negative impact that the stadium would have in its current proposed location.

I hope that the children and their families would hold a higher priority than a "nice to have" new stadium. 2 [GEN-5]

Thank you for your time, and thoughtful consideration of the impact of this proposal.

Sincerely,
Rachel Leavitt, RN
UCSF Benioff Children's Hospital
San Francisco

P.S. Go Warriors!!

I-Lee

From: Jeremiah Lee <mass@jeremiahlee.com>
Sent: Monday, July 20, 2015 11:13:45 PM
To: Warriors, PLN (CPC)
Cc: info@missionbayalliance.org
Subject: Another stadium will make Mission Bay unliveable

I lived in Mission Bay for two years at the Radiance Building on Mission Bay Blvd and recently moved out of the neighborhood. I left Mission Bay primarily because AT&T Park and its crowds wrecked havoc on the burgeoning neighborhood. Anytime there was a Giants game, it became impossible to get home using the inbound T line. Fans would transfer to the T line starting at Civic Center and fill it beyond capacity. Working in SoMa, it became impossible to board a train home. 1 [GEN-6]

Driving was also impaired. Just trying to leave my home or return to it during a game sometimes meant planning an additional half hour to get through the few blocks of traffic. 2 [GEN-6]

After games, the neighborhood sidewalks were covered in trash, vomit, and urine of drunken fans. 3 [GEN-6]

Adding a basketball stadium to Mission Bay would make this nightmare a year round nuisance. Stadiums don't belong in urban centers. Don't let the Warriors ruin the neighborhood with the most potential in San Francisco. 4 [LU-1]

Sincerely,
Jeremiah Lee

I-Lighty

July 27, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

California Nurses Association has serious concerns regarding the environmental impacts on patient access, safety and health of the proposed Warriors Arena, which are not fully disclosed or fully analyzed in the Draft EIR, and show a fundamental incompatibility between the project and Benioff Women and Children's Medical Center located across the street.

Unmanageable Traffic and Incompatible Land Uses

The Draft EIR shows that the project would cause severe traffic gridlock, noise and air pollution in Mission Bay, right next to UCSF and other medical facilities. 1 [ERP-9] A new massive entertainment center is inconsistent with these current and previously planned future uses, previously proposed under the carefully developed Mission Bay Plan. Yet, the Draft EIR does not even discuss the land use impacts of the project, which were not analyzed in the Mission Bay Plan EIR. 2 [LU-1]

Parking will also be a nightmare, with less than 200 dedicated parking spaces for the 18,500-seat entertainment center. While restricting the number of parking spaces may be considered a means of traffic management under the City's regulations, the practical effect will be yet more gridlock and unhealthy air emissions. For the nurses who work at the Medical Center, parking access looms as a major concern, unsatisfied by the parking provisions of the project and the implementation of the Muni transit plan or the timing of the event start times. 3 [TR-13] 4 [AQ-4b]

The traffic and parking impacts will reduce access for emergency and urgent care for patients seeking health care services and add to the existing commute challenges for the nurses, doctors and medical staff who work at the Mission Bay medical campus. The Draft EIR also ignores the health and safety impacts of interfering with access to essential medical facilities. 5 [TR-9]

Health Concerns

The project's traffic new massive gridlock and parking problems will also cause significant and unavoidable impacts on air quality. Increased car and truck emissions in the area will be unhealthy for residents, workers and hospital patients. This will have a severe impact on the health and welfare of Mission Bay residents and patients and families who rely on UCSF and other lifesaving services in Mission Bay. The Draft EIR fails to address and mitigate these health impacts, relying on vague plans and purchases of emissions offsets rather than effective mitigation measures as required by CEQA. 6 [AQ-4b] This concern includes the construction phase, which though temporary, occurs next to a health care facility that has large numbers of sensitive receptors. 7 [AQ-4b]

I-Lighty

Overall, we are disappointed in the City's approach to environmental review of this project, which fails to fully assess the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR. 8 [ERP-6]

For example, the assertion that there will be no significant impact on access to Emergency Services during events at the project lacks plausibility given the traffic volume and restricted road network. Traffic patrol officers will not be sufficient to identify non-ambulance patients coming to the Medical Center with an emergency, including women in labor. The ambulances themselves may be delayed, which is of course a matter of life and death. 9 [TR-9]

Given these impacts, which the SEIR fails to identify and/or mitigate, and which may not be possible to mitigate, point to the incompatibility of locating the project across the street from a hospital serving some of the most sensitive patients in the region. 10 [LU-1]

Sincerely,
Michael Lighty
Director of Public Policy
California Nurses Association

I-Lowe

From: Denise Lowe
To: Warriors, PLN (CPC)
Subject: Warrior Stadium
Date: Sunday, July 26, 2015 1:06:08 AM

I signed the petition to try and stop the stadium but it was a mistake. I honestly do not find any problem with building a new stadium even if it is near a hospital. I want to change my vote and I support the stadium project. 1 [GEN-5]

Thank you.

--
Denise Lowe

I-Ly

From: Tina Ly
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Thursday, July 02, 2015 9:06:01 PM

To Whom This May Concern,

Wow, What a season for the Warriors! and for Oakland, the Bay Area, and Warriors fans everywhere. I was born and raised in San Francisco, recently moved to Oakland, and working at UCSF Benioff Children's Hospital where the proposed Warriors stadium sits across. Part time, i work as a real estate agent at Climb SF in Potrero Hill.

While i am happy that San Francisco has grown and flourished so much since i was a kid, i am also troubled at the rate and way in which it is all happening. I am seeing my co-workers, great nurses and doctors, leave the Bay Area because they just can't afford to live here anymore. Most recently, a nurse on our unit who has been vital to our Neuro Neonatal ICU program and her husband who works as a special ed teacher. Portland now gets to benefit from their hard work and dedication in their fields of work.

Having the Stadium built across from the medical center will surely impact the quality of life for all the employees in how they get to and from work. I commute across the Bay Bridge, which isn't bad now (30min average commute), but am very afraid that the numerous game days will extend this. Public transportation is not efficient enough to get me to work in the same amount of time or less. I work 12-hour night shifts from 7pm to 7:30am the next morning and when i get off work, i just want to be home and in bed. 1 [TR-4]

While the Medical Center has a heli-pad, we are limited in the hours we are allowed to use it because of the noise it would create for our resident neighbors. Therefore, we need to rely on efficient ambulance transfers of sick patients in order to get them care. When you are THAT sick, EVERY MINUTE COUNTS. 2 [TR-9]

And what about Oakland? Sure, we can think about all the benefits this has for Oakland, but taking 20 steps back and looking at the bigger picture, we are taking away a positive force from Oakland. A city that needs more positivity in the community. San Francisco has the Giants, we have the techies, we have the city that everyone wants to be in, why not allow Oakland to keep the Warriors and provide them with a new stadium? Because after all, they are our neighbors and as San Francisco continues to grow and spill over, our communities will be shared. Let's allow the Bay Area to grow and flourish together so people have more incentive to stay close and not feel like SF is the ONLY option. Because THAT is what makes people move to other states. 3 [GEN-5]

Thank you for giving me this opportunity to speak my mind. I trust that the decision made will be one that sees not only monetary value, but the value of all humans living in this area.

I appreciate your time and consideration.

<3 tina.

I-MacKenzie1

From:	dennismackenzie@roundthediamond.com
To:	Warriors, PLN (CPC)
Subject:	Draft SEIR Comments:Warriors Arena & Event Center/Mission Bay
Date:	Sunday, July 26, 2015 10:13:36 PM
Attachments:	EIR-RESPONSE.TO.DRAFT.SEIR-OCII-T.BOHEE-PLANNING.7.20.15.docx

July 26, 2015

Ms. Tiffany Bohee, OCII Executive Director
C/o Mr. Brett Bollinger
San Francisco Planning Department
1660 Mission Street, Suite 400
San Francisco, CA 94103

Re: DSEIR Comments for Response to Warriors Arena & Event Center - Due by 7.27.15

Dear Ms. Bohee and Mr. Bollinger,

Please review and include the enclosed Attachment with my comments regarding the Warriors Arena & Event Center and Mixed-Use Development at Mission Bay Blocks 29-32, Draft Subsequent Environmental Impact Report.

Thank you for all the work you and both the OCII and Planning Department staffs do to put together such detailed and comprehensive reports.

Sincerely,
Dennis MacKenzie

I-MacKenzie1

July 24, 2015

Ms. Tiffany Bohee, OCII Executive Director
C/o Mr. Brett Bollinger
San Francisco Planning Department
1660 Mission St, Suite 400
San Francisco, CA 94103

Re: Draft Subsequent Environmental Impact Report (SEIR)
Event Center and Mixed-Use Development at Mission Bay Blocks 29-32
Office of Community Investment and Infrastructure Case No. 20114-919-97
San Francisco Planning Department Case No. 2014.144IE

Draft SEIR Public Comment Period: June 5, 2015 – July 27, 2015

Dear Ms. Bohee and Mr. Bollinger,

I am writing to share my thoughts and comments in response to this Draft Subsequent Environmental Impact Report regarding the Warriors Arena & Event Center proposed to be built in San Francisco's Mission Bay neighborhood in relation to the following issues.

Please study and respond to my following comments addressing the potential impacts that the construction of a Warriors Arena & Event Center can have for San Francisco and Mission Bay.

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Chapter 7 – Alternatives
Page 7-20

7.3.1 – Alternative A: No Project

As required by CEQA Guidelines Section 15126.6(e), the No Project Alternative is evaluated to allow decision-makers to compare the environmental effects of approving the proposed project with the effects of not approving the project. The No Project Alternative represents what would reasonably be expected to occur in the foreseeable future if the project is not approved.

7.3.1.1 - Description of the No Project Alternative

Under the No Project Alternative, the Golden State Warriors organization would not relocate to San Francisco, and Blocks 29-32 in the Mission Bay South Plan area would not be developed with the proposed event center and mixed-use development described in Chapter 3 of the SEIR. Instead, it is assumed that in the short term, the Warriors organization would exercise its option to stay in Oakland, and accordingly, the team would continue to play its home games at Oracle Arena and lease their management offices and practice facility at the Oakland Convention Center in Oakland. Oracle Arena, built in 1966 and remodeled in 1996, is the oldest facility still in use by the NBA. Therefore, under this alternative, it is likely that the Warriors organization would either build a new arena at its current location or relocate and build a new facility in the long term in the Bay Area or elsewhere.

<u>7.3.1.3 - Impacts of the No Project Alternative</u>
Page 7-23

The No Project Alternative would result in similar impacts to those disclosed in the Mission Bay FSEIR and would be subject to all mitigation measures identified in the Mission Bay FSEIR applicable to Blocks 29-32. Impacts of the No Project Alternative would also be similar to those of the proposed project. This is because many of the impacts would result from the conversion of a vacant parcel at this same location to a fully developed City block, regardless of the size of the development, and the same or similar mitigation or improvement measures identified for the proposed project would apply to the No Project Alternative. The impacts of the No Project Alternative as compared to those of the proposed project are summarized below by resource topic. The reader is referred to Initial Study (Appendix NOP-IS) and Chapter 5 of this SEIR for the full analysis of impacts similar to those of the proposed project.

The environmental impact analysis of the No Project Alternative considers only the hypothetical development scenario on Blocks 29-32 described above and does not consider any effects associated with building a new arena for the Warriors basketball team at another location. However, it should be noted that in March 2015, the City of Oakland certified a Final EIR on the Coliseum Area Specific Plan 3 which discloses the environmental impacts of a new sports venue at the current location of Oracle Arena and the surrounding area.

****
My comments and perspectives in relation to these above Chapter 7 items:

One of many potential impacts that a "No Project Alternative" would have if the construction of the proposed Warrior's San Francisco Arena & Event Center is not built at this Mission Bay location, is a fact that has become crystal clear; that is, the Warriors would not be able to return to San Francisco in order to build a new state-of-the-art Arena & Event Center. This option would also prevent the opportunity to offer an indoor multi-purpose facility that would provide not only Warriors professional NBA basketball games, concerts and a variety of sports tournaments and games for numerous college, high schools and other youth programs, but it would also prevent the potential creation of an innovative Model indoor Education & Career Development Classroom within this facility capable of offering a wide range of social-economic benefits including education, career development programs and new businesses for an untold 1 [PS-3]

I-MacKenzie1

amount of public and private sector organizations, students and youth, young adults, families and our entire San Francisco-Oakland Bay Area Community as a whole.

This is a unique opportunity to build an Event Center and Mixed-Use Development at Mission Bay on Blocks 29-32, that can offer unique and invaluable incentives, inspiration and real-world career guidance and skills development and leadership training opportunities for our youth that would disappear if this Warriors Arena project does not get built. This project can also inspire and create new jobs and careers, as well as build education and career development programs that will not be possible in any other central location in San Francisco, Oakland or other Bay Area cities. I believe it would be an unfortunate failure of our collective responsibilities if we do not cooperate as a city and community and demonstrate the successful leadership necessary to construct an NBA Arena in San Francisco at the Mission Bay location. This is a once in a life time opportunity for San Francisco leaders to collaborate effectively in order to build a professional sports facility integrated with a model visionary, innovative and strategically located indoor Classroom facility capable of enhancing and expanding our capacity to establish effective wide-ranging and healthy socio-economic growth and opportunities for our entire diverse, cross-cultural San Francisco community. At the same time, I believe our public and private sector agencies, corporate leaders and Non-Profit Foundations and officials can work together in collaboration with the Warriors in order to benefit, support and share their professional knowledge and experience inside this Arena & Event Center environment for all our San Francisco, Oakland and our Bay Area schools, youth, teachers, families and communities all year-round. 1 [PS-3] cont.

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Chapter 6
<u>Other CEQA Issues</u>

<u>6.1 - Growth Inducing Impacts</u>

<u>6.3 - Effects Found Not to Be Significant</u>
Page 6.3 – 6.4

Public Services -The project would not create impacts associated with the need for new or altered schools, parks, or other services.

<u>7.3.1.3 Impacts of the No Project Alternative</u>
Public Services / Page 7-41

Schools, Public Health, Childcare, Library, and Street Maintenance Services. Like the proposed project, the No Project Alternative would not result in increased demand for schools because it would not include residential uses. Other public services, such as demand for public health, childcare, library, street maintenance, and emergency medical would be within the assumptions provided for in the overall Mission Bay Redevelopment Plan and analyzed in the Mission Bay FSEIR. These impacts would be less than significant and no mitigation would be required.

****
My comments and perspectives in relation to these above Chapter 6 and Chapter 7 items regarding Schools:

Once again, the failure to build this Arena & Event Center - including the loss of socio-economic growth, enhanced and newly created business opportunities and a wide range of educational and career development programs, jobs, internships, practical real-world experience, leadership training and comprehensive support for our San Francisco, Oakland and Bay Area high school and college age students, non-profit youth and community organizations that can all be served year-round through visiting an indoor Warriors Arena Classroom - would be a huge loss for all sectors of our San Francisco, Oakland and the Bay Area Community; as well as the loss of creating an educational Model for our nations professional sports organizations and teams that would be worthy of emulation for future construction of Arenas and Stadiums throughout our country – and beyond.

The potential loss of building this San Francisco Warriors professional NBA Basketball Arena & Event Center, would also include the lost opportunity to create a model facility with the visionary capacity to initiate and develop an Education and Career Development Classroom in collaboration with San Francisco government, public and private sector officials and business leaders, the San Francisco Unified School District, non-profit youth and community organizations; while at the same time, create effective partnerships with public-private Non-Profit Foundations and philanthropists for financial support and matching funds as well. 2 [PS-3]

The loss of this unique opportunity would also prevent enhancing and expanding much needed opportunities for our San Francisco-Oakland and Bay Area high schools and college students. This Mission Bay location also has the opportunity to inspire new businesses, and offer our public-private sectors and government leaders and agencies to work together in order to enhance and expand long-term, comprehensive socio-economic initiatives and cross-cultural, international sports and education exchange programs as well; if not, this will be instead - a huge and irreplaceable missed opportunity for our interdependent communities of San Francisco, Oakland and the entire Bay Area.

****
7.3.1.3 Impacts of the No Project Alternative
Public Services / Page 7-23

Public Services / Page 7-41
Schools, Public Health, Childcare, Library, and Street Maintenance Services. Like the proposed project, the No Project Alternative would not result in increased demand for schools because it would not include residential uses. Other public services, such as demand for public health, childcare, library, street maintenance, and emergency medical would be within the assumptions provided for in the overall Mission Bay Redevelopment Plan and analyzed in the Mission Bay FSEIR. These impacts would be less than significant and no mitigation would be required.

I-MacKenzie1

****
My comments and perspectives below address these above items contained within the SEIR, and the 'less than significant' impact, which will not require any additional schools to be built for our San Francisco Unified School District and family needs. With this in mind, I ask that our collective efforts envision this opportunity to build a Warriors Arena & Event Center in Mission Bay to be considered an invaluable opportunity for the Warriors, City and County of San Francisco's public and private sector officials, the SF Chamber of Commerce, Non-Profit Foundations and organizations – as well as business and community leaders to support the inclusion of an indoor Classroom to be built within this Warriors facility that can be accessible to all of our San Francisco Unified School District's high schools, students and teachers in order to initiate, create and establish an Educational Methodology Model 'Magnet Education & Career Development Classroom' within this Warriors Arena & Event Center in Mission Bay:

I believe the proposal I have shared with the Warriors and all San Francisco public and private sector officials, agencies and leaders can create a "Model Magnet Sports Management & Facilities Operations Pathway" studies, including the numerous multi-media, journalism, business and other curriculums I've shared with you, the Warriors, all San Francisco Unified School District leaders and San Francisco officials that can contribute to our current challenge to attract parents and families to raise their children in San Francisco, and attend our San Francisco public schools. The numerous jobs and careers associated with any professional Basketball Arena and NBA team, ownership and organization, could initiate tremendously inspiring incentives for high school age students to listen to and learn from all the professionals presenting their knowledge, experience and guidance within this proposed state-of-the-art Warriors Arena and Event Center High School-College Career Pathway & Field Study Classroom. I trust there would be tremendous interest throughout our San Francisco and Bay Area communities and schools to participate and become involved in an education system that included real-world experience and training within this Warriors Arena in San Francisco's Mission Bay. 3 [PS-3]

This indoor Warriors Arena Classroom would have the capacity to create first-of-its-kind Model programs; including the ability to serve as a model for building future NBA Arenas throughout the country, and the Americas - as well as a unique opportunity to serve our community, city, state and country by establishing and building a National Model for other professional sports organizations and teams across the country for generations to come.

In addition to my comments above addressing these issues contained within the SEIR, I respectfully ask that you and your OCII and Planning Department staff and city officials take into consideration the details of the comprehensive programs and positive influential impacts of this Arena that I have shared with you through my previous communications and materials in writing and in public comments at both the OCII and Planning Commission hearings regarding this Arena & Event Center, my proposal to include a high school classroom within this Arena, and this Environmental Impact Report.

I-MacKenzie1

I respectfully ask that my proposal requesting the Warriors and SF city officials and leaders collaborate in order to include the far-reaching positive impact the construction of a High School-College Career Pathway & Field Study Classroom© within this SF-Warriors Multi-Use Arena & Event Center can have for San Francisco and this proposed project to be built on Blocks 29-32 in Mission Bay. I also ask that this Environmental Impact Report consider - and comment on - the immense potential loss that not building this Arena & Event Center would have; including the lost socio-economic benefits and educational programs and options lost through the failure to build this project would have without initiating a national Model Education and Career Development Classroom for the benefit of supporting our students, youth, young adults, families, communities and newly created business opportunities in the present - and for generations to come. 3 [PS-3] cont.

Thank you for your time, and the immense effort you and your staffs have dedicated in order to study and assess these numerous environmental and community issues and impacts that the construction of this proposed Warriors Arena & Event Center in Mission Bay will have for our entire San Francisco community – for generations to come.

Sincerely,

Dennis MacKenzie

I-Mason

From: Mason, Amber
To: Warriors, PLN (CPC)
Subject: comments on warriors DSEIR
Date: Saturday, June 27, 2015 12:25:21 AM

Hello,

I am a nurse at UCSF BCH. I have major concerns regarding the warriors stadium location proposal in San Francisco. 1 [GEN-5]

I have heard the debates both for and against the proposal. However, having two stadiums so close to the hospital would be detrimental to our patients, families, and employees.

I am less concerned with my personal commuting problems. More so, I am concnerned with the fact that critically ill patients will not receive the care and attention they deserve and are now able to receive. I have spoken with several AMR employees as well who have major concern regarding the transportation of patients to the hospital when there are events. I am also a transport nurse that works closely with AMR and I have seen first hand how badly traffic can impact our patient care.

Often patients are in a Code III situation, where lights and sirens are permitted. Most often, however, our patients are getting transported because they are very very ill and are near code status. It is imperative that we not sit in heavy traffic and get in and out of the hospital very quickly. Our resources are limited on the ambulance and we simply need to get back in a safe manner of time. 2 [TR-9]

I am afraid that our paitent's safety will be compromised and also that patient and family satisfaction will dramatically decrease and therefore the hospital will eventually lose the funding we need to continue to be one of the top hospitals.

Please consider my deep concerns.

Thank you

I-McDougal

From: Bruce McDougal
To: Warriors, PLN (CPC)
Cc: Bruce McDougal
Subject: Public Comment on Warriors Arena
Date: Monday, July 27, 2015 7:45:15 AM

Re: Case No.: OCII: ER 2014-919-97
Planning Dept.: 2014.1441E

Thank you for the opportunity to comment on the proposed Warriors Arena project and related office buildings in Mission Bay. As a local resident (I live by the Ballpark at 2nd and King) I strongly support the proposed development as a sport and entertainment destination for our neighborhood. Please see my thoughts below: 1 [GEN-5]

1. Traffic. The original proposal to locate the Warriors Arena at Pier 32/34 was far preferable from a traffic perspective as it would have permitted visitors to the Arena to use the multiple public transit lines that pass within a few blocks of that location. However, in view of the significant politics and expense associated with that proposal, I feel the current proposal is the "next best thing" while still providing our neighborhood the benefits of the vibrancy and activity that will be generated by the Arena. I call on Muni and Caltrans, in particular, to take whatever steps they can to enhance service in and around the proposed arena and understand that the Arena would use extra traffic-control officers during events in the same way that Giants games do. 2 [TR-3a]

2. Aesthetics. The Arena, with its round, gleaming design, will be a striking presence on the waterfront and in the neighborhood. The Mission Bay neighborhood has been built, for better or worse, with a very standardized, stucco-box and concrete aesthetic, and the proposed arena will shake that up quite a bit. When the building is empty, which will be most of the time, it will be an enhancement to have a modern building in our midst. Also, the landscaping of the waterfront park will help extend the beautiful jogging/bike trail that's been started further north. 3 [ERP-8]

3. Neighborhood benefits. Just as with the Giants ballpark, the presence of the Arena in Mission Bay will attract and encourage the development of restaurants, bars, and other entertainment facilities, more than would be drawn to the simple residential and office neighborhood that's been built around UCSF. As in the South Beach neighborhood, those bars and restaurants will attract more residents to the area and will generate taxes and activities even when the Arena is dark. 4 [GEN-5]

Thank you,

Bruce McDougal

I-Millls

From: Rusty Mills
To: Warriors, PLN (CPC)
Subject: Golden State Warriors' Arena
Date: Monday, July 13, 2015 2:25:16 PM

Mr. Brett Bollinger:

We don't need or want another congestion-producing sports palace in San Francisco. This city has a very limited geographical area which is already far too built-up. Please think about the consequences to the residents of the city -- instead of catering to the money-grubbers who would gladly turn the city into a dysfunctional ants' nest if they can make money from it. 1 [GEN-5]

~Russell Mills
115A Noe Street
San Francisco

"The past, like the future, is indefinite and exists only as a spectrum of possibilities."
~ Stephen Hawking

I-Mussetter

From: Jani
To: Warriors, PLN (CPC)
Subject: The Warriors stadium
Date: Monday, July 27, 2015 2:45:09 PM

Dear sir or madam,

I have lived here on Potrero Hill for over 20 years.

I AM 100 PERCENT AGAINST THE IDEA OF BUILDING A WARRIORS STADIUM ON 3RD ST AND 16TH STREET!!!!!!!!!!!!!

WE DO NOT WANT THAT STADIUM BUILT HERE IN SAN FRANCISCO!!!!!!!!

KEEP YOUR TEAM IN OAKLAND!!!!!! 1 [GEN-5]

The Oracle arena in Oakland is a PERFECT place for that team!!!

WE HAVE BEEN BOMBARDED WITH AN INSANE AMOUNT OF DEVELOPMENT HERE IN THE EASTERN NEIGHBORHOOD. PLEASE GIVE US A FLIPPEN BREAK!! FOR GOD'S SAKES!!!!!!!

Thank you,
Jani Mussetter

I-Osborn

From: KimOsborn2
To: Warriors, PLN (CPC)
Subject: Strongly Opposed to New Arena in Mission Bay
Date: Monday, July 27, 2015 12:18:58 PM

Dear Arena Planners,

We who work in Mission Bay already face many days a year in which a normally 35 minute commute home takes 60 minutes or more due to traffic congestion from Giants' games. Even if we like baseball, it makes us glad whenever the Giants are away or baseball season is over. For those away or off season days we actually get a sensible commute time. 1 [TR-4]

The original city plan for the area included more EVENING entertainment space, not a massive new stadium with hundreds of events at all times of day, all year long. 2 [PD-1] If the traffic were more congested after dark, that would probably be fine. During the day time, however, the Giants' stadium congestion is already enough of a challenge. 3 [TR-4]

I signed UCSF's WinWin petition because it is better than total surrender, but I would really vastly prefer that you put the new stadium somewhere else entirely.

It really isn"t fair to take a neighborhood already seriously damaged by the congested traffic around AT&T ballpark events to endure a doubling of the traffic with the Warriors' stadium. 4 TR-4

We could use a lot more retail establishments around here, and smaller restaurants would do well. The thousands of us working out here don't have a lot of choices to walk to at lunch time. That would be a welcome addition. And that is the type of thing that was on the original plan I believe. 5 [LU-1]

Ah well,
I hope the project goes somewhere else,

Kim

I-Pelly

From: Steven Pelly
To: Warriors, PLN (CPC)
Subject: Stadium
Date: Thursday, July 23, 2015 7:08:19 PM

New York City went through the same process when a stadium was proposed for Manhattan .
It was defeated, sensibly, as incompatible with Manhattan.
Same logic-different city, it doesn't belong in the Mission . 1 [GEN-5]

I-Pezzuto

From: Mary Pezzuto
To: Warriors, PLN (CPC)
Subject: don"t gut the Warrior"s base!!
Date: Monday, July 13, 2015 2:16:36 PM

Dear Mr. Bollinger,

I'm writing to offer my perspective on the proposed Golden State Warriors Arena and Events Center at Mission Bay.

The Warriors have been Oakland's team for decades, and they belong here. This is where the heart is. You will lose a significant portion of your regular ticketholders with the move, and derail the (current and ongoing) accessibility of East Bay youth and community to continue to afford and gain access to the team we love.

Moving to SF may seem strategically great from a financial/investment perspective, but that's not everything. It's not that I dislike change, it's that if you saw the turnout that came to the parade, or the energy in the playoffs and the finals, you know that Oakland doesn't just support, Oakland needs and loves this team. And Oakland needs a team to love.

I was born in SF, and my family has been here for 5 generations. I love the city. It's not about that. San Francisco has plenty of reason to party and celebrate, with all the attractions and civic and community pride. I'm thinking Pride Parade, BatKid, St. Paddy's day parade, not to mention the Giants and the 49ers (Okay, so they've left or may leave. You'll still have their parades in SF, and ATT park will continue to be a hip destination and tourist destination.) SF doesn't need more congestion to already overstressed transit, street parking, and street and ramp traffic. It also doesn't need the kind of regentrification that displaces hundreds or thousands of hardworking San Franciscans who keep the lights on and do much of the heavy lifting in the local economy. It needs to fine-tune the garden it's growing, by helping the homeless, supporting underserved neighborhoods, cleaning up the urine-soaked streets and entryways, and providing more grassroots community events to engage the public and energize neighborhood continuity. 1 [GEN-5]

Oakland deserves to keep the Warriors. The spirit of connection and civic pride that's evolved from this championship is beyond compare. People here are talking to each other in supermarkets, gas stations, banks, cafes. It's such a happy vibe, and it's pulling Oakland together. Don't hijack one of the most significant bright spots this east bay community has seen in years.

Sincerely,
Mary Pezzuto
Bay Area Native, Oakland & Visitacion Valley

I-Pierce

From: elaineyoga1111@aol.com
To: Warriors, PLN (CPC)
Subject: Arena at Mission Bay
Date: Thursday, July 23, 2015 12:04:18 PM

Dear City Planners:

I am writing to plea that you do not approve construction of the planned sports arena at Mission Bay. Such a facility would have a devastating impact on the Mission Bay Environment and the workers who must travel there to go to work and home again, as well as to the accessibility of U.C. Medical Center. 1 [GEN-5]

Thank you for your consideration.
Elaine Pierce
1262 Hampshire Street
San Francisco, California

I-Pollak

From: Robert P
To: Warriors, PLN (CPC)
Subject: warriors stadium mission bay
Date: Thursday, July 23, 2015 4:42:44 PM

I object to the construction of this stadium at this location because:
1. Traffic to stadium may occasionally during game days impede or interfere with traffic flow to SF Hospital nearby 1 [TR-4]
2. The water frpnt view belongs to all, and the stadium will deprive us of this pleasure 2 [ERP-8]

Robert Pollak
Mountain View, CA 9443
500 W. Middlefield Rd Apt 86

I-Ramsdell

From: Ramsdell, Kay (Catherine)
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Wednesday, June 24, 2015 9:29:00 AM

To whom it may concern,

I am a nurse practitioner at UCSF Benioff Children's Hospital, and I am strongly opposed to building a new Warriors stadium at Mission Bay. 1 [GEN-5]

It is already very difficult to commute in and out of the area, so much so that some co-workers have resigned their positions since we left the Parnassus campus. I will also likely resign if this stadium is built. I work in an Intensive Care Unit, and cannot withstand the additional stress of negotiating gridlock at the end of my workday.

The report that traffic can be managed in the area when the new stadium is built is not realistic, and leads me to suspect financial motives/bias in the 'experts' generating this report. 2 [TR-4]

I also cannot imagine adding to the stress of parents with sick children, who already find it difficult to travel to the new Benioff campus.

Ill children matter more than money.

Sincerely,
Kay Ramsdell, RN, NNP, MSN

I-Rosa

From: Jana
To: Warriors, PLN (CPC)
Subject: stadium
Date: Friday, July 24, 2015 9:09:56 PM

ABSOLUTELY NOT!!!!!!!!!!!!!!!!!!!!!!!!!!!! 1 [GEN-5]

I-Rowitch

From: Rowitch, David, MD, PhD
To: Warriors, PLN (CPC)
Subject: FW: MB and Warriorts
Date: Thursday, July 23, 2015 12:54:31 PM

>To whom it may concern:
>
>As a medical practitioner, I think it is important to ensure that there
>are adequate provisions for traffic to and from the Mission Bay hospital
>site in normal and emergency conditions, that parking for hospital
>employees and patient-families is prioritized and that there is attention
>to very sensitive environment of a high-acuity hospital, where many
>patients and their families are under terrific stress. In this regard,
>behavior of attendees leaving sports or concert events in the
>neighborhood of the hospital vicinity is an important concern.
>
>I think that clear plans to address these issues are needed to determine
>suitability of the Warriors Stadium located across the road from a busy
>hospital.
>
>Yours truly,
>
>David Rowitch, MD, PhD
>Professor of Pediatrics and Neurological Surgery UCSF

1 [TR-4]

I-Rynne

From: Gavin R
To: Kim, Jane (BOS)
Cc: Yadegar, Danny; Warriors, PLN (CPC)
Subject: Concerns about Warriors Arena & 5M Development
Date: Monday, July 27, 2015 4:13:08 PM

Dear Ms. Kim,

I've never taken the time to contact anyone at City Hall but two huge developments currently under consideration demand responses.

I work at UCSF Mission Bay and am convinced that the proposed arena development is a huge mistake. I am fortunate to be able to walk to work, but for my colleagues game days at AT&T Park already involve forward planning, changes to schedules, or work from home. Traffic is awful and the already glacial Muni cars are further slowed. [1 [TR-4]] The arena development is completely ill-suited to a university campus and medical center location--not to mention a prime waterfront site. [2 [LU-1]] The scale is ill judged and and it just does not fit with a world class research institution. The site is poorly served by public transport, just two routes--it only functions now because of extensive private shuttle links. [3 [TR-5a]]

Secondly I recently learned of the so-called 5M development two blocks from my home (Russ St). I am horrified by the inappropriate scale of the plans. Retail and service businesses are already being squeezed out of Soma, extending the FiDi westward will not help. The plan strikes me as intentionally vague, with promises of retail and art space, that just don't add up financially. Retail even in the Westfield is struggling to survive, and arts organizations don't stand a chance. Witness the Mint building which has sat closed--when that project for a museum (or a gallery, something?) should have been a city priority.

While I'm taking the time to write I'm curious to know what is being done about the vacant lot that used to be a car park on 7th St at Minna. It's been ripped up and become a eyesore, at night it's positively apocalyptic. I can only imagine what the tourists in the 3 nearby hotels make of it. Surely the owner has a responsibility to maintain even a vacant lot?

I could continue, but I won't.

Yours Gavin Rynne

I-Schreiner

From: Christoph Schreiner
To: Warriors, PLN (CPC)
Cc: Tom Lippe; Samuel Barondes
Subject: Vibration sensitive equipment at Mission Bay
Date: Monday, July 27, 2015 2:44:03 PM
Attachments: Vibrationexamples.pptx
ATT00001.htm

Dear Ms Bohee:

The following statement is provided in addition and as complementary information to the comments provided to you by Tom Lippe (Law Offices of Thomas N. Lippe APC, 201 Mission St., 12th Floor, San Francisco, CA 94105) on behalf of the Mission Bay Alliance regarding the Warriors Arena Project.

Surveying the vibration-sensitive equipments that are mostly used at the UCSF Mission Bay (MB) by members of the Neuroscience research community, there appear to be two groups of equipment that fall under different criteria when considering vibration design/tolerance features for buildings (according to the ASHRAE Handbook).

The main category (VC-B) relevant for MB includes: Microsurgery, eye surgery, neurosurgery; bench microscopes greater than 400x magnification; optical equipment on isolation tables such as two-photon microscopes. Tolerance vibration velocities (in microns/sec) are indicated as the yellow line in the two attached figures from a study in another building (not at MB but relevant as general reference for vibration-sensitive equipment used here). Acceptable values for vibration velocities above 8Hz vibration frequencies are 25 microns/sec (max) and up to 50 microns/sec for lower frequencies, especially those in the range of walking-induced vibrations (~2Hz). Actual values of measurements should fall below those lines (as in the example measurement in the second slide; again not made at MB) for equipment to work error free.

1
[NOI-5]

The next category (VC-C) deals with ultrahigh vibration requirements (< 6 microns/sec Max.) for electron microscopes (TEMs, SEMs). However, I did not hear from any of the Neuroscience faculty whether those currently are in use.

The EIR considers vibration-sensitive equipment not to be 'sensitive receptors' but we would disagree with that since those pieces of equipment are indispensable for performing our research, largely supported by the National Institute of Healths. The EIR indicates that, during construction, research buildings may experience vibration velocities that exceed 0.008 in/s (or 203.2 microns/s), 5 to10-fold the values considered acceptable for operating the equipment (although the affected vibration frequency range is not indicated). Additionally, the EIR does not indicate by how much those velocities may be exceeded. Without a more thorough assessment of the potential vibration levels and spectra to be expected during construction and usage of the facility the impact on vibration-sensitive equipment is not possible. Even from the few points mentioned in the EIR it appears that vibration levels would be significantly above the VC-B criteria and, thus, may constitute intolerable interference with ongoing research or medical practice.

Sincerely,

I-Schreiner

Christoph Schreiner, PhD, MD

Examples of vibration measurements and standards in a research building

I-Schreiner

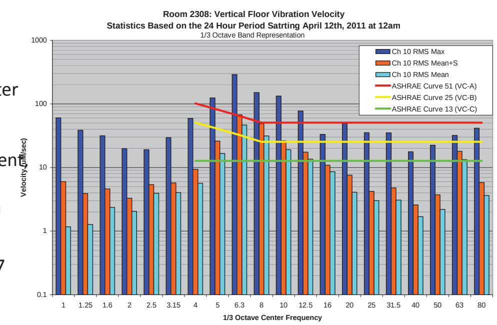
Floor Vibration Criteria

The 2007 ASHRE Hand Book (Section 47.39, table 46) provides a set of floor vibration criteria (VC) as a function of vibration frequency that are often used when the actual tool sensitivity has not been quantified. The frequency axis is broken in to bands each of which is 1/3 of an octave wide called a 1/3 octave band plot. The curves are plotted in floor vibration velocity units of microns/sec.

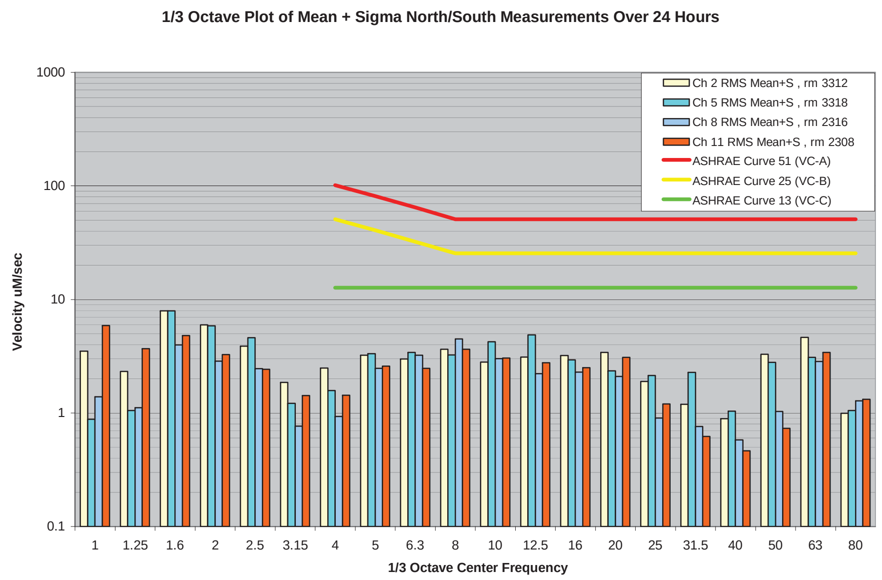
The yellow line across the 1/3 octave band plot of the vertical floor vibration corresponds to the ASHRE VC-B criterion.

VC-B – Microsurgery, eye surgery, neurosurgery; bench microscopes greater than 400x magnification; optical equipment on isolation tables; microelectronic manufacturing equipment such as inspection and lithography equipment (including steppers) to 3 um line widths.

From section 47.39 table 46 of the 2007 ASHRAE Handbook.



I-Schreiner



3

I-Shull

From: Mark Shull
To: Warriors, PLN (CPC)
Subject: The water front is a national treasure. Put the stadium some place else!!!
Date: Tuesday, July 14, 2015 11:25:23 AM

The San Francisco water front is a national treasure. We don't need an ugly visually polluting stadium or the cluster of bars and fan excesses that go along with the highly commercialized and hyped up nature of professional sports today.

Stadiums can go anywhere. There is only one San Francisco Bay. It should be a place where anyone can walk, enjoy sweeping views and feel the power and healing nature of the ocean and tides. Do not ruin this national treasure by giving into crass commercial interests who what to take this treasure from all of us, to put up a massive building that cannot but be ugly, polluting, noisy and the equivalent of trading paradise for a parking lot. 1 [GEN-5]

Save the water front for all. Put the stadium someplace else.

Mark Shull
Palo Alto, CA
650-521-0351

I-Siegel1

From: David Siegel
To: Warriors, PLN (CPC); Cohen, Malia (BOS)
Subject: Traffic Mitigation in Dogpatch
Date: Tuesday, July 14, 2015 10:08:03 PM

I am VP and founder of the Dogpatch Neighborhood Assc. We have been living at 917 Minnesota St.since 1986. We are supportive of the Warriors development if proper steps are taken to guarantee parking and traffic will be mitigated in the Dogpatch neighborhood. 1 [GEN-5]

We are concerned about the negative impact the new stadium will have on our already over taxed neighborhood parking.
Hospital workers and patients at the newly opened UCSF Hospital are currently parking on Minnesota and Tennessee streets further taxing street parking already at capacity. This is happening in spite of UCSF promising to provide traffic mitigation for 5 years prior to the hospital opening. In addition to the hospital, Giants fans are also parking in the neighborhood during games both day and night.
The addition of the Warriors stadium and other events planned at the site will only worsen an already untenable situation.
The Warriors and the City must take the necessary steps to limit further street parking in Dogpatch. Muni and Caltrain and the City must commit in writing upgrading existing public transport to accommodate increased traffic and pressure on Dogpatch parking. 2 [TR-13]

Sincerely,
David Siegel
917 Minnesota St.

--
David Siegel

I-Simpson1

From: Todd Simpson [mailto:todd.g.simpson@gmail.com]
Sent: Thursday, June 18, 2015 10:16 AM
To: Warriors, PLN (CPC)
Subject: Feedback on EIR

Hi,

I am a (concerned) resident of the Radiance (corner of Terry A Francois and Mission Bay Blvd North). I have raised this with several stakeholders, without any response yet.

Here is my concern. I would appreciate your feedback asap.

- The post-game traffic planning involves shutting down 3rd Street to northbound traffic. This is justified to allow pedestrian traffic to get onto Muni.
- Therefore, all northbound traffic will go on TAF northbound.
- The Giants development plan calls for closing TAF north of Mission Rock Street. TAF is currently often closed at the north intersection with 3rd.
- The Police and Fire station limits cross traffic on Mission Rock and China Basin Streets. They limit traffic when there are ball games; it is reasonable to expect that they will do likewise during arena events.
- Thus, **all northbound TAF traffic will need to funnel through Mission Bay Blvd North.**
- Mission Bay Blvd North is a single lane road adjacent to residences and a park. It is the only reasonable ingress/egress point for residents of the Radiance and the Madrone.

My question: Has this untenable situation been discussed, and accepted as the correct approach? Or, has this not yet been fully considered? If the later, I hope to raise awareness and effect a change to this plan. 1 [TR-4]

How can I raise the priority of this issue?

Regards,
Todd Simpson
415-676-1682

1

I-Simpson2

COMMISSION ON COMMUNITY INVESTMENT AND INFRASTRUCTURE

SPEAKER'S CARD

(Please Print)

NAME TODD SIMPSON

AFFILIATION RADIANCE (MISSION BAY RESIDENT)

AGENDA ITEM (OR SUBJECT YOU WISH TO SPEAK TO) Post event traffic plan (see back)

SPEAKING FOR THE ITEM ☐

SPEAKING AGAINST THE ITEM ☑

(See Agency Secretary for Speaker Regulations)

SPEAKER'S TIME LIMIT

Please be advised a member of the public has up to three minutes to make pertinent public comments on each agenda item unless the Commission adopts a shorter period on any item. It is strongly recommended that members of the public who wish to address the Commission should fill out a "Speaker Card" provided by the Commission Secretary, and submit the completed card to the Commission Secretary.

All northbound traffic after arena events will end up on a one way one lane residential street (Mission Bay Blvd North) as all other connectors to 3rd street from Terry A. Francois are blocked or closed (due to Giants and/or PSB). This is unacceptible.

1 [TR-4]

I-Smith

From: Smith, Christine G.
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Friday, June 19, 2015 11:08:38 AM

To whom it may concern,
I am a Neonatal Nurse Practitioner, specializing in emergency newborn care that includes transport of these complicated, high acuity, critically ill infants. My job involves helicopter, airplane and ambulance transport of medically fragile infants. My greatest concern regarding the proposed development of an arena in such close proximity to the hospital is that is would prevent the ambulances/personal cars transporting patients from reaching the hospital in a timely matter, potentially creating life threatening situations for a mother or child that is in urgent need of medical care. The importance of this cannot be understated.

1 [TR-9]

I have personally witnessed the traffic jams from an afternoon game getting out from SF Giants Stadium, which is actually further away than the proposed stadium would be. I was outside the UCSF Benioff CHildrens Hospital after a day of work at approximately 430 pm, waiting for muni. There was complete gridlock, no T train was able to easily move and people in their independent cars were stuck, people were acting aggressively, honking, yelling, and actually driving up on the designated muni sectioned off train path to break out of the gridlock. UCSF Shuttle buses downloaded their passengers to get on the T train towards downtown since they were unable to move for at least 30 minutes. Although I was frustrated to not to be able to get home from work, I was feeling relieved that I wasn't in the back of an ambulance providing life sustaining care to a child that needed further care that I cannot provide in the back of an ambulance. To say that we have a helipad, transports will fly in, is an inaccurate statement. Contact our transport team and you will see that the majority of our tranports are ambulance based, some from even here within our own city. Children often need life sustaining treatments that only UCSF can provide, such as ECMO. In fact, there are limitations on the number of helicopter landings we can do per month per the community board. I remember also thinking, I hope there is not a laboring mother in any of these cars, because I certainly wouldn't want to be in her shoes. Now what if there was an event at this new proposed arena and an event at Giants stadium? It is already so bad as it is! Not to mention there was not one security or police presence in the entire area near UCSF. It is literally an accident and lawsuit waiting to happen!

2 [TR-9]

I am from NY City, I realize change happens, areas get rejuvenated! There needs to be thorough and realistic approach to any considerations of any further developments. Quite frankly, lives are at stake. The area already has enough congestion and lack of insightfulness around how to alleviate the already cramped roadways in the Mision Bay area. The impact of such a large stadium in this hospital area would be multifold. I am writing this letter in hopes for more to gain insight into actually what we are doing here everyday at UCSF, this isn't about money, getting stuck in traffic on the way to /from work, this is about providing efficient, reliable, state of the art healthcare. The city of SF needs to reevaluate what its primary goals are and be thoughtful about how major decisions such as an arena could single handedly increase the mortality and morbidity of its citizens. Is this really worth it?

3 [TR-4]

Please feel free to contact me with any further questions
Christine Smith, NNP

From: Springer, Matt <Matt.Springer@ucsf.edu>
Sent: Thursday, July 16, 2015 6:54 PM
To: Warriors, PLN (CPC)
Subject: comments on Warriors arena draft SEIR

Dear Ms. Bohee,

I would like to submit the following comments regarding the DSEIR for the Warriors arena in Mission Bay. For disclosure, I am a Mission Bay resident, I am on the Board of the South Beach / Rincon / Mission Bay Neighborhood Association, and I am a UCSF professor. My comments do not necessarily reflect the views of the Neighborhood Association nor UCSF; they are my own.

1) Use of third-party parking structures: In Figure 5-2 in the Transportation Management Plan, it appears that several UCSF or residential parking structures are being provided as examples of where fans might park. A note in accompanying text states that the figure does not reflect actual third-party agreements, but residential parking garages should not be used for fan parking, and while perhaps the UCSF parking garage closest to the arena could potentially be incorporated into a deal of some sort with the university, the parking structure on the other side of campus in the Rutter Center should not be used as a preferred fan parking structure because that would result in a horde of fans, sometimes drunken fans, pouring through the campus. This is not acceptable at any time of day, as the research mission of the university is not confined to business hours. 1 [TR-13]

2) Page 5.2-68 states that preferred performance standards include that "event traffic does not block access to the UCSF emergency room entrance for emergency vehicles or patients on Mariposa Street between I-280 and Third Street" and says "In the event that ongoing monitoring shows at any time that the performance standards outlines above are not being met,…" It is crucial that lack of blocking of patient access to the UCSF hospital will never be a performance standard that isn't being met. That is, monitoring of the blocking of access to the hospital to identify a problem is not sufficient; rather, monitoring should be in place to prevent that from ever occurring and to actively control event traffic to allow patient access at all times. 2 [TR-3a]

3) The funding must be guaranteed for the mitigations outlined in the SEIR. Whether it comes from the City or the Warriors, the mitigations must not be reliant on there being sufficient funds; those funds should be identified and secured before the project is approved, or else the EIR is irrelevant. 3 [GEN-1b, IO-2]

4) Egress from Mission Bay South to the west occurs via the traffic circle and via 16th/Mariposa corridors. The arena attendees will be encouraged to use the 16th and Mariposa corridors or to exit to the north, but I suggest that they be actively diverted away from Mission Bay Blvd. MB Blvd doesn't show up as a preferred route but it is hard to interpret from the maps whether the traffic will be kept away from it. The residents of Mission Bay South, and those of Mission Bay North via the west end of Berry St, will rely on the traffic circle to be able to get in and out of their homes during pre- and post-event times. If arena traffic is pouring westward through the 4 [TR-4]

traffic circle, the residents will be trapped in Mission Bay or prevented from reaching it, especially as the Caltrains come through. The traffic circle should be reserved for non-event traffic. Please note that from my experience on Berry St before the west end was completed through Mission Bay Drive to 7th St, we were trapped on Berry whenever there was pre- or post-AT&T Park traffic, and we had to plan to not leave home or come home during those times via car or transit. If the traffic circle becomes held hostage to event traffic as well, then everyone in Mission Bay will experience unacceptable access limitations to their homes. 4 [TR-4] cont.

Respectfully submitted,

Matthew L. Springer
matt.springer@ucsf.edu
(415) 369-9295 (Home)
(415) 502-8404 (Work)
(415) 218-5155 (Cell)
http://www.matthewlspringer.com

I-Steiner

From: Amy Steiner
To: Warriors, PLN (CPC)
Date: Thursday, July 23, 2015 5:21:13 PM

Building the stadium at Mission Bay is a bad idea. Many of us think so and we vote. Please find somewhere else or send them back to Oakland. 1 [GEN-5]

Sincerely,

Amy A. Steiner

I-Sterling

From: Kaylah Sterling
To: Warriors, PLN (CPC)
Subject: Please don"t build the stadium
Date: Monday, July 13, 2015 2:55:02 PM

I'm against building the Warriors stadium at its proposed site: 1 [GEN-5]

I'm not in favor of:
More traffic near the UCSF hospital/medical offices
More traffic in SOMA
More traffic on the bay bridge 2 [TR-4]
Parking issues 3 [TR-13]

Please don't allow the Warriors stadium to be built at the proposed site

Kaylah Sterling
(Sent from my iPhone)

From: Michael Stryker
To: Warriors, PLN (CPC)
Subject: Comments on Warriors Entertainment Center Draft Subsequent Environmental Impact Report
Date: Sunday, July 26, 2015 6:17:06 PM
Attachments: Warriors-letter-Stryker.pdf

To Brett Bollinger

City of San Francisco

Dear Mr. Bollinger,

Please consider my comments on the proposed Warriors Entertainment Center Draft Subsequent Environmental Impact Report , which are presented in the attached letter.

Michael P. Stryker, Ph.D.

William Francis Ganong Professor of Physiology

Center for Integrative Neuroscience

675 Nelson Rising Lane, Room 535

University of California

San Francisco, CA 94143-0444

I-Stryker

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

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MICHAEL P. STRYKER, Ph.D.
W.F. GANONG PROFESSOR OF PHYSIOLOGY
Voice: (415) 502-7380
Fax : (415) 502-7332
E-Mail: stryker@phy.ucsf.edu

SCHOOL OF MEDICINE
CENTER FOR INTEGRATIVE NEUROSCIENCE
675 NELSON RISING LANE, ROOM 19A-415B
UNIVERSITY OF CALIFORNIA
SAN FRANCISCO, CALIFORNIA 94143-0444

July 25, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

As a professor at UCSF-Mission Bay, I believe that the proposed Warriors Arena will have a devastating impact on the faculty and students of UCSF and on the health care professionals and patients in our hospital. The impact of this project on traffic and transportation is not appropriately analyzed in the portions of the Draft EIR that I have read. 1 [ERP-9]

We who work at UCSF Mission Bay and use public transportation (the T line and the Golden Gate ferry) know that the transportation system frequently fails during Giants games, extending commute times unreliably often by hours as a result of missed connections in the intermodal travel. The overall impact of the Giants home games on public transportation (and on alternatives like Uber and taxis) are such that I personally, along with many others, choose to drive a car back and forth to Marin when there are events at AT&T Park during the times I would travel. The failure of public transportation can not be remedied when the Muni shares right of way with cars and the intersections are blocked. The proposed Warriors Arena would exacerbate this situation beyond measure. 2 [TR-5a]

The idea that there would be more than 225 traffic-generating events per year at the proposed Warriors Arena, which is much closer to our campus and hospital than AT&T Park, is a nightmare that can not be alleviated by having policemen direct traffic. The fact that events at AT&T Park and the proposed Warriors Arena would coincide more than than 30 time a year is truly horrible. No one will be able to go to or from work on those days, or get to our hospital, without delays that are completely unreasonable.

Access to the Bay Bridge and to the south, as well as to the hospitals, will also be tremendously compromised by the gridlock that will ensue when fans come to the stadium. Bay Bridge commuters have to go north, and 3rd and 4th streets will be impassible or perhaps closed to cars in order to allow the Muni to run. The Mariposa freeway entrance and exit can take only very low traffic flows, nothing like the freeway entrances and exits at the present Warriors arena in Oakland. 3 [TR-4]

The proposed parking restriction, with 200 spaces for 18,000 fans at the proposed Warriors Arena, is also ludicrous, and will result in further gridlock and air pollution [5] as fans cruise the neighborhoods in search of a place to park. 4 [TR-13]

I-Stryker

Finally, the traffic situation will surely impair ambulance access to our hospitals. I have seen this happen during occasional Giants game gridlock, as ambulances get stuck on 3rd Street for more than 5 minutes through 3 lights. This problem will be unimaginably worse with the addition of the proposed arena. The Draft EIR ignores the health and safety impacts of interfering with access to essential medical facilities. 6 [TR-9]

None of the assessments of traffic take account of the huge increase in the residential population of the Mission Bay community that will take place when the many apartment blocks under construction are occupied. The transit-first philosophy of the City assumes, I suppose, that the public transit system that is already overburdened and frequently dysfunctional can accommodate the thousands of additional patrons without further deterioration. Given features like the transit constriction at the 4th street bridge, such a view is unreasonable. The transit system and traffic will surely become worse even before the proposed Warriors Arena is in place. No reasonable assessment of the traffic impact of the proposed Arena can be made without measuring that of the new residential developments, something that will be possible only in a year or two. 7 [TR-2h, AQ-4b]

I ask that the City of San Francisco avoid the disastrous impacts of the proposed entertainment center on the Mission Bay community, including the health and welfare of patients, families, neighbors, and university students and employees including faculty members like me. 8 [GEN-5] The City should consider alternative sites, other than Mission Bay, for this environmentally damaging project 9 [ALT-4] and conduct a new and complete environmental review process before any decisions are made. Finally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City concerning this project. 10 [ERP-2]

Sincerely,

Michael P. Stryker

Michael P. Stryker, Ph.D.
William Francis Ganong Professor of Physiology
Center for Integrative Neuroscience
675 Nelson Rising Lane, Room 535
University of California
San Francisco, CA 94143-0444

I-Sullivan

From: Jim Sullivan
To: Warriors, PLN (CPC)
Subject: Comments on Draft SEIR
Date: Thursday, July 09, 2015 9:24:05 PM

I have three comments:

1) The planned event center will hold less than half of AT&T Park's capacity and by far the majority of events at the new arena will be held on days/times when the Giants will not be playing.

2) As at AT&T Park, the arrival times of attendees will be occur over a longer period than at other venues in the country because of the various attractions and amenities (food and otherwise) that will exist around the arena site. Traffic of all types (autos, public, walking) will not all occur right before the start of the events easing the various traffic flows. 1 [TR-2d]

3) I believe that this event center will be a very positive addition to San Francisco. 2 [GEN-5]

Thank you for your consideration of these items.

Jim Sullivan
825 30th Avenue
San Francisco, CA 94121

From: Tan, Judy
To: Warriors, PLN (CPC)
Subject: Unmanageable and Unhealthy!
Date: Monday, July 27, 2015 11:15:44 AM
Importance: High

July 27, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

I have serious concerns regarding the environmental impacts of the proposed Warriors Arena, which are not fully disclosed or fully analyzed in the Draft EIR. I do not believe that the most recent announcement from UCSF (WinWinSF) would adequately address the following points:

Unmanageable Traffic and Incompatible Land Uses

The Draft EIR shows that the project would cause severe traffic gridlock, noise and air pollution in Mission Bay, right next to UCSF and other medical facilities. 1 [ERP-9]

A new massive entertainment center is inconsistent with these current and previously planned future uses, previously proposed under the carefully developed Mission Bay Plan. Yet, the Draft EIR does not even discuss the land use impacts of the project, which were not analyzed in the Mission Bay Plan EIR. 2 [LU-1]

Additionally, the project will further hinder access to other parts of the City and the Bay Bridge to Mission Bay. Even with the improvements promised by the City, Mission Bay cannot handle up to 18,500 fans at 225 events per year, especially when both stadiums have games. Parking will also be a nightmare, with less than 200 dedicated parking spaces for the 18,500-seat entertainment center. While restricting the number of parking spaces may be considered a means of traffic management under the City's regulations, the practical effect 3 [TR-13]
will be yet more gridlock and unhealthy air emissions. 4 [AQ-4b]

The traffic and parking impacts will reduce access for emergency and urgent care for patients seeking health care services and add to the existing commute challenges for the nurses, doctors and medical staff who work at the Mission Bay medical campus. The Draft EIR also ignores the health and safety impacts of interfering with access to essential medical facilities. 5 [TR-9]

Health Concerns

The project's traffic new massive gridlock and parking problems will also cause significant and unavoidable impacts on air quality. Increased car and truck emissions in the area will be unhealthy for residents, workers and hospital patients. This will have a disastrous impact on the health and welfare of Mission Bay residents and patients and families who rely on UCSF and other lifesaving services in Mission Bay. The Draft EIR fails to address and mitigate these health impacts, relying on vague plans and purchases of emissions offsets rather than effective mitigation measures as required by CEQA. 6 [AQ-4b]

The current health care and research center is a hub of care and innovation, the future of this world-class medical center should not be jeopardized by billionaires seeking to double the value of the Warriors as a sports franchise on the backs of San Francisco residents. 7 [GEN-5]

* * *

Overall, we are disappointed in the City's approach to environmental review of this project, which fails to fully assess the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR. Specifically, reliance on the 1998 EIR prepared for entirely different land uses for several important impact areas defies common sense and CEQA's review requirements. 8 [ERP-7]
Moreover, the Draft EIR does not reflect a commitment to in innovative and sustainable development, and rather represents a step backward from environmental stewardship. 9 [PD-4]

Thus, we ask that the City of San Francisco avoid the disastrous impacts of the proposed entertainment center on the Mission Bay community, including the health and welfare of patients, families, employees and neighbors. 10 [GEN-5]
The City should consider alternative sites, other than Mission Bay, for this environmentally damaging project 11 [ALT-4]
and conduct a new and complete environmental review process before any decisions are made. Additionally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City with respect to this project. 12 [ERP-2]

Sincerely,

Judy Tan, Ph.D.

19B Beaver Street
San Francisco, CA 94114

--

Judy Y. Tan, Ph.D.
Assistant Professor
Department of Medicine
Division of Prevention Science
550 16th Street, 3rd Floor, Box 0886
San Francisco, CA 94158-2549
Voice: 415-476-6052
Fax: 415-476-5348

I-Trossbach

From: JoAnn Trossbach
To: Warriors, PLN (CPC)
Subject: Warriors Stadium
Date: Friday, July 24, 2015 5:41:10 AM

Attn: Brett Bollinger

I think it would be another great enhancement to and for the City of San Francisco to have the stadium here in the City 1 [GEN-5]
Sent from my iPhone

I-Tsai

From: Tsai, Richard
To: Warriors, PLN (CPC)
Subject: concerns for new warriors stadium
Date: Thursday, July 23, 2015 2:58:36 PM

Hello,

I am a physician at UCSF Mission Bay (research buildings, not the recently opened hospital) and am concerned about the impact to traffic a new Warriors stadium will bring to the area. I commute daily to Mission Bay by car and have already noted a significant increase in traffic since the hospital opened. On days with Giant's games or other events, traffic is pretty much a stand still.

There are currently only really 4 options into and out of Mission Bay for the vast majority of people coming from the city, or bay bridge. When one consults a map, you can see that you need to take either 16th street west, Mariposa West, or you can take 3rd or 4th street north. The entire Portrero Hill area cannot exit west unless at 16th, 17th street or all the west south to Cesar Chavez. This creates huge bottle necks at 16th and Mariposa, which are at times only single lanes due to construction or people making left turns. 1 [TR-4]

7th street or Owens street to 7th street will NOT be a viable option. The intersection of Owens to 7th Street is very complicated, spanning 2 lights and a busy Cal Train crossing. People who want to turn onto 7th from Owen often cannot because during rush hours, 7th street is a parking lot and the Cal train is frequently passing by.

Let's not even try using 3rd and 4th street to exit/enter Mission Bay during a Giant's game, let alone a Giant's game and/or other events at the proposed Warriors stadium.

The ability for patients and healthcare givers to access Mission Bay in a timely manner is of paramount importance, and another giant, busy public venue such as the Warrior's stadium will certainly impede that.

Thank you,
Richard Tsai

Richard Tsai MD MBA
Behavioral Neurology Fellow
Clinical Instructor, Department of Neurology
University of California, San Francisco
Memory and Aging Center, MC 1207
675 Nelson Rising Lane, Suite 190
San Francisco, CA 94158

Tel: 415-502-7627
Fax: 415-476-4800

I-Tsai

Email: rtsai@memory.ucsf.edu

I-Tuialu'ulu'u

From: TuiFam
To: Warriors, PLN (CPC); alex@singersf.com
Subject: proposed Golden State Warriors' Arena and Events Center at Mission Bay.
Date: Tuesday, July 14, 2015 10:49:38 AM

Hello,

Mission bay is a beautiful area where I go on a regular basis to take loved ones to medical appointments and visits. The arena being built here is going to be a huge inconvenience to many residents, commuters, and especially hospital visitors and staff in general. More than that, I feel it poses a safety issue to the community's children. 1 [GEN-2]

I demand that the powers that be understand and truly consider the implications of building an arena in this area. The new children's hospital and its EMERGENCY ROOM are located there. The traffic that this arena will bring to the area will devastate any chances of parents, in a true emergency, being able to get to the hospital in time. By building this arena here, you are putting the lives of children unnecessarily at risk all so you can have one more sports team in the city. 2 [TR-9]

Entertaining this idea is reckless and irresponsible. As the local SF government you have a responsibility to the health and public safety of the community and that MUST come first! 3 [GEN-5]

Blessings,

R. Tuialu'ulu'u

"Turn your face to the sun & the shadows fall behind you" - Maori Proverb

I-Vyas

From: Vyas, Girish
To: Warriors, PLN (CPC)
Date: Wednesday, July 15, 2015 9:29:05 AM

Considering the new UCSF hospital and current traffic jams in the Mission Bay Area locating the Warrior Stadium in the area if absurd and should not be allowed by city. Certainly, the owners of the 12 acre parcel have a profit motive with utter disregard for the crowded development around the area. Hope that the civic minded authorities in the city hall will prevent this from happening. 1 [TR-4]

Girish.

Girish N. Vyas, Ph.D., F.R.C.Path.
Professor, Department of Laboratory Medicine
Clinical Sciences Room C-224
521, Parnassus Avenue
San Francisco, CA 94143-0451
e-mail girish.vyas@ucsf.edu
Phone: 415-476-4678; Fax 415-476-5520
Emegency Cell Phone: 415-608-3841

From: Elizabeth Waldron
To: Warriors, PLN (CPC)
Subject: New Arena
Date: Monday, July 13, 2015 3:09:59 PM

An arena is not a welcome addition to the neighborhood in which it is proposed to be located. It does not fit well into an areea where families reside and should be placed in a more business dedicated locale. 1 [GEN-5]

Elizabeth Waldron

I-Watson

-----Original Message-----
From: joanne.watson@yahoo.com [mailto:joanne.watson@yahoo.com]
Sent: Monday, June 15, 2015 5:31 PM
To: Warriors, PLN (CPC)
Subject: Public Comment: concern about street parking for residents

I live 2 blocks away from the proposed site (18th and Tennessee). Street parking is already limited by the new hospital (why use the paid parking when street is free?).

I would like to see the restrictions extended later in the day for those without a permit to discourage game goers from using all the street parking before residents get home from work. (Some already happens with ATT, even though not as close.). Or maybe restricted sections on each street for only permit holders. Or some other solution. 1 [TR-13]

People are not going to pay for parking in those "many" available spots if they can park on street. And that will cause untold problems for residents.

Joanne.Watson@yahoo.com
415 244-7535

I-Wheeler1

From: Wheeler Priscilla
To: Warriors, PLN (CPC)
Subject: stadium
Date: Friday, July 24, 2015 8:19:23 AM

To: Planning Department
Please do not allow a stadium to be built next to the hospital. This is a crazy plan. The MTA says it will have solutions for traffic. Does anyone who lives in this city believe the MTA about anything? Just look at the job they are doing now with traffic 'solutions'. I am a native San Franciscan and enough is enough!!! 1 [TR-4]
Priscilla Wheeler

I-Wheeler2

July 24. 2015

RECEIVED

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

Dear Mr. Bollinger,

As a native San Francican, a homeowner and a tax payer I am writing to request that you do not approve a stadium to be built in Mission Bay right next to a busy hospital. 1 [GEN-5]

We are already experiencing gridlock on our streets and constant disruption from construction sites everywhere. 2 [TR-10]

The idea that the MTA will come up with traffic solutions is laughable on the face of it. 3 [TR-4]

Please consider that our city is small and already bursting at the seams.

Respectfully,
Priscilla Wheeler

I-Wife

From: Johns Wife
To: Warriors, PLN (CPC)
Subject: Warriors should stay in Oakland!
Date: Tuesday, July 14, 2015 12:34:26 PM

I feel that the City is congested enough and that adding another arena will make it worse. Let the Warriors stay in Oakland! 1 [GEN-5]

I-Williams

From: Williams, Joanne
To: Warriors, PLN (CPC)
Subject: Warriors Stadium at Mission Bay
Date: Thursday, July 23, 2015 12:13:58 PM

Dear Mr. Bollinger,

I am a San Francisco native, a UCSF employee of 10 years at the UCSF Mission Bay campus and a Warriors fan. I am concerned about how traffic will be directed during Warriors games if the stadium is built at Mission Bay. 1 [TR-4] We already have severe traffic congestion during SF Giants game time. How will the patients get access to the new medical center, especially in an emergency? 2 [TR-9] What will happen when there is a Giants and a Warriors game during rush hour? I can't see how this will work, especially for the UCSF patients. 3 [TR-4]

Thank you,
JoAnne Williams

I-Woods

300 Channel Street, #10
San Francisco, CA 94158-1520
Email: corinnewoods@cs.com

July 27, 2015

Tiffany Bohee, Executive Director, OCII tiffany.bohee@sfgov.org
C/o Brett Bollinger, SF Planning Dept. warriors@sfgov.org
Via e-mail

Re: GSW Event Center DSEIR OCII Case No. ER2014-919-97
Planning Department Case No. 2014.1441E

Dear Tiffany,

I have questions about the adequacy and accuracy of the DSEIR for the Golden State Warriors Arena project in Mission Bay South Blocks 29-32.

Transportation and Circulation, SEIR Section 5.2

Impact TR-1. While the SEIR states that the project would not result in construction-related ground transportation impacts because of their temporary and limited duration, the use of Terry Francois Boulevard for construction staging will have a significant impact on traffic flow to and from AT&T ballpark parking lots. Improvement Measure 1-TR-1 needs to be stronger. Where suggested mitigations "could" be required, the word should be changed to "shall", and enforcement must be incorporated in the plans. When there are events at AT&T Park, Terry Francois Boulevard needs to be vacated by construction staging and equipment to allow clear traffic flow, as is done by Mission Bay infrastructure developers to clear roads on event days to allow free traffic flow. 1 [TR-10]

Impact TR-2 and TR-3. While parking in and of itself is not considered a significant environmental impact (based on SB743), the traffic caused by searching for (acknowledged inadequate) parking, or drop-off/pick-ups around the Arena, will create a significant and unavoidable impact, even with mitigation. If this neighborhood is to survive the impact of the arena in addition to the already unacceptable conditions that result from ballpark events, there needs to be effective mitigation of the unavoidable impacts. The SEIR suggests mitigation strategies that "could" be implemented "if feasible", but there are no teeth in the recommendations. Mitigation measures must be specific and enforceable through permits, conditions, agreements or other measures. Mitigations contingent upon further (required) discretionary approvals may not be enforceable, and cannot be deferred. The SEIR mitigation strategies need to be tightened up so that "could" becomes "shall", and the necessary mitigations are stated as conditions of project approval. 2 [TR-4]

Creation of a Transportation Management Plan and coordination and implementation of the TMP demand oversight and authority to enforce and if necessary, amend the plans to respond to "lessons learned", conflicts and changing conditions. While the Ballpark/Mission Bay Transportation Coordinating Committee (see Mitigation Measure M-TR-11b) has been helpful in both interagency coordination of traffic and transportation impacts of the ballpark and expression of neighborhood issues, the BMBTCC has no official authority or standing to enforce or amend plans, or ensure adequate funding for required mitigations. The OCII is in no position to become an enforcing agency, and leaving 3 [TR-3a]

I-Woods

implementation to "the City" is too vague – there's no authority or accountability. The SEIR should clearly designate a responsible authority to enforce, amend and access funding for mitigations. 3 [TR-3a] cont.

It has been our experience that adequate funding and oversight of mitigations, and flexibility to amend the plan, is the key to success. While the project sponsors are supposed to be drafting a Special Reserve Account to set aside the operational costs of the impacts of the arena, there needs to be a specific and enforceable reference in the SEIR that funding of mitigations will be dedicated for the life of the plan and not subject to the vagaries of City General Fund budget cycles. 4 [GEN-16]

Impact TR-6, TR-21, TR-22 While the SEIR addresses active management of pedestrian flows, it needs to be tied to priority for transit. Pedestrians need to be controlled so that transit vehicles have priority over vehicles exiting garages and pedestrian movement. 5 TR-6

The most important mitigation for traffic congestion is to reduce the number of private passenger vehicles attempting to access the arena through Mission Bay's limited and congested street network. It is important that the SEIR require off-site parking, shuttle access to off-site parking, link ticket sales to off-site parking or transportation alternatives, create smart phone or other electronic links to available parking (including reactivation of SFPark), and actively discourage private passenger vehicle access to the Mission Bay neighborhood by providing better transit service. 6 [TR-12a] The assumption that UCSF or Alexandria (ARE) parking garages or private parking lots in Mission Bay will be available for Arena patrons is faulty. This incorrect assumption, which inaccurately overstates available parking in the neighborhood, makes it even more critical to discourage "at will" attempts by arena patrons to drive and hope to find parking or the congestion caused by ride-hailing services (TNC's). 7 [TR-13]

As an active participant in the development of Mission Bay, Chair of the Mission Bay Citizens Advisory Committee, 30 year resident of the neighborhood, and MBCAC representative to the B/MBTCC, I am very concerned that resources for mitigations are overestimated, enforcement and funding are underestimated, and authority and responsibility for implementation of mitigations is vague and 8 [IO-2] unenforceable as expressed in the SEIR. Some of the proposed mitigations in the Mission Bay SEIR still haven't been implemented, and without specific designated authority and responsibility for implementation, there is no assurance that important mitigations for the impacts of the GSW Arena will actually occur or be maintained. 9 [PD-1]

Sincerely yours,

Corinne W. Woods

I-Woody

From: james woody
To: Warriors, PLN (CPC)
Subject: Warriors in SF
Date: Tuesday, July 14, 2015 11:02:58 PM

NO WAY!!! Look at the logistics!! Suppose there is a Warriors game and a Giants game going on at the same time!!
Uhhh.....think about the traffic and think about the parking nonsense......THERE IS NO MORE PARKING - ANYWHERE!!!!

ARE YOU KIDDING? 1 [TR-13]

There is NO room to put up an arena for the Warriors! There are NO PARKING SPACES AVAILABLE!!! How would you expect an ambulance to transport a patient facing death to get to the UCSF Emergency Room at the Hospital there? 2 [TR-9]

The Warriors, as spoiled as they are right now, are perfectly accommodated in Oakland right now! I don't care how much these rich, little whiners piss and moan about it - screw 'em! They are doing well enough, right where they are!!

DO NOT BRING THEM TO SAN FRANCISCO!! THEY DON'T BELONG TO SAN FRANCISCO!! THEY BELONG TO THE ENTIRE STATE! KEEP THEM PLAYING IN OAKLAND (in a fine, modern venue)! THEY ARE DOING VERY WELL, RIGHT WHERE THEY ARE......... 3 [GEN-5]

I-Yost

From: Dave Yost
To: Warriors, PLN (CPC)
Subject: No on the Warriors stadium
Date: Monday, July 13, 2015 12:23:08 PM

Don't ruin Mission Bay! 1 [GEN-5]

and certainly don't subsidize any stadiums!

Dave Yost

I-Zboralske

From: jfz723@yahoo.com
To: Warriors, PLN (CPC)
Cc: James Zboralske
Subject: Warriors Opposition Letter
Date: Monday, July 27, 2015 9:59:39 AM
Attachments: Warriors-Objection-Letter-Final Copy.docx

Hello,

I am a current resident of Mission Bay and am submitting the attached letter to voice my concerns and opposition to the planned Warriors Arena Project in my neighborhood. 1 [GEN-5]

Please acknowledge receiving this email and the attachment.

Regards,

James Zboralske

I-Zboralske

July 25, 2015

Ms. Tiffany Bohee
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Ms. Bohee:

I am writing and submitting this letter to voice my concerns and objections to the proposed building of the Golden State Warriors Arena in Mission Bay.

I am a longtime San Francisco resident and have lived in several different neighborhoods over a period that exceeds 25 years. I have lived in the Mission Bay area for the past three and one-half years. I moved to the area in December 2011 and lived in the Strata Apartments located at Fourth Street and China Basin. At that time, there was very little completed development in the area and little in the way of on-going construction projects. In August 2012, I moved into a newly constructed condominium building located on Mission Bay Boulevard North. I still reside there.

I am retired and have keenly followed the growth and development in the area. I walk between four to six miles about five times a week. These walks take me all around Dogpatch, Mission Bay, Lower Potrero Hill, Showplace Square, SOMA and the Embarcadero. I walk at various times in both the morning and afternoon hours. I walk before, during and after events at AT&T Park.

During these walks I am constantly evaluating vehicular traffic flow, pedestrian and bicycle traffic patterns, signal light timing, traffic signage effectiveness, the impacts of on-going construction projects and observing, when possible, traffic control and mitigation efforts by police officers, parking control officers and employees of construction companies. 2 [TR-1]

Why do I take such a detailed and keen interest in these matters? Simply put, I'm a retired law enforcement officer with well over 30 years of municipal law enforcement experience and this stuff just fascinates me. I have extensive experience in all aspects of municipal policing. With respect to the development of the Mission Bay area my extensive experience with uniformed patrol duties, traffic enforcement strategies, traffic control measures, noise issues, parking enforcement, community policing and crime prevention, addressing quality of life issues and special event management is relevant. In fact, I would be considered a subject matter expert (SME) in these areas.

In addition to walking extensively, I also regularly take the Muni T-line and the new 55 bus. This allows me to adequately evaluate those services as well.

Over the past years things have changed significantly in Mission Bay and throughout a large portion of San Francisco. Specifically, in Mission Bay many large residential buildings have been completed and occupied. Others are in various states of construction. The new UCSF Children's Hospital project has been built and opened in early 2015. The new Public Safety Building has been completed and occupied. The San Francisco Giants' plan for significant development on Lot A is working its way through a process and has yet to be finalized. It does call for significant proposed changes on that parcel. Proposed changes to Pier 48 are in the works. High-profile businesses plan to build and locate their corporate offices in the area. A significant amount of newly planned residential developments are in the proverbial "pipeline" in Mission Bay, Dogpatch, Potrero Hill and Showplace Square. 3 [IO-3]

Virtually all of these projects impact local residents by causing traffic congestion, noise pollution, taxing public transit and affecting important quality of life issues in the area. As the projects are completed, the influx of new residents living in the area has increased significantly and at a rapid rate. The influx of new workers (in significant numbers) also impacts traffic and public transportation ridership. This will only be accelerated over the next couple of years as thousands of new residential units and many large-scale new retail and commercial buildings will be built and occupied. The scope and pace of development in Mission Bay and its surrounding areas is astonishing.

New local residents use many services that draw additional traffic to our neighborhood. Many of these services use or even require the use of vehicles such as: taxis and ride share companies, delivery services (UPS, FedEx), moving services, pet walkers, house cleaners, nannies, home repair and remodel services and meal delivery companies. In my building alone there are 50-70 of these occurrences on most days. Many of the local businesses also receive deliveries and they face the same problem. 4 [TR-8]

Few of the streets have any commercial loading zones or parking spaces for these vehicles and as a result vehicles frequently circle the area looking for parking, double-park, park in front of fire hydrants, block driveways, and illegally park in turn lanes and the like. This is a regular and predictable practice that is only going to get worse. Although most of these indiscretions last for short periods of time, there is a cumulative effect on the neighborhood and its residents.

Parking in the area is very restrictive. Some of the area is controlled by the Port Authority and metered on a sliding pricing model. Other streets have abusive (in my view) parking restrictions which include two-hour parking zones from 7 a.m. – 10 p.m. daily. On many weekdays (non SF Giant game days) after 6 p.m. and most weekend days, the immediate area around my building is a virtual ghost town. It is not uncommon to have dozens upon dozens of vacant parking spaces on nearby streets 5 [TR-13] throughout the day. Terry Francois Street often has 50 – 75, if not more, open spaces alone. Yet restrictive parking restrictions are in place. The Port Authority does not make it a practice to offer residential parking permits in our area. Residents understand the need for parking restrictions, but in our area the two-hour parking hours should be relaxed to a more realistic timeframe of perhaps between 8 a.m. – 7 p.m. on non-event days. 5 [TR-13] cont.

The new Public Safety Building recently opened and already residents are experiencing problems as police vehicles park illegally, drive too fast and have been observed committing a variety of California Vehicle Code violations. I recently attended a community meeting with police officials where these issues (among others) were brought up and discussed. The meeting went well and the police department will be looking for ways to mitigate these issues.

City officials and the public have long recognized that the City's public transportation system is not as efficient, effective and robust as it needs to be. Complaints about the system have been occurring for decades. Former Mayor Willie Brown vowed to fix Muni within his first 100 days in office and we all know how that turned out. 6 [TR-5a]

Ironically, in a July 22, 2015, article published in the San Francisco Chronicle titled, "Housing boom fee could boost Muni," written by J.K. Dineen and Michael Cabanatuan, Mayor Lee is quoted as saying, "As our city grows, we must ensure that our transportation network grows along with it." The article further states San Francisco has added over 100,000 jobs since 2010 and is growing by 10,000 residents a year. It references the hot-bed issue about the proliferation of high-end residential towers in areas that have not been accompanied by adequate improvements in open space, transit and affordable housing.

The article did not mention the proliferation of commercial and retail developments and their significant impacts on San Francisco over the last five years. It is the cumulative impacts of all of these changes that affect our daily lives, our health and our outlook on the City. 7 [IO-3]

I choose not to belabor the historical problems and proposed fixes to our public transportation system. I choose to not focus on the increased advocacy for bicycle riders and pedestrians. I choose to not focus on homelessness and the mentally ill. I choose to not take up the issue of affordable housing and open space. I choose not to evaluate future proposed changes that may never be funded or built. I truly understand these issues and the interests of various advocacy groups.

I choose to look at the project(s) and simply evaluate it based on my extensive professional experiences. Can a project be developed and ultimately function in an efficient, effective, cost-effective and safe manner without causing significant disruptions and degrading the quality of life for nearby residents, workers and visitors? Can it be developed and be successful in the present? Can it work now?

As a longtime San Francisco resident, I understand the interests of many of the City's residents. Having worked in law enforcement has given me a unique perspective and insight into many issues that truly matter to residents, workers and visitors alike.

Residents want to live in a clean, safe and well-maintained environment that offers exceptional public services and infrastructure; a city in which both our elected officials and city staff are responsive and willing to focus on quality of life issues; a city that plans for, and manages, change in a thoughtful, orderly and well-conceived manner; a city that is open and transparent. Simply put, we want to work in a city "that works well at a high level." The expectations are high, but very straightforward.

With regard to quality of life issues, they are of great importance and can be described as:

Those issues which affect the residents, businesses and visitors to the area by creating fear or adversely impacting their health, safety, and welfare.

Some typical quality of life issues in Mission Bay and our surrounding areas include, but are not limited to:

- Aggressive panhandling
- Ticket scalpers hassling people and/or stepping into traffic
- Chronic public intoxication 8 [GEN-2]
- Drinking in Public and open containers
- Litter, graffiti and public nuisances such as urinating and defecating in public
- Incidents that involve the mentally ill
- Illegal encampments
- Illegal dumping
- Chronic noise complaints
- Illegally parked vehicles
- Dust and grime associated with on-going construction projects
- Significant numbers of California Vehicle Code violations being committed by motor vehicles, bicycles and pedestrians.
- Constant and often poorly designed and implemented road and/or lane closures and traffic modifications disrupt all modes of both public and private transportation with regularity.

In order to make an assessment of the project I did extensive research, conducted site visits, spoke with local residents, local employees, delivery drivers, a variety of City workers who work special events and several construction workers.

I also spent significant time directly observing traffic flow (all modes) both during Giants games (pre and post-game) and on non-Giants game days at many intersections. I walked and observed over a period of several months.

I have reviewed many sections of the proposed Environmental Impact Report, Planning Department Case No. 2014.1441E for an Events Center and Mixed Use Development at Mission Bay Blocks 29-32.

Based on my direct observations, review of the EIR and my prior experience, I have many concerns and do not believe the City should allow this development to proceed as designed. 9 [GEN-5]

The construction of the Warriors arena is only one piece of the local puzzle. Multiple major projects are in various states of planning and/or development. These include:

- Expanding UCSF – Several projects
- Developing Pier 50 – Anchor Steam
- Building a hotel in Mission Bay
- Developing Seawall Lot 337 – Lot A – A massive project
- Pier 70 – A large mixed use development
- The Eastern Neighborhood Program
- The Uber Headquarters Project
- Realignment of Terry A. Francois Boulevard and Mission Bay Park
- The construction of many new residential complexes that will contain several thousand new units in Mission Bay, Dogpatch, Potrero and Showplace Square

In congested urban areas like San Francisco, no new development can be evaluated in isolation. For that reason you need to consider the total cumulative impacts these projects will have. The Warriors Arena was never originally intended to be built in Mission Bay. It was never included in any previous plan for Mission Bay. It would, however, be arguably the biggest and most impactful project ever built in the area. It was thrust and forced on San Francisco when the owners of the Warriors went into contract to buy parcels of land in Mission Bay. This was after the failed attempt to build the arena along the Embarcadero. 10 [IO-3]

The report fails to adequately address many of the actual event usage plans. The Warriors intend to have up to an additional 200+ events at the site. In total, the arena may easily host more than 250+ events a year. This is only an estimate. This number of events is excessive. The area cannot handle these events without significant negative impacts affecting local residents and other people that work in the area. 11 [PD-2]

The plan focuses on the Warriors games and potential overlap with some San Francisco Giants home games. It refers vaguely to other events, but offers no specificity on the types of events, the days or hours of the events and/or any realistic estimate of

the number of people expected to attend. Possible events seem to have a classified threshold of whether they expect to attract over 12,500 attendees or not. This is pure guesswork. 11 [PD-2] cont.

The Warriors, to my knowledge, have never publicly released any demographic information about their season ticket holder base. It would be easy for them to acknowledge, for instance, how many of their season ticket holders reside or work in various postal codes in the Bay Area. This measure, would at least offer a starting point to evaluate the efficiency and effectiveness of current public transportation options for their large base to use as many presumably would need to travel to San Francisco from other communities. The following issues could, at least, preliminarily be looked into: 12 [TR-2e]

- Are viable public transportation options currently available?
- How would the scheduling work for transferring between agencies?
- Would it be convenient for those individuals to take public transit?
- How many transfers would the average rider to need make?
- What would the average cost for a round-trip fare likely be?
- How long would a sampling of journeys take each way on average?
- Would the transit options run late enough for attendees staying in the area after a game to still use public transportation to get home?

Vagueness is not my friend.

The Warriors have a huge financial incentive to use the site extensively in order to generate revenue and help pay for the project and ultimately make more profits.

The City should be a staunch steward of City resources and funds, taking appropriate measures to ensure we do not over-commit limited resources or over-spend for service delivery. 13 [GEN-1b]

Section 5.8 – Public Services

This section evaluates if the project would require new or physically altered governmental facilities to maintain adequate public safety. This is a misleading measure. We should really be assessing the issues associated with providing the broad range of public services to the geographic area impacted by the project.

For example Table 5.8-2 addresses San Francisco Fire Department (SFFD) responses in the project area over a 12-month period. Staff at four fire stations responded to 10,702 medical responses and 4,968 fire calls. In total, SFFD responded to 15,670 incidents. For urban municipal fire departments, medical aid calls typically outnumber all other types of calls for service. Indeed, nearly 70% of the calls at the four stations were medical in nature. Should all the projects in the pipeline be constructed and occupied, the number of total calls will increase dramatically in the target area. With the 14 [PS-1, PS-2] increase of traffic congestion and associated factors of event management, SFFD response times under current staffing levels are likely to increase.

There is no way to evaluate if there are more or fewer calls on special event days compared to non-event days. There is no way to determine which days of the week and hours of the day are peak response times. Simple raw data does not give us the information we need to determine if the proposed arena project, along with all the other projects, will cause service delays or disruptions.

The San Francisco Police Department (SFPD) is currently understaffed by as many as 300 officers. Although they plan to aggressively hire recruits and increase staffing, this process is arduous and slow. SFPD intends to offer up to three (3) new academy classes with as many as 50 recruits per class over the next several years. Unfortunately, during the next three years they will lose other staff members to retirement, lateral transfer, disability leave and others who choose to transition into other career fields.

The process of recruiting, hiring and training an individual to become a fully functioning and solo officer can easily take up to 18 months. This means that even if you have staff "on paper" there are likely many officers in various stages of the employment and training process. Individuals, who are not yet fully trained and have not completed the FTO program and are not qualified to perform solo officer duties. A police department's current staffing level is merely a number. The more important number is how many physically able and qualified officers can actually be deployed to staff events and/or handle calls for service. These numbers are usually quite different.

14 [PS-1, PS-2] cont.

Furthermore, if SFPD is successful in sponsoring an academy class with 50 recruits, it is unlikely that all new hires will pass the police academy. Others will fail to complete the rigorous Field Training Program and some will fail to complete their probationary period. This is the nature of police hiring and training programs. It is a predictable outcome that occurs in all local law enforcement agencies.

It is therefore highly unlikely that SFPD can achieve full staffing levels by mid-2018. Any new officers would be inexperienced. It can easily take several years or more for new hires to become truly skilled and competent in handling the broad range of police calls that occur in municipal jurisdictions after achieving solo officer status.

Because SFPD will not, in my view, ever reach its authorized staffing level it may be stretched to safely, professionally and adequately staff another 250+ special events each year. They may be required, at times, to have staff pull double shifts (working patrol and then stay over to work an event), require some form of mandatory overtime and utilize creative scheduling practices.

With respect to staffing levels at special events, the document indicates:

- Staffing levels are determined by SFPD's Event Commander in coordination with the event sponsor in advance of the event as well as by levels established in event security/operations plans. The Department of Parking and Traffic typically provides traffic control services for special events.

Without more specificity, I am not able to determine if adequate resources and being utilized for on-site security by sworn members of SFPD and parking control officers (PCOs).

14 [PS-1, PS-2] cont.

I can tell you from my own personal experience that sponsors have a financial incentive for fewer personnel usage because they often pay for these services. Sponsors often try to supplant the use of sworn officers and trained PCOs with far less expensive "private security" personnel. Unfortunately, when things go bad – and they will at some point, the ultimate burden to respond and resolve an incident will rest with the sworn police officers and PCOs.

Private security guards can be a deterrent and provide valuable services, particularly inside venues, but for the most part they will not be arresting, citing or physically ejecting people from an event site. They will not be writing a detailed crime report, but rather are usually treated as "witnesses." They will observe, report on conditions and request assistance from uniformed sworn officers or PCOs in enforcement-related incidents or in any circumstance in which the personal safety of a patron or themselves is involved.

In Table 5.8-3 the Summary of Annual Crimes in Mission Bay Area does not specify how many of the crimes occurred on special event dates versus non-special event dates. It is not possible to make an accurate evaluation and/or comparison from the raw numbers supplied.

The numbers reported appear to be crimes that require reporting under the FBI's Uniform Crime Reporting Program. These are crimes that all police departments report annually. They serve as a basis to compare crime rates between jurisdictions in an "apples to apples" approach or crimes that occur year over year for comparison purposes.

15 [PS-1]

While interesting you'll notice that there is no mention of any of the following:

- Actual police calls for service (CFS) in the area
- CFS types and frequencies on event days versus non-event days
- Number of self-initiated detentions, stops, citations issued and arrests made by SFPD
- Number of parking citations issued and vehicles tows by PCOs
- Statistics relating to the many **quality of life issues – previously listed**

- Vehicle collisions
- Disturbance calls
- Disorderly conduct calls
- Alcohol or drug-related calls and crimes
- Total number of crime reports taken
- Response times to crimes in the event area.
- Alarm calls
- Incidents occurring at public transportation facilities
- Incidents occurring on public transportation vehicles of all types
- Number of private person arrests made

Having accurate statistics relating to these types of incidents (in addition to the FBI UCR) gives you significantly more information to evaluate and determine accurate levels of overall police activity in any given area. 15 [PS-1] cont.

Critical information is not provided for analysis in the report. Simply put, utilizing the FBI Uniformed Crime Reporting for SFPD alone is a very ineffective way to gauge the actual level of police, parking and traffic related incidents in a given geographical area or associated with special events.

Given the location of the proposed project it would be prudent to obtain the more comprehensive crime statistics and information from the following agencies:

- University of California Police Department
- The California Highway Patrol
- Port of San Francisco Police Office
- Bay Area Rapid Transit Police Department (BART)

Once the appropriate information is gathered from all relevant sources a detailed analysis of the actual impacts to public safety could be evaluated.

With respect to emergency vehicle access (5.2.3.6) and parking conditions (5.2.3.7) the report is woefully lacking.

The report indicates the primary access for emergency vehicles would be 3rd Street because it has two lanes of traffic in each direction. Although 3rd Street has two lanes in each direction, they are separated by raised curbs and Municipal rail tracks. The lanes on 3rd Street are standard width and there are no shoulders, delineated bike lanes, loading zones, parking spots or any place to pull out of traffic between intersections. 16 [TR-9]

Subsequently, should any disruption occur mid-block that impedes any lane of traffic, all vehicles behind it will be negatively affected and congestion will begin occurring almost immediately. In essence a “bottleneck” will occur. There are many scenarios in which

this could happen; a traffic collision, a stalled vehicle, or any type of police, fire or medical response to a fixed location along the corridor – to name only a few of the likely possibilities.

If a traffic collision occurred where an individual needed immediate medical assistance and transport to a hospital and/or have their disabled vehicle towed, it could easily take an hour or longer to clear the scene. The traffic back-up associated with this type of incident and closure would be stifling. Emergency responders, in vehicles, would have a difficult time getting to the incident. Police on motorcycles and bicycles would be able to get there, but they don’t have the ability to transport injured parties or move and tow disabled vehicles. 16 [TR-9] cont.

The existing parking was looked at in the parking study area. That area was defined to include off-street parking facilities located within a reasonable walking distance from the project site – one-half (.5) mile with easy access to major street corridors that provide access to Mission Bay. 17 [TR-13]

Geographical constraints make access to the area problematic already. To the east is the Bay. To the north there are only two access routes, namely 3rd and 4th Streets.

To the west, the Mission Bay Boulevard extension to 7th Street has not been completed. Sixteenth Street also runs east/west. It crosses the railroad tracks at 7th Street and dead ends at Illinois. Much of the local traffic uses 16th Street to access retail establishments in Potrero, the Mission and beyond. Access to the new UCSF Medical facilities is accomplished by taking 16th Street. Seventh Street extends south, crossing 16th Street and becomes Mississippi Street. This is taken to access southbound Highway 280 from Mariposa Street.

Mariposa Street also runs east/west. It is a primary entrance and exit point for traffic using Highway 280. The ramp northbound frequently gets backed up for up to one-half mile during normal commute times. The ramp to southbound 280 is heavily used and traffic on Mariposa during normal days can be brutal during the afternoon commute. From the south, 3rd Street and Illinois Street allow access to César Chavez and Pennsylvania to access Highway 280 south. 18 [TR-4]

In reality, there are limited points of ingress and egress to the project area. The streets are either one or two lanes in each direction. Many are controlled by signalized intersections and the freeway entrance and exit ramps are poorly designed to handle significant traffic. These ramps were built decades ago and have not been modernized to reflect current demands.

To make modifications would be costly and is in conflict with the City’s transit first policy. The old adage, “you can’t have it both ways” comes to mind. The City would resist making improvements and modifications that might actually increase vehicle traffic efficiency and effectiveness because it contradicts established policy.

The City would also have to coordinate with other local and state agencies to accomplish any improvements to freeway on and off ramps. It is unknown what funding sources would exist to do this type of work. Local community groups would surely oppose such measures. In short, this appears to be a non-starter, which bodes poorly for the proposed arena attendees, local residents in the area and other merchants or businesses that are reliant on the use of these public roadways. 18 [TR-4] cont.

In my opinion, the proposed number of parking control officers (PCOs) slated for deployment is not nearly sufficient.

The report identifies PCO controlled intersections during the various scenarios. Table 5.2-10 gives an example in which only six of 22 locations are staffed. There is no mention of how many PCOs are assigned to each location and no indication of what traffic control measures they will utilize to expedite the safe flow of all modes of traffic. My observations tell me that much PCO intervention focuses on monitoring traffic from a distance and/or controlling the signals via the override function. I do not see a lot of engagement and interaction. Pedestrians and bicyclists regularly do what they want on many of the local streets. The intersections of King Street and 3rd Street, King Street and 4th Street and King Street and 2nd Street are staffed with more personnel. The staff working those intersections appears to be much more engaged and interactive in their efforts to safely control the various modes of traffic. If you do not facilitate the flow of traffic all the way to freeway on-ramps and other major exit routes, traffic will always "bottleneck upstream" and clog its way back toward the event site. 19 [TR-3b]

Over the past three years, I've often observed one and sometimes two PCOs at intersections who were simply controlling the traffic signals (manual override) to facilitate vehicular traffic. They were not adequately engaging with pedestrians to prevent jaywalking, pedestrians crossing against red lights and people crowding into the roadway. They also weren't able to control bicyclists that were weaving through traffic. The focus was on cycling the lights rather than a comprehensive effort to facilitate all modes of traffic. PCOs must engage with people to control the intersection and make it clear how the manual traffic flow cycle will be handled and monitored. Each mode of transportation must be addressed independently, but within the context of a master plan, during times of heavy congestion to promote safe traffic movement for all modes.

Traffic control duties can be quite difficult and require significant resources and constant engagement. Simply standing at a signal light control box and manually controlling the light cycle at signalized intersections is not sufficient to ensure the safe movement of vehicles, bicyclists and pedestrians. Active engagement and proper use of traffic control devices (cones, barricades, signs, flares, reflective sleeves and message boards) is also required. Many of the intersections listed in the report indicate "a PCO" will be used. In my opinion, most of these intersections would require between two-three PCOs to safely facilitate the movement of vehicles, bicyclists and pedestrians.

Remember, many attendees may not be familiar with the area. Many events will conclude at night when it is dark. Some people leaving the venue will have consumed alcohol. Existing lighting at some of the critical intersections is not robust. There may be inclement weather. It is likely that with the ongoing construction of other projects that roadway modifications may need to be navigated, which only makes facilitating traffic more difficult. I view the plan as significantly understaffing the traffic control aspect.

According to the plan during overlapping events, due to restricted access on the 3rd Street and 4th Street bridges, it is assumed that no vehicles will travel north on either street during overlapping events. This will be a self-induced "double bottleneck" that will force traffic south and west. The plan calls for "a PCO to be stationed at the intersection of 4th and 16th Streets to "discourage the use of this street except for local access." Good luck with that! 19 [TR-3b] cont.

The intersection would require minimally two and maybe three PCOs to safely facilitate all modes of traffic and respond to inquiries made by individuals on congested days. People will stop and ask PCOs questions. When they do stop or at least slow down, traffic disruption occurs. This is predictable and inevitable to some degree.

The parking lot assessment in section 5.2.3.7 is flawed in my opinion. It claims the 15 off-street parking facilities are located in areas "with easy access from the major street corridors that provide access to the Mission Bay Area." Unfortunately, given the geographical constraints in the area, and the limited points of ingress and egress, everybody that needs to access Mission Bay for any reason will be on the same few roads. There is no such thing as "easy access" in this area today. To claim "easy access to the major street corridors" is a blatant misrepresentation. Existing conditions do not warrant that description. In theory, by looking at a map, one would expect simple access. In practice this is simply not true. 20 [TR-13]

Twice this last week, for example, between 2:00 – 2:30 p.m. I observed northbound 3rd Street backed up (bumper to bumper) from South Street all the way to King Street and beyond. In both instances it took vehicles over 35 minutes to traverse this short distance. Yes, I stayed, watched and timed a truck. Terry Francois Boulevard was no better, being backed up around the bend all the way to Pier 50. It was an absolute mess and the drivers were frustrated. 21 [TR-4]

Oftentimes when the traffic lights at the signalized intersections turned green no more than a dozen or so cars could get through. This is because the signal light cycles are not long enough and may not be synchronized. The "bottleneck upstream" that was causing the congestion clearly wasn't being handled properly. The "bottleneck upstream" in this instance was the temporary closure of King Street between 3rd and 4th Streets. One closure (or other incident that blocks a road) had the cumulative ripple effect of bringing an entire section of town to a virtual grind for a period of hours. I have gone out to this location on five occasions and spent an hour or two watching traffic, watching the efforts of traffic control personnel and have been unimpressed. It's not uncommon for the traffic control staff to simply stand on the sidewalk and watch the gridlock. They only seem to intervene when somebody tries to do something unsafe.

At the intersection of 3rd Street and Townsend I found two PCOs manually overriding the signal in an effort to facilitate traffic flow. Unfortunately, neither was engaging and controlling the pedestrians and bicyclists in the area. At that location, 3rd Street has four lanes of traffic (one way) heading north. There were so many pedestrians in the area crossing the street that vehicles wanting to make left or right hand turns onto Townsend, Brannan or Bryant could not turn and had to wait. This means two of the four lanes did not flow. No efforts were being made to stop all pedestrians, at some point, and allow vehicles to proceed and turn. The City's effort to mitigate this street closure (planned for about a month during weekday hours) is pretty dismal. 21 TR-4 cont.

All it takes is one incident to bottleneck and clog any of these arteries for hours. It is blatantly irresponsible and defies logic to believe that hundreds if not thousands of cars will descend on the Mission Bay, Dogpatch and Potrero areas over 260+ times a year without a level of congestion and disruption

To reiterate, traffic control duties can be quite difficult and require significant resources and constant engagement. Simply standing at a signal light control box and manually controlling the light cycle at signalized intersections is not sufficient to ensure the safe movement of vehicles, bicyclists and pedestrians. Active engagement and proper use of traffic control devices (cones, barricades, signs, flares, reflective sleeves and message boards) is also required.

With respect to the timeframes used to evaluate parking and occupancy rates, the evening hours used in the study were from 7:00 – 8:30 p.m. This timeframe is flawed. I have seen, with the San Francisco Giants games, fans are often arriving very early to the area. In fact, people come several hours early regardless of transportation mode; hang out, walk the waterfront, and frequent local eating establishments. 22 [TR-13]

If this trend holds, the people looking to park in these 15 facilities will be arriving hours before the 7:00 p.m. threshold. Spots will not be available because day workers will not have vacated them yet. These people will circle the area looking for other options or decide to park further away in residential areas.

I do volunteer work several days a week between 3:00 – 4:30 p.m. at Market Street and 2nd Street. I regularly walk to and from this location. I walk along the Embarcadero to Market Street or walk up 2nd, 3rd, or 4th Streets. I return using one of the same four routes. I do this walk between 2:00 – 3:00 p.m. and 4:30 – 5:30 p.m. These frequent walks give me the great opportunity to observe all modes of traffic in the area.

I am amazed at the congestion and traffic gridlock trying to access the Bay Bridge. I also see Giants fans parking in lots and on the streets along the way. Once again, on a normal non-game day, the traffic gridlock on these streets is often remarkable. On 23 [TR-4]

game days it can be worse. I see people in their Giants garb driving, parking and wandering the area hours before the opening pitch. There is no reason to believe Warriors fans and other event attendees will not come to the area hours before an event. When "newbies" to the area discover how bad navigating the City can be they will likely: adjust schedules to arrive even earlier, decide not to come as often or look at public transportation options. 23 [TR-4] cont.

At any rate, limiting the survey hours in the evening from 7:00 – 8:30 p.m. is flawed. The survey should look at parking supply and occupancy rates in the 15 lots beginning as early as 4:30 p.m. and starting no later than 5:30 p.m. to accurately assess parking availability. 24 [TR-13]

The report indicates in section 5.2.3.7 that bicycle conditions were observed to be operating acceptably, with no conflicts, between bicyclists, pedestrians and vehicles. I dispute this. 25 [TR-1]

It is actually fairly common for bicyclists to ride their bikes on the sidewalk northbound on 3rd Street from South Street up to AT&T Park. They choose to do this because the pavement is wide and 3rd Street has no delineated bike lane in the roadway. Apparently, shifting over to Terry Francois Boulevard or 4th Street, which both have established bike lanes is cumbersome.

As I continue to read through the report page by page, I'm amazed at how frequently problem areas are identified.

For example, the report openly acknowledged that many intersections would have significant traffic impacts that would remain "**significant and unavoidable with mitigation,**" under specified scenarios. Accordingly, the report says the City and the project sponsor should work together to seek feasible mitigation measures to reduce transportation impacts.

One strategy being considered is to use additional off-site parking lots south of the project (not within walking distance) and providing a free shuttle service to patrons.

The report says location sites (yet to be identified) that could provide up to 250 parking spaces for events drawing less than 12,500 patrons and up to 1,000 total spaces on days with overlapping events would be used to accomplish this. Working details regarding to this traffic mitigation option have yet to be specified and defined. Unfortunately, no sites have been identified as possibilities to date. There is no guarantee the sponsor and City could negotiate acceptable terms that would be feasible in the long term. 26 [TR-12a]

The report says the sponsor would need to provide, as needed, up to six (6) shuttle trips per hour both before and after the events. There is no mention of the types of shuttles being considered or their capacity. These shuttles would be required to navigate to and from drop-off and pick-up points and be subject to traffic disruptions like other vehicles. If, in the extreme, the maximum 1,000 cars were to use this service it is likely a minimum of 2,000 people (two people per vehicle average) would be shuttled to and from.

Most shuttles (airport rental car and hotel type) probably hold a maximum of 25 people. Doing that math, it could take up to 80 shuttle trips to accommodate the patrons. At six shuttle trips per hour there would be a significant capacity shortfall to move patrons in a timely fashion. Using a lower number of only 500 cars and 1,000 patrons would require up to 40 shuttle trips (given full capacity for each trip) and would also result in capacity shortages, delays and disruptions.

Given the lack of specifics and details about this option, I believe patrons using this mode of transportation will incur significant delays both before and after games.

As the report continues other notable references to traffic problems are aptly addressed. Some of these include:

Page 5.2-178 of the report addresses other factors that affect traffic mitigation efforts. These include physical limitations of the City's street grid and the City's Transit First policies and goals that seek to limit private vehicle usage.

26 [TR-12a] cont.

Page 5.2-182 of the report specifically and clearly states, "for conditions without an overlapping SF Giants evening game, no feasible mitigations are available for the freeway ramp impacts because there is insufficient physical space for additional capacity without redesign of the I-80 and I-280 ramps and mainline structures, and which may require acquisition of additional right-of-way, and other potential measures would not adequately address the short term peak travel patterns associated with special events." Later it states, "Thus, for these reasons, the proposed project's impacts related to freeway ramp operations would be significant and unavoidable with mitigation."

27 [TR-12a]

It would require significantly more time and effort to for me to continue to cite other report sections that highlight problems with the plan and/or point out other deficiencies. I think my efforts thus far have been sufficient to highlight the many problems I see with the plan.

I sincerely hope that you and other members of San Francisco City Government will read the report in its entirety and in detail. If you do, you'll read about many other aspects that the report indicates would be problematic.

Interestingly, I have gone to great lengths to speak with many people who live, work and visit the area. I engaged them in conversation about the current state of life in Mission Bay, the rapid and substantial increase in development, the on-going disruptions

associated with construction, the reliability of public transportation and, of course, their thoughts about the proposed Warriors Arena complex.

These individuals included a broad spectrum of: local delivery drivers, US Postal employees, local technology sector workers, construction workers, employees of Impark, Mission Bay Shuttle employees, UCSF employees, dog walkers, cleaning service workers, San Francisco police officers, San Francisco parking control officers, Muni employees, food delivery services and random visitors to the area as they recreate and enjoy local food establishments.

The overwhelming majority of responses cite great concern about too much growth in Mission Bay. They raised concerns about inadequate public transportation and infrastructure, the immense scope and scale of the arena and all the other developments that are underway or planned. Specific objections usually involved: traffic congestion, noise and nuisance problems and some mention of one of the quality of life issues I referenced earlier.

28 [PD-1]

The City's current infrastructure can't efficiently and effectively handle the large influx of people to an estimated 250+ yearly events in our neighborhood. The police and fire departments did not adequately address relevant issues in their sections of the report. The City's Public Works Department admittedly struggles now to deal with keeping our streets, sidewalks and neighborhoods clean.

29 [PS-1, PS-2]

30 [GEN-6]

Traffic mitigation options that include concepts like private shuttles, identifying and using new parking lots and increasing public transportation services lack details, specificity, funding sources and could take many years to build.

31 [TR-12a]

People living, working or visiting the area would be exposed to a tremendous increase in the number of quality of life incidents and upsurge in crimes. These increases would degrade our personal quality of life. Local residents and local workers often bear the unpleasant burden of over-development, poor infrastructure and the increases in crime, nuisances and disruptions that it brings.

32 [PS-1]

The City may have admirable intentions by implementing a transit first policy. The City cannot, however, impose this policy on the region. There are about 26 different public transportation entities in the Bay Area. Oftentimes, their systems do not operate on schedule and delays occur. Any glitch on one system will negatively affect an individual's ability to make transfers. Until the entire public transportation system in the region is improved and integrated more cohesively, traveling throughout the region by linking multiple systems can be problematic.

33 [TR-5d]

Trying to force a transit first policy on people throughout the region is problematic. To try and impose your will, and policy, on people throughout the region will not be successful. In my view, the City is mistaken if it believes the transit first policy and existing public transportation system will be able to alleviate traffic congestion and disruptions in Mission Bay.

Many patrons attending events at the proposed arena will come from cities throughout the greater Bay Area. Most will want to see events with friends and family. People want to go together so they can socialize, hang out and perhaps dine before or after events. Many people have friends and coworkers that live in different cities, have different work hours and may not have robust public transportation options immediately available to them. In the end, much of what we choose to do or not do really involves details, logistics and convenience. 33 [TR-5d] cont.

So what inevitably happens? Often groups of attendees make a decision to carpool and drive to the event together. This allows them to share costs. They can decide if they want to leave early or stay late without the constraints of an unpredictable transit schedule. They keep their options open. This is modern day life. This is what happens. This is predictable.

Although not related to the arena project, take a look at recent incidents at Dolores Park. Recently, newspaper articles have reported the park has been besieged by people on weekends, vandalized multiple times and is a filthy mess. Garbage has been strewn about and an inadequate number of trash receptacles were installed. Apparently, the City thought if they didn't put a significant number of trash receptacles in the park that park goers would responsibly haul their trash out and pick up their own mess. How did that work out?

The City is also grappling with measures to curb people urinating and defecating on City streets. So far that effort has not been successful. These issues are the types of quality of life issues that are so important to residents.

We need to focus on, and remedy, the current pressing problems that we face before embarking on additional major projects that will only exacerbate the situation.

In summary, I urge you to prohibit the Warriors Arena project in Mission Bay. The area simply cannot handle a project of this magnitude, especially given all the other major developments currently underway or on the drawing board. The over-all negative impact to the local residents, and ultimately the City, is very concerning. There are far too many unknowns, uncertainties and ambiguities in the report. 34 [GEN-5]

Sincerely,

James F. Zboralske

JFZ/et

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APPENDIX PH

Public Hearing Transcripts

This appendix contains the complete transcripts of the public hearing on the Draft SEIR held before the OCII Commission on June 30, 2015.

The public hearing transcripts include commenter codes, which designate "PH" followed by the person's last name. The public transcript presents all oral comments chronologically, in the order in which they were presented at the public hearing. **Table PH-1** lists all of the commenters who presented oral comments at the public hearing alphabetically, indicates the corresponding comment code prefix for each commenter, and provides the page numbers of the transcript where their comments are located.

To facilitate the commenter in locating the responses to his or her comments, the SEIR assigns a unique commenter code plus one or more topic code to each individual comment, as explained below. Both the commenter and topic codes are shown in the margin of the transcript, with the unique commenter code shown first and the topic code(s) in square brackets beneath the commenter code. This information shown in the margins of each written comment serves as the cross-reference guide for the commenter and topic codes.

Commenter Codes

This document assigns a code to each person that provided oral comment at the public hearing transcript based on the name of the agency, organization, or individual submitting the comment. Comments submitted by mail, email, facsimile, comment card, or orally at the public hearing (as transcribed in the official public hearing transcript) are all coded and numbered the same way. Each commenter code begins with the individual's last name. The second part of the code is the sequential numbering of individual comments within a letter or email that represents a distinct topic. In the public hearing transcript, the comment codes are shown in the margin alongside the individual bracketed comment. Only substantive comments received on the Draft SEIR are bracketed; for example, oral testimony that describe an agency's or organization's mission or a persons biographical history are not bracketed as comments for the purposes of this document.

As an example of the commenter coding system, the public hearing transcript for Bruce Agid is coded PH-Agid, and the first comment in the letter is coded PH-Agid-1, the second comment from Bruce Agid on a different topic is coded PH-Agid-2, etc.

Topic Codes

The prefixes for the topic codes used in the organization of Chapter 13, Responses to Comments, are shown below:

- General Comments (GEN)
- Environmental Review Process (ERP)
- AB 900 Process (AB)
- Project Description (PD)
- Plans and Policies (PP)
- Impact Overview (IO)
- Land Use (LU)
- Cultural Resources (CULT)
- Transportation and Circulation (TR)
- Noise and Vibration (NOI)
- Air Quality (AQ)
- Greenhouse Gases Emissions (GHG)
- Wind and Shadow (WS)
- Recreation (RE)
- Utilities and Service Systems (UTIL)
- Public Services (PS)
- Biological Resources (BIO)
- Geology (GEO)
- Hydrology and Water Quality (HYDRO)
- Hazards and Hazardous Materials (HAZ)
- Energy Resources (EN)
- Alternatives (ALT)

Within each topic area, similar comments are grouped together, and Chapter 13 provides a comprehensive response to those related comments under one topic code. Topic codes are numbered sequentially using the topic code prefix and sequential numbering for each subtopic. For example, General Comments [GEN] are listed as [GEN-1], [GEN-2], [GEN-3], and so on. Under each topic code in each section of Chapter 13, all of the commenter codes that are addressed under each topic code as a cross-reference. As described above, topic codes are shown in this appendix in the margin of the transcript in square brackets underneath the commenter code.

TABLE PH-1
PERSONS WHO PRESENTED ORAL COMMENTS ON THE DRAFT SEIR AT THE PUBLIC HEARING, JUNE 30, 2015

Commenter Code	Name of Individual Submitting Comments	Comment Format	Comment Date	Page No. in Transcript
PH-Agid	Agid, Bruce	Transcript	06/30/2015	57-58
PH-Aquino	Aquino, Vanessa	Transcript	06/30/2015	28
PH-Ballasteros	Ballasteros, Jon	Transcript	06/30/2015	43-44
PH-Battat	Battat, Andrew	Transcript	06/30/2015	25-26
PH-Belloini	Belloini, Nick	Transcript	06/30/2015	48-49
PH-Bleiman	Bleiman, Benjamin	Transcript	06/30/2015	47-48
PH-Boss	Boss, Joe	Transcript	06/30/2015	72-73
PH-Brookter	Brookter, D.J.	Transcript	06/30/2015	37-38
PH-Carroll	Carroll, Kevin	Transcript	06/30/2015	43
PH-Caine	Caine, John	Transcript	06/30/2015	50-51
PH-Cassolato	Cassolato, Stefano	Transcript	06/30/2015	45-46
PH-Conn	Conn, Sebastian	Transcript	06/30/2015	32-33
PH-Cornwell2	Cornwell, John	Transcript	06/30/2015	69-71
PH-Corpus	Corpus, Rudy	Transcript	06/30/2015	74
PH-Davis	Davis, Sheryl	Transcript	06/30/2015	55-56
PH-deCastro2	deCastro, John	Transcript	06/30/2015	75-77
PH-Donaldson	Donaldson, Drakari	Transcript	06/30/2015	58-59
PH-Doniach	Doniach, Alex	Transcript	06/30/2015	21-22
PH-Ellington	Ellington, Celestino	Transcript	06/30/2015	59-60
PH-Evans	Evans, Abe	Transcript	06/30/2015	54
PH-Fernandez	Fernandez, Anna	Transcript	06/30/2015	17-18
PH-Gisslow	Gisslow, Blaise	Transcript	06/30/2015	26-27
PH-Granowski	Granowski, Alexander	Transcript	06/30/2015	31-32
PH-Greenstein	Greenstein, Adam	Transcript	06/30/2015	49-50
PH-Hartnett	Hartnett, Diane	Transcript	06/30/2015	44-45
PH-Hrones2	Hrones, Christopher	Transcript	06/30/2015	65-67
PH-James	James, Oscar	Transcript	06/30/2015	77-78
PH-Johnson	Johnson, Silvia	Transcript	06/30/2015	71-72
PH-Karnilowicz	Karnilowicz, Henry	Transcript	06/30/2015	53
PH-Kies	Kies, Alyssa	Transcript	06/30/2015	16-17
PH-Kirk	Kirk, Elizabeth	Transcript	06/30/2015	54-55
PH-Kobasic	Kobasic, Kim	Transcript	06/30/2015	40-41
PH-Lazarus	Lazarus, Jim	Transcript	06/30/2015	52-53
PH-MacKenzie2	MacKenzie, Dennis	Transcript	06/30/2015	63-64
PH-Madi	Madi, Alejandro	Transcript	06/30/2015	19-20

TABLE PH-1 (Continued)
PERSONS WHO PRESENTED ORAL COMMENTS ON THE DRAFT SEIR AT THE PUBLIC HEARING, JUNE 30, 2015

Commenter Code	Name of Individual Submitting Comments	Comment Format	Comment Date	Page No. in Transcript
PH-Meserve	Meserve, Osha	Transcript	06/30/2015	81-82
PH-Mondejar	Mondejar, Marilyn (OCII Commissioner)	Transcript	06/30/2015	87
PH-Norman	Norman, Al	Transcript	06/30/2015	75
PH-Nyden	Nyden, Ray	Transcript	06/30/2015	10-11
PH-Ortiz	Ortiz, Annabel	Transcript	06/30/2015	29-30
PH-Osmundson	Osmundson, Paul	Transcript	06/30/2015	78-79
PH-Pan	Pan, David	Transcript	06/30/2015	83-84
PH-Paulson	Paulson, Tim	Transcript	06/30/2015	41-43
PH-Prieshoff	Prieshoff, Matt	Transcript	06/30/2015	15-16
PH-Rosales	Rosales, Mara (OCII Commission Chair)	Transcript	06/30/2015	85
PH-Scott	Scott, Damion	Transcript	06/30/2015	22-24
PH-Searby	Searby, Cathy	Transcript	06/30/2015	36-37
PH-Sesich	Sesich, Michael	Transcript	06/30/2015	60-62
PH-Siegel 2	Siegel, David	Transcript	06/30/2015	62-63
PH-Stearns	Stearns, Esther	Transcript	06/30/2015	14-15
PH-Taliaferro	Taliaferro, Jac	Transcript	06/30/2015	67-69
PH-Ushman	Ushman, Neal	Transcript	06/30/2015	13-Nov
PH-Valentino	Valentino, Patrick	Transcript	06/30/2015	34-36
PH-Van Horn	Van Horn, Scott	Transcript	06/30/2015	33
PH-Vaughan	Vaughan, Sarah	Transcript	06/30/2015	79-81
PH-Washington	Washington, Ace	Transcript	06/30/2015	38-40
PH-Yagi	Yagi, Curt	Transcript	06/30/2015	30-31

CITY AND COUNTY OF SAN FRANCISCO
OFFICE OF
COMMUNITY INVESTMENT & INFRASTRUCTURE COMMISSION
---oOo---

TUESDAY, JUNE 30, 2015

SPECIAL MEETING

REPORTER'S TRANSCRIPT OF PROCEEDINGS
FOR AGENDA ITEM No. 5(b)

PUBLIC HEARING ON THE DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT FOR THE GOLDEN STATE WARRIORS EVENT CENTER AND MIXED-USE DEVELOPMENT AT MISSION BAY SOUTH BLOCKS 29-32

CITY HALL
1 Dr. Carlton B. Goodlett Place, Room 416
San Francisco, California 94102

REPORTED BY: KATY LEONARD, CSR
Certified Shorthand Reporter
License No. 11599

I N A T T E N D A N C E
---oOo---

COMMISSION ON COMMUNITY INVESTMENT & INFRASTRUCTURE
CHAIRPERSON MARA ROSALES
COMMISSIONER MARILY MONDEJAR
COMMISSIONER DARSHAN SINGH
COMMISSIONER MIGUEL BUSTOS (NOT PRESENT)
EXECUTIVE DIRECTOR TIFFANY BOHEE
DEPUTY DIRECTOR SALLY OERTH
DEPUTY CITY ATTORNEY ROBERT BRYAN
DIRECTOR OF COMMISSION AFFAIRS CLAUDIA GUERRA

ORION ENVIRONMENTAL ASSOCIATES
JOYCE HSAIO, PRESIDENT

ENVIRONMENTAL SCIENCE ASSOCIATES
PAUL MITCHELL, SENIOR MANAGING ASSOCIATE

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INDEX OF PUBLIC SPEAKERS

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INDEX OF PUBLIC SPEAKERS (Continued)

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I N D E X O F

P U B L I C S P E A K E R S (Continued)

---oOo---

I N D E X O F

P U B L I C S P E A K E R S (Continued)

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P R O C E E D I N G S

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TUESDAY, JUNE 30, 2015 1:22 P.M.

AGENDA ITEM No. 5(b)

EXECUTIVE ASST. GUERRA: The next order of business is Regular Agenda 5(b), Public Hearing on the Draft Subsequent Environmental Impact Report for the Golden State Warriors Event Center and Mixed-Use Development at Mission Bay South Blocks 29 through 32, Discussion.

Agenda Item 5(b) is a Public Hearing on the Draft Subsequent Environmental Impact Report for the Golden State Warriors Event Center and Mixed-Use Development Project at Mission Bay.

The purpose of this hearing is to receive comments on the adequacy and accuracy of the Draft SEIR in identifying the potential impacts of the project -- proposed project on the environment.

Members of the public wishing to make comments are asked to please limit your oral comments to two minutes and try not to repeat points already made by other speakers. More detailed comments may be submitted

in writing until July 20th, 2015.

Please be advised for safety reasons standing is not allowed due to room capacity. We have open overflow rooms in Room 400, 408, and in the event that fills up, Room 421 will also be available.

Once you have made your public comment, please make your way to the overflow rooms to allow other individuals to make their public comment. Thank you.

Madam Director.

EXECUTIVE DIRECTOR BOHEE: Thank you, Madam Secretary.

Good afternoon, Commissioners and good afternoon to the members of the public. Thank you so very much for joining us.

Commissioners, this is a public hearing. There is no proposed action on the proposed Golden State Warriors mixed-use project. Today, again, the sole purpose is to receive comments on the EIR.

So, with that brief introduction, I'd like Sally Oerth, OCII Deputy Director, to provide context and outline a process and procedures. Then the Commission will receive public comment.

DEPUTY DIRECTOR OERTH: Thank you, Director Bohee.

Good afternoon, Commissioners. Again,

Sally Oerth, Deputy Director.

So, this item before you is to -- is a hearing to receive comments on the Draft Subsequent Environmental Impact Report, or SEIR, for the Golden State Warriors Event Center and Mixed-Use Development at Mission Bay South Blocks 29 to 32.

The Draft SEIR was published on June 10th, and the comment period runs through July 20th, 2015. Written comments may also be sent via E-mail to warriors@sfgov.org or to the Planning Department, which is assisting OCII with the Draft SEIR, and the specific mailing address for submitting written comments to the Planning Department is listed on page 2-9 of the SEIR.

Comments provided will be transcribed and responded to in a Responses to Comment document, which will respond to all verbal and written comments received and make revisions to the Draft SEIR as appropriate.

This is not a hearing to consider approval or disapproval of the project, therefore staff is not here to respond to comments today. That hearing will accompany the final certification of the SEIR later this fall.

Comments today should be directed to the adequacy and accuracy of information contained in the Draft SEIR. Commenters are asked to state their name

and to speak slowly and clearly so that the Court Reporter can produce an accurate transcript.

After hearing comments from the general public, we will also take comments on the Draft SEIR by members of the Commission.

And with that, that concludes my presentation. I'm available for any questions. Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Members of the public, please come to the podium in the following order and state your name for the record: Anna Fernandez, Neal Ushman, Ray Nyden, Esther Stearns, and Matt Prieshoff.

CHAIRPERSON ROSALES: Can you repeat those names?

EXECUTIVE ASST. GUERRA: Esther Sterns, Ray Nyden, Neal Ushman, Anna Fernandez, and Matt Prieshoff.

RAY NYDEN: Hello, Commissioners. My name is Ray Nyden. I have lived in Potrero Hill and South Beach for the past 15 years. I also have two businesses nearby, and I'm a board member for the South Beach Mission Bay Merchants Association.

The Warriors have shown an impressive commitment to collaboration and community input in

PH

planning the arena, in my opinion. They regularly brief community stakeholders, present updates to the Mission Bay Advisory Committee meetings, and gather feedback from small businesses such as myself in the neighborhood.

One of the many reasons I support the project is because it's -- it is so pedestrian friendly. I will be able to actually walk to the arena events from my home, as well as be able to take dogs the new green area that's going to be developed because of this arena.

I also like the fact that they're gonna have year-round retail as well as restaurants for local residents. So, it's going to be a new meeting place and a place for us to enjoy.

Nyden-1 [GEN-5]

With that short set, I would like to just thank you for your time today, and the City, for taking the time to do the Environmental Impact Report. Thank you.

CHAIRPERSON ROSALES: Thank you.

NEAL USHMAN: Good afternoon, Commissioners. My name is Neal Ushman, and I'm a resident of Mission Bay.

I was originally going to address how impressed I have been with the way the Warriors have been working with the community in addressing our

PH

concerns regarding the new arena. At the many community meetings I have attended, concerns by residents were voiced, and potential solutions to these concerns were explained in great detail. However, after reading this morning's Chronicle, I would like to address another topic.

Thus far, the major opposition has come from the Mission Bay Alliance, and while most of the membership is anonymous, none of those publicly-named members even live close to Mission Bay, and as most thinking-people realize, this group is made up of U.C.S.F. donors and biotech executives who are upset that the land is not going to be used for biotech. After all, they know what's best for San Francisco.

Now, the California Nurses Association comes out against the arena with concerns about access to U.C.S.F. Mission Bay. Have any of these representatives attended any of the CAC meetings where these items were discussed? No.

And according to the Chronicle, when asked about the Warriors' plans, all of the speakers admitted they were unfamiliar with the EIR. And while they claim to have no affiliation with the Mission Bay Alliance, their news conference, conveniently timed for coverage on the same day as this meeting, was organized by the same public relations company that represents the Alliance.

I'm an educator, and as I remind my students about the duck test, if it looks like a duck and quacks like a duck, it probably is a duck. I would give much more credence to the nurses' concerns if they were brought up earlier, and even if one the speakers yesterday had taken the time to actually read the relevant sections of the EIR.

As a grandparent, my granddaughter was a patient in the U.C.S.F. neonatal unit at Parnassus. Access and parking at that location was a challenge. I find it difficult to believe that the Nurses Association believes that the City, U.C.S.F., and the Warriors have turned a blind eye to the legitimate traffic concerns surrounding the new arena and have not taken steps to deal with this issue. After all, we are talking about approximately 200 events per year.

Salesforce would have brought in at least that number of people into the area five days a week, 52 weeks a year.

Let's not use traffic concerns that have been or are being addressed as a foil for other people's agendas.

Thank you.

Ushman-1 [GEN-5]

ESTHER STEARNS: Good afternoon. My name is Esther Sterns. I am a resident of Mission Bay, where I've been a homeowner since 2010.

I'm very excited about the arena's bike and pedestrian access, which I hope will really encourage people to get out of their cars and walk more in our neighborhood, which is something I would like to see.

My wife and I are raising three teenage children in Mission Bay. Until recently, I think they were the only teenagers in Mission Bay. But -- so, when we moved to Mission Bay, when we crossed the creek and moved South, we knew there would be more development, more traffic, more density. And so, we're not surprised that there's new development on this lot. We don't expect there to be empty lots anyplace in a valuable part of San Francisco.

We think the arena is an unexpected bonus for our neighborhood, with the bike paths, with the new parks, with the holiday ice arena as a possibility. All of these things are things that we think enhance our neighborhood for families in a way that few alternatives really could achieve.

So, in that sense, we are excited about the arena. Of course, we support the Warriors, but we're also excited about what the arena can mean for our

Stearns-1 [GEN-6]

neighborhood, and particularly, children in our neighborhood. And there are now 250 new children in our neighborhood. We're very excited for them to have access to all of this.

So, that's the basis for our support. I thank you for your attention today, and I hope you'll take into consideration these neighborhood needs as you make your decision.

Thank you.

Stearns-1 [GEN-5] cont.

CHAIRPERSON ROSALES: Thank you.

MATT PRIESHOFF: Good afternoon. My name is Matt Prieshoff. I'm the chief operating officer for Live Nation in the State of California.

As many of you know, Live Nation is one of the world's largest entertainment companies, putting concerts on all across the world.

We're strong supporters of the proposed arena in the Mission Bay area, in large part because there's no major arena in San Francisco, and this great city deserves a great arena, and we know the Warriors have planned for one.

As San Francisco's first ever multipurpose arena, the Warriors will attract people from around the Bay Area, from around the state, and around the world for major events.

Prieshoff-1 [GEN-5]

As a city, we should be pushing transit first, and we believe that the Warriors EIR plan does that. We believe that this is a transit-rich area and -- that they've done a phenomenal job studying all the potential parking areas around the arena as well.

Prieshoff-2 [TR-3a]

We want to go on record to you to voice our enthusiastic support of this arena plan, and we hope you will consider our recommendation throughout this process.

Prieshoff-3 [GEN-5]

Thank you very much.

EXECUTIVE ASST. GUERRA: Anna Fernandez, Alyssa Kies, Alejandro Madi, Alex -- and I'll spell the last name -- it's D-O-N-I-A-C-H -- Damion Scott, Andrew Battàt, please come to the podium.

ALYSSA KIES: My name is as Alyssa Kies, and I'm here representing SPUR.

We've been involved with planning in Mission Bay for many decades, and while we understand that the idea of putting an arena in Mission Bay is a change, we think it's going to be very positive overall for the neighborhood. It's how cities work.

Over the years, different people bring you ideas, and places evolve through the layering process of each generation contributing something different. It's going to make Mission Bay a more interesting place than

Kies-1 [GEN-5]

have it all being one thing.

And on the issue involving transportation impacts, we believe the Warriors are doing pretty much everything we could hope for. Between the transit investments, the existing transit infrastructure, and the fact that some people will be able to walk from Caltrans or from their neighborhood, the impacts are going to be manageable. The City is making the proper investments in transportation infrastructure to support the project.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

ANNA FERNANDEZ: Good afternoon. My name is Anna Fernandez, and I work at the Pediatric Emergency Department in Mission Bay.

I care for very sick children who need continual monitoring and devoted, hands-on care. I am here today to convey my concerns and the concerns of my colleagues, the 3,000 registered nurses represented by the California Nurses Association at U.C.S.F., including the 900 registered nurses who work at U.C.S.F. Mission Bay.

We are not here today to protest the Golden State Warriors. We are here today for one reason: To advocate for our patients and their family members.

Kies-1 [GEN-5] cont.

Kies-2 [TR-3a]

As you know, the area around the hospital and clinic facilities at Mission Bay is almost like a small island unto itself, with a very narrow corridor between the Bay and the highways. It is an increasingly dense community with little public transportation that can become easily congested.

A major additional project such as this will undoubtedly increase congestion during the events it is intended to house. We know that the games or other special events -- in those narrow corridors, the traffic can result in gridlock and can limit access for everyone, and that is our major concern.

What will the City do to ensure the patients who need the highly specialized care that we provide, and other patients coming to Mission Bay -- will they have access in a timely manner when they need it -- 24 hours a day, every day of the year, including during games, concerts, or other special events?

What will the City do to ensure the parents of the children I care for and members of other patients -- will they be able to get to the hospital to be by the side of the -- of their loved ones?

What will the City do to ensure that nurses like myself and doctors and other healthcare professionals and personnel will be able to get to the

Fernandez-1 [TR-4]

PH

hospital and clinics at Mission Bay to care for our patients?

In a small, densely-packed city such as ours, congestion that affects public health and safety must always be addressed, and the needs of the whole community, not just the wealthy developers, must always be addressed.

Fernandez-1 [TR-4] cont.

Many of us raised similar concerns during the review process for the California Pacific Medical Center facility --

CHAIRPERSON ROSALES: I'm sorry, but your two minutes is up.

ANNA FERNANDEZ: Thank you for your time.

CHAIRPERSON ROSALES: Thank you.

ALEJANDRO MADI: Hello. My name is Alejandro Madi, and I'm a research analyst for Unite Here Local 2. We are the union that represents more than 14,000 hotel and food workers in San Francisco.

I'm here today to express our union's strong support for the Warriors project. From the prospective of creating good, quality, working-class jobs, the proposed arena is probably the most important development we have seen in San Francisco in the last 15 years.

At a time when working-class families are

Madi-1 [GEN-5]

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PH

being squeezed out of our City through a combination of stagnant incomes and rising rents, we should be doing everything we can to promote projects like this one.

As you may know, our union represents 800 concession workers at the AT&T park. While we struggle hard to raise wages and benefits at the ballpark, those remain very part-time jobs because of the nature of the baseball season.

The prospect of a basketball and event center close by holds out the possibility that food service workers could string jobs at these facilities together to something that gives them a real pathway to middle-class jobs. That would be a game changer for food service workers in San Francisco.

The Warriors reached out to our union early on to ensure that workers who currently staff their concessions are guaranteed a place at the new arena, and that the addition of positions created here will be the kind of jobs that raise the bar in San Francisco. That's exactly the kind of development that our City should be investing in.

Madi-1 [GEN-5] cont.

Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Will the next person please come up?

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ALEX DONIACH: Good afternoon. Thank you. My name is Alex Doniach, and I am speaking on behalf of the Mission Bay Alliance, the coalition of U.C.S.F. staff, stakeholders, and residents concerned about the proposed stadium in Mission Bay.

Doniach-1 [ERP-9]

Since we've launched our efforts, we've been out talking to employees and residents in the Mission Bay neighborhood. We've heard from hundreds, if not thousands, of people who are concerned about this project and its significant impacts on traffic, parking, access, and quality of life in Mission Bay.

Doniach-2 [GEN-5]

We've also launched a petition, calling for the City to reject this project. In the past few weeks alone, we've collected more than 4,600 signatures from residents, U.C.S.F. healthcare workers, employees, and neighbors who are concerned about the impact of this 18,500-seat arena.

Doniach-3 [ERP-9]

I am submitting that petition today. We have received letters, too, which we're also submitting, from neighbors who are concerned about the impacts of this project on parking, access to hospitals, traffic, and air quality --

Doniach-4 [ALT-4]

letters that ask the City of San Francisco to consider alternative sites other than Mission Bay for this environmentally-damaging project.

Doniach-5 [ERP-9]

Just yesterday, the California Nurses

Doniach-5 [ERP-9] cont.

Association expressed their concerns about this project. In the weeks and months to come, more people will be joining the growing numbers who are coming to understand just how bad this will be for the neighborhood, U.C.S.F. access to emergency care, and traffic throughout the entire east side of the City.

We hope you'll take these residents and their strong opinions into consideration when reviewing this project.

Thank you.

EXECUTIVE ASST. GUERRA: Please come to the podium.

DAMION SCOTT: Good afternoon. Thank you very much for this opportunity. I am speaking on behalf of Allison Heath, who could not make it here today.

She writes:

Scott-1 [ERP-9]

"I have serious concerns regarding the environmental impacts of the proposed Warriors arena which are not fully disclosed or fully analyzed in the Draft EIR.

"The Draft EIR shows that the project would cause severe traffic gridlock, noise, and air pollution in Mission Bay, right next to the U.C.S.F. and other medical

Scott-2 [LU-2]

facilities, yet the Draft EIR does not even discuss the land-use impacts of the project. They were not analyzed in the mission of the planned EIR.

"Additionally, the project will further hinder access to other parts of the City and the Bay Bridge to Mission Bay. Even with the improvements proposed by the City, Mission Bay cannot handle up to 18,500 fans and 225 events per year, especially when both stadiums have games.

"While restricting the number of parking spaces may be considered a means of traffic management under the City's regulation, the practical effects will be yet more gridlocked and unhealthy air emissions, and traffic and parking impacts will reduce access for emergency and urgent care for patients and add to the existing commute challenges for the nurses, doctors, and medical staffs who work at the Mission Bay medical campus.

"The Draft EIR also ignores the health and safety impacts of interfering with access to essential medical facilities.

"Increased car and truck emissions in

Scott-2 [LU-2] cont.

Scott-3 [TR-4]

Scott-4 [AQ-4b]

Scott-5 [TR-9]

Scott-6 [AQ-4b]

the area will be unhealthy for residents, workers, and hospital patients. This will have a disastrous impact on the health and welfare of Mission Bay residents.

"Overall, we are disappointed with the City's approach to the environmental review of the project, which fails to fully access the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR.

"Thus, we ask the City of San Francisco, avoid the disastrous impacts of the proposed entertainment center at the Mission Bay community, including the health and welfare of patients, families, employees and neighbors."

Thank you very much.

EXECUTIVE ASST. GUERRA: Sir, would you please state your name?

DAMION SCOTT: Oh, I'm sorry. My name is Damion Scott.

EXECUTIVE ASST. GUERRA: Would the following people please come to the podium: Blaise Gisslow, Annabel Ortiz, Vanessa Aquino, Curt Yagi, Alex -- and I'll spell the last name -- it's G-A-N-O-W-S-I-H-I.

Scott-6 [AQ-4b] cont.

Scott-7 [IO-2]

I-Scott-8 [GEN-5]

PH

ANDREW BATTÀT: Hello. My name is Andrew Battàt, and I'll be reading a letter on behalf of J. Huerta (phonetic), who was not able to attend this meeting.

"I am very concerned about the negative impact of traffic and parking in the neighborhood by the proposed stadium at 3rd and 16th Streets.

"Currently, when there is an event at the Giants Stadium, my commute to the Financial District is doubled, be it by car, T-train, or bicycle, due to the influx of people to the neighborhood. Furthermore, parking in the neighborhood is filled with fans, and makes it difficult for residents returning from work.

"While I appreciate these fans supporting our local Giants, I do not appreciate the out-of-town, In-N-Out Burger trash, nor the empty containers left in the streets. This speaks to the way that crowds rush into the games and are often not supporting the local" -- excuse me -- "and how the crowds are not supporting the local community since the games are already so

Battat-1 [TR-4]

Battat-2 [GEN-2]

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PH

expensive.

"Adding basketball season to the event calendar for this neighborhood will definitely have a negative impact on the traffic and parking in the surrounding neighborhoods, and residents will be hurt, along with business development and growth.

"I am in favor of neighborhood growth, but unfortunately, I think this stadium will only profit the developer, and I would rather have long-term business growth that this neighborhood is already invested in."

Thank you again. That was J. Huerta, a San Francisco resident.

CHAIRPERSON ROSALES: Thank you.

BLAISE GISSLOW: Thank you to the board for putting on this meeting. I'm very happy to have an opportunity to voice my opinion.

My name is Blaise Gisslow. I'm a concerned citizen of San Francisco, and I'm pretty familiar with the EIR. And I know we've all heard a lot of statistics about parking and stuff, so I'm going to start with a quote I read from an SF Gate article. The quote was from a City official. It said:

"Will there be traffic?"

Battat-2 [GEN-2] cont.

Battat-3 [GEN-5]

Gisslow-1 [TR-5a]

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PH

"Yes."

"Will we be able to handle it?"

"Yes."

Well, I look around the City, and I don't think it's been handled at all. I don't see the credibility in an official who says they know how to handle traffic in a city that's been overrun with traffic for years now.

Gisslow-1 [TR-5a] cont.

A problem, I think, with the EIR and the public's opinion is, people are very uninformed about what's actually going on with the costs going into this arena.

Yes, the arena is publicly -- I mean, privately financed, but one thing they haven't talked about is the resulting public transportation improvements that will come along with this project.

So, Caltrans had a proposed and approved line going through King Station, but the Mayor wants to change that line going to the new arena he's proposing, and that would cost $2.5 billion.

That is not privately funded. That would be taxpayer money. And I think that's a huge problem that's not addressed in the EIR. That's a huge amount of money not accounted for, let alone the $40 million of proposed improvements to the public transportation, as

Gisslow-2 [GEN-1b]

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well as $6.6 million in annual upkeep fees to the public transportation.

These are all costs that are not addressed at all in the EIR. These are all under the radar that no one talks about or knows about, and I think that's a huge problem with this project.

Gisslow-2 [GEN-1b] cont.

Thank you.

CHAIRPERSON ROSALES: Thank you.

VANESSA AQUINO: Good afternoon, Commissioners. My name is Vanessa Aquino. I'm a native San Franciscan and have lived in Dogpatch for almost 12 years. I'm also on the board of the neighborhood Dogpatch Association, and I have witnessed firsthand how our community has grown and changed a lot.

I proudly support the Warriors mixed-used development, because it will serve as a community hub for performing arts, retail space, restaurants, and a wide range of community events, and the Warriors have outreached to us and communicate within our community.

Aquino-1 [GEN-5]

Even better, the Warriors are privately financing it with no money coming from the City or the public, and no new taxes would be involved.

This is a huge win for our community and for all of San Francisco. Having the Warriors in our neighborhood and community will create and bring new

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PH

needed businesses within Mission Bay, Dogpatch, and beyond, which would be Bayview, for me speaking.

Thank you for your time, and I hope you will take my support in consideration. Have a good afternoon.

CHAIRPERSON ROSALES: Thank you.

ANNABEL ORTIZ: Hi. Good afternoon. My name is Annabel Ortiz, and I am here to talk about the opposition, because we do not want the stadium to be built at the Mission Bay.

So, over the past two weeks, I have been canvassing the Mission Bay area, and I've been speaking with residents and employees, and I've been speaking to the relatives who are visiting patients at the hospital, and I've been asking them, What are your views on building the stadium in such a closed unit?

And overwhelmingly, the response that I received frequently was, Do not build it. I do not want the stadium here. We do not need the traffic. We do not have enough parking.

Ortiz-1 [GEN-5]

Again, you know, the BART station doesn't go in that direction, so more people are going to be driving in. So, number one, the concern is to definitely avoid the traffic congestion.

One employee said that when he's driving out

Ortiz-2 [TR-4]

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of the parking area to go home, and if there's a Giant's game, it takes him about 30 minutes just to drive one block, and it takes about two hours or two-and-a-half hours just to get out of the area and to catch the freeway. So, in thinking about that, the infrastructure is not suited for a stadium. It's not suited to bring 18,000 fans into this area.

Ortiz-2 [TR-4] cont.

A nurse also mentioned her concerns, which are, How are the emergency vehicles going to access? How can they come in and out of the area?

Well, there's really no plan, and if there is, it hasn't been communicated, and that's a problem.

Ortiz-3 [TR-9]

And, lastly, I want to just leave you with a question about, What would responsible development look like in San Francisco?

You know, it's not just a problem with the stadium, but in San Francisco in general. What does that really look like for the council members? And, you know, we can't deny that traffic is a problem in the quality of life for all of San Francisco.

Ortiz-4 [GEN-2]

Thank you.

CHAIRPERSON ROSALES: Thank you.

CURT YAGI: Hello, Commissioners. My name is Curt Yagi. I'm the executive director of ROCK, Real Options For City Kids. We're a non-profit in

San Francisco's Visitacion Valley for over 28 years, serving children and youth there. I'm also a long-term Potrero Hill resident.

I'm a big supporter of the Warriors and their move to Mission Bay. I know the team and the City have worked really hard to take feedback from the community, address their needs, and put this into a plan. I think this is great for that community.

Yagi-1 [GEN-5]

In addition, through my work at ROCK -- we have been working with them in partnership for well over about 10 years, probably even longer -- they're the one rare sports team in the Bay Area that really takes to heart what they want to do, gives back to the community, like organizations like us, does a host of things without the need for -- and expectations for PR. They're doing it for the right reasons.

I have no doubt they're going to look out for the community organizations such as ours, as well as the general community.

Thank you.

CHAIRPERSON ROSALES: Thank you.

ALEXANDER GRANOWSKI: Good afternoon. My name is Alexander Granowski. I'll be speaking on behalf of Harold M. Hoogasian, who could not make it today.

"Although I support the quest for an

Granowski-1 [TR-13]

event arena that might serve as the Warriors' home in San Francisco, the site proposed to cross the U.C.S.F. Mission Bay is not appropriate.

"The lack of parking, coupled with the proximity to both the Medical Center and AT&T park is a recipe for congestion and a potential disturbance for the quiet care of patients at the Medical Center.

Granowski-1 [TR-13] cont.

"I understand there's an alternative site available for consideration which has comparable transportation infrastructure support and is removed by some distance from the Medical Center and the ballpark."

Thank you for your time.

Granowski-2 [ALT-4]

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Will the following people please come up: Sebastian Conn, Kevin Carroll, Scott Van Horn, Pat Valentino, and Esther Stearns.

SEBASTIAN CONN: Good afternoon, Commissioners and Madame Chairman. My name is Sebastian Conn, and I'm here to speak in support of the project.

I'm a student here in San Francisco, and like so many San Franciscans, I rely on riding my bicycle everywhere.

Conn-1 [GEN-5]

I'm excited for the Warriors to move to Mission Bay, because I think this venue will have tremendous bicycle access, with the abundant bike parking as outlined in the EIR.

It has over 300 valet spots, over 100 secure bike parking spots in the office buildings, and dozens more around the site. Plus, this project will bring new bike lines on Terry Francois and 16th Street, making it simple and safe to get to.

Thank you for your time.

Conn-1 [GEN-5] cont.

CHAIRPERSON ROSALES: Thank you.

SCOTT VAN HORN: Hi. I'm Scott Van Horn. Thank you for the opportunity to have me speak today on the Draft EIR.

I live in Dogpatch, just a couple of blocks from the site. I'm actually one of the very few that is going to get my view of the Bay Bridge blocked from my apartment by the project, however I'm not a NIMBY.

As others have talked about this document, this document is incredibly thorough, and I applaud the City for looking at all the issues so carefully and demonstrating attention to the impacts to my neighborhood.

I'm especially pleased about the new businesses and parks that will go in within walking

VanHorn-1 [GEN-5]

distance.

As you know, the Warriors and the City have been working very closely with neighbors like myself, listening to our feedback and incorporating the community suggestions into their plan. As a result, they've come up with a project that perfectly fits into the Mission Bay, Dogpatch, and other surrounding communities.

Most of the neighbors that I've talked about [sic] are extremely excited about it. I'd like to go on record that I am personally in support of the new arena.

VanHorn-1 [GEN-5] cont.

Thank you.

EXECUTIVE ASST. GUERRA: Cathy Searby, Ace Washington, D.J. Brookter, and Nick Belloini, please come to the podium.

PATRICK VALENTINO: Good afternoon. My name is Patrick Valentino. I'm the vice president of the South Beach Mission Bay Merchants Association. I also live in the neighborhood, close to where the new event center will be.

I've taken some time to look at the Traffic Management Plan and the Draft EIR, and a couple of things, I think, are very important to point out.

Number one, if you start to compare traffic management plans of arenas that have been constructed in

Valentino-1 [TR-3a]

the recent decade, you'd see that this is probably one of the most in-depth and forward-looking plans, moving to a transit-first plan, as opposed to prioritizing the automobile, which I think is extremely important. This one talks about having the most bike parking spaces that we'll ever see for an arena.

Also, in discussions, as I understand it from attending a lot of the public meetings, is that there's talk about having direct right-of-way for hospital workers and emergency vehicles. And I think that's extremely important to consider.

It is not the case that the hospital and the emergency issues have been taken off the table. That is very much part of the discussions, and we should pay deference to that.

Valentino-1 [TR-3a] cont.

As far as quality of life goes, you know, we're evolving and finding out that cities are some of the greenest places that we can be, and this is where we have a chance to put housing next to work, next to play.

And the event center is a sense of place that can happen in Mission Bay. It can create a very new and exciting place for us that is environmentally very aware and sensitive to our surroundings.

It's going to be a LEED gold-certified construction -- that's significantly important -- with

Valentino-2 [PD-4]

offers to mitigate 100 percent of any greenhouse gas emissions.

Valentino-2 [PD-4] cont.

Again, we shouldn't look through the lense of the automobile and what might have been construction in the 1950's, but look forward to what we're doing today.

I very much support this project, and so does our association.

Valentino-3 [GEN-5]

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

CATHY SEARBY: Thank you, Commissioners. My name is Cathy Searby, and I live in Mission Bay with my husband and daughter, and I live next door to the proposed arena site.

We're very excited as a family, not only to watch the championship Warriors basketball team in the arena, but we feel strongly that San Francisco needs this entertainment destination, with the family shows such as "Disney on Ice," the Globetrotters, and concerts we can attend together.

I'm also excited about the waterfront park as there's nothing like this currently in the south neighborhoods, and it provides a place for kids and families to enjoy the beautiful views, have fun in a safe environment.

The Warriors and the City have gone through

Searby-1 [GEN-5]

thorough analysis of the project, including extensive meetings -- the Mission Bay CAC, U.C.S.F., and our neighborhood -- to address our concerns. They have made good progress with all of us, especially U.C.S.F., in coordinating their respective operations so both can function productively in our neighborhood.

As a result, the Warriors team have come up with a project that fits well in the community and that we, as neighbors, are very excited about, if you would put us down for three.

Searby-1 [GEN-5] cont.

Thank you.

CHAIRPERSON ROSALES: Thank you.

D.J. BROOKTER: Good afternoon, Commissioners, Madam Chair, Director Bohee. My name is D.J. Brookter, and I'm the president of Bayview-Hunters Point, and I'm also the deputy director of Young Community Developers, which is in Bayview-Hunters Point, and I'm here to express my strong support for the Warriors and the arena at Mission Bay.

Pat actually stated -- I was extremely impressed on how green the project itself is based off the EIR. The arena emission rate will be LEED gold certified and will truly set a standard for sustainable building design, I think, here in the City.

And the Warriors are more than just a

Brookter-1 [GEN-5]

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basketball team, as we've seen, especially with the championship that we just had. And what the team will actually do is be a partner in the community.

I know just that Young Community Developers alone, within the past two seasons, we've been able to employ well over 200 individuals from Bayview-Hunters Point that we actually transported from Bayview-Hunters Point to Oakland to work in the arena. So, just imagine how many more folks, from an economic standpoint, that will be able to work once those guys are here in Mission Bay.

Brookter-1 [GEN-5] cont.

I just want to thank you all for the opportunity to speak on behalf of the EIR and for your time today in my support for the Warriors stadium.

Thank you.

ACE WASHINGTON: Good afternoon.

I apologize to the younger generation in the back here, but, you know, this is what happens down here at City Hall. I mean, this is something light.

But let me just go on. Ace on the Case. Who is gonna replace Ace is the Case, Community Assistance Service Enterprise?

See, what we do is analyze things -- think about the theme, the scheme, and the team. We analyze the team, find out what the scheme is, and we come back and analyze it.

Think about it, ladies and gentlemen. I'm not new to this; I'm true to this. Okay.

Let me just also go on and say, I don't need the permission, because I'm on a mission. You know, I've been doing this for 25 years, youngsters back there, so you all need to take note. My name is Ace, and I'll give you my numbers later.

But right now, let's talk about the players we've got here. The players. This is all about dollar bills. You know, you talk about the EIR. This is about dollar bills.

Right here. Let's talk about the players, the bases. Let's talk about who is representing who. One side is an ex-member of the Mayor's, and then you got a next side that's a -- what -- he's a community or -- he works for consultants for the big Lennar out there. So, you've got big two big consultants. We're talking about money now. We don't mention that in the EIR, but I'm here to tell you, that A-C-E has been studying it.

So, we're going got put all these things together and we're gonna up with a solution, Mr. Warrior. It's called "community reform," to get -- you know, flip-flop and drop all this other stuff.

We, as community people, must be involved with

Washington-1 [GEN-6]

the growth of this city for the next 10 years for the generation in the back. So, therefore, I've got a method to all this pollution.

You need to have some kind of conversations about how we're going to put things together. And the only way to do that is you've got to collectively deal with our legislators out here, with our supervisors -- London Breed and Cohen.

Washington-1 [GEN-6] cont.

That's the only way, youngsters in the back, we're gonna change, so you, in 10 years, will be able to have some part of it.

My name is Ace, and I'm on the case.

Also, about the Warriors down at Mission Bay, my request is a simple one: For the blacks to note that we were part of the Mission Bay through Jim Jefferson.

My name is Ace, and I'm on the case.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: John Caine, Jon Ballesteros, Dianne Hartnett, and Kim Kobasil [sic], please come to the podium.

KIM KOBASIC: Good afternoon, Commissioners. My name is Kim Kobasic. I am a Potrero Hill resident and small business owner in the South Beach.

I'm also the copresident of the South Beach Mission Bay Business Association, and I am here to

Kobasic-1 [GEN-5]

PH

express my support for the Warrior's arena in Mission Bay.

After taking some time to review the EIR, I am excited about the open pedestrian accessibility in the arena. The walk is going to be flat. It's going to be easy and beautiful along the waterfront.

The venue's proximity to public transportation means that anyone who lives near BART, Muni, or a Caltrain line can walk to a stop or station and arrive at the arena's doorstep within minutes.

The new arena also triggers the construction of the new bayfront park, which will make Mission Bay more hospitable for runners, families, and allow people to enjoy the waterfront. Right now, that is not currently possible.

Kobasic-1 [GEN-5] cont.

Thank you for your time today, and I hope you will take my feedback into consideration.

TIM PAULSON: Commissioners, good afternoon. my name is Tim Paulson.

I'm the executive director of the San Francisco Labor Council. We represent over 100 unions here in town, many of members who do live in the District 10 and 6 in the areas that have been revitalized over the last 30 years.

I can remember when there was an old shipyard

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out there -- I should say an old train station -- out in that area, and there were many different plans that were put together to build a hospital, build new businesses and parks. There's so many different, exciting things that are going there. And I've been on record as saying that the Labor Council supports this arena to come to San Francisco.

The first thing that the Warriors did -- one of the first things they did when they first announced their intentions to come to San Francisco is to call the Labor Council, and there have been many, many meetings and discussions with the unions here in town, and that's where we moved.

And I'll tell you, even last night when I was coming back on the plane from New York City and I noticed that the California Nurses Association, which is a very wonderful union that's part of our Labor Council -- even before I saw that they had a press conference yesterday, there still were concerns that people had about traffic mitigation next to a hospital.

And we take that very seriously, and we take the nurses very seriously. But I've been assured by the Warriors and the City as we go through this ongoing process that those mitigations will take place.

Paulson-1 [GEN-5]

Again, this is an evolving neighborhood, and it's a wonderful neighborhood, and it's exciting that the Warriors are coming here, and I think that we will get to the right place at the right time to make sure that this happens.

Paulson-1 [GEN-5] cont.

Thank you very much.

JOHN CAINE: Hello, Commissioners. My name is John Caine, and I'm a small business owner in Mission Bay and in South Beach.

I support the Warriors arena project in San Francisco, knowing that it will have a positive impact on our Mission Bay Community. I've reviewed the arena plan, and what really stands out to me is the steps that the architects have taken to minimize the impact that this project has on our environment.

Caine-1 [GEN-5]

Thank you for the opportunity to weigh in today.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Please come to the podium: Paul -- and I'll spell the last name -- it's O-B-I-D-S-M-O-N; Stefano -- and I'll spell the last name -- C-A-S-S-O-L-A-T-O; Ben Bleiman. Please come to the podium, Adam Gould and Curt Yagi.

JON BALLESTEROS: Good afternoon, Commissioners. Jon Ballesteros, San Francisco Travel Association, and I'm here today to express our strong

Ballasteros-1 [GEN-5]

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support for the Warriors arena in Mission Bay.

Throughout the EIR process, the City has done a thorough analysis of the project and every conceivable impact it could have on the city. The team has been above board and maintained complete transparency in their plans since they've been talking about this project many, many years ago.

We have confidence in the City's assessment that traffic be manageable, and we believe that the benefits of having a multipurpose arena that will serve all of San Francisco will far outweigh any potential impacts.

Ballasteros-1 [GEN-5] cont.

So, with that, I want to thank you for opportunity to weigh in today.

DIANNE HARTNETT: Thank you for your time. I'm Dianne Hartnett, and I'm here because I'm a real estate professional that's been working in the South Beach Mission Bay area since 1989.

I have been specializing in South Beach Mission Bay since 2005. I have worked with hundreds of people renting, purchasing, developing in the area, and I am here to support the progress.

I know change is difficult, and I believe, witnessing, attending meetings, talking to people that I have worked with, for the most part they're supportive

Hartnett-1 [GEN-5]

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of a responsible vote.

There is no place in the City that does not have a traffic headache at this moment in time, that I, too, have witnessed. I, too, live in a neighborhood with retail. That comes with some pros and cons, but the majority of the people with this vision for this neighborhood moved here knowing this change was inevitable. And I think that the outcome, if people will collaborate, could be very, very positive for the entire City, not just Mission Bay.

Hartnett-1 [GEN-5] cont.

We thank you for taking so much time to really thoughtfully think and listen to everybody and all their opinions.

Thank you.

CHAIRPERSON ROSALES: Thank you.

STEFANO CASSOLATO: Good afternoon, Commission. My name is Stefano Cassolato. I'm a registered lobbyist in the City, but I'm here on a pro-bono basis.

I'm coming as a long-term resident. I'm 50 years old, and I was 10 years old when the Warriors won the championship. That really made me happy as a young child and really got me interested in the Warriors. And I'm 50 now, and I'm still very excited about what they brought to the Bay Area.

I would like to say this: When the Giants came, you know, to talk about putting a stadium on the water, there was opposition. There was many of the same opposing dis- -- opposing arguments that we're hearing today. However, this is a very thorough group, project sponsor, from the top down -- Mr. Wells, Lacob, Gruber. They pay attention to detail. They dot their I's. They cross their T's. They hire very, very skilled people, and they're very well prepared.

This City is going to have something that they've needed desperately for years. We have a big venue, we have many small venues, but we don't have a an arena. If we want to call ourselves a world-class city, we're going to need a venue that they're proposing today. More than just basketball. Concerts. Events.

I remember, in 2001, I worked with Bob Arum of Top Rank to bring Mayweather-Chavez before Mayweather was money. And we had that event at the Civic. And I remember how important that was. We can attract more venues like this.

This EIR is very thorough, well thought out, and this arena will be nestled in Mission Bay, which many people will embrace.

Cassolato-1 [GEN-5]

I think what's going to happen here is, we're going to make sure that all the steps are taken so that

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all these concerns are addressed.

Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Will the following people please come to the podium: Kevin Carroll, Cathy Searby, Andrew Goldstein [sic], and Nick Belloini.

BENJAMIN BLEIMAN: Hello, Commissioners. Thank you from having me. My name is Benjamin Bleiman.

I am the founder and owner of Tonic Nightlife Group, which has seven bars in San Francisco, as well as an event company. We employ over 75 people.

I'm also the founder and manager of the San Francisco Bar Owner Alliance. We have 220 elite bar owners in that group.

I'm also the chairman of the board of the California Music and Culture Association, which is the trade group called CMAC for short, that represents bars, nightclubs, music festivals, and music venues in San Francisco.

I want to talk today about the impact that this stadium, this arena, will have on San Francisco's nightlife.

It is -- all those groups that I spoke of, it's our job to support vibrant, world-class nightlife in San Francisco, and we feel that this arena will

Bleiman-1
[GEN-5]

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contribute in a very meaningful way to bringing San Francisco up to a world-class city in terms of nightlife, not just from the events that will be there, from sporting events to A-list concerts and music events such as the Red Hot Chili Peppers or Beyoncé, which now have a chance of actually playing in our city, but also in all the people that it'll draw from the outside areas, who will then stay in the city, some of them, and go in the City and spend their time and their money and their joyous smiles at our nightlife venues. So, we're very excited about that.

They've outlined the existing parking near the venue and the extensive of public transportation that will serve the site, and the traffic management plan that I've looked at is very thoughtful and thoroughly done, and it gives us no reason for concern.

So, we want to go on record to support the arena in the strongest possible terms.

Bleiman-1
[GEN-5]
cont.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

NICK BELLOINI: Good afternoon, Commissioners. My name is Nick Belloini. I'm going to weigh in on this proposal.

I think that's it's a wonderful idea to have an arena here in the San Francisco. The area has gone

Belloini-1
[GEN-5]

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through an extensive EIR early on, when it became the Mission Bay.

I remember hearing my dad's stories -- who used to be a part of customs, going through the warehouses that used to be there. And, trust me, there's some things you never want to hear that happened down that way.

But the issue is, it had that EIR that made it the great possible [sic] that it is now. And now we're doing a second EIR that is turning into making it so that the Warriors can have the arena here, which is a true gem for San Francisco.

It will complement the hospital, it will complement everything there, and it will be a great thing for San Francisco. So, I fully want to say I support this project and I support the arena with all of my existence.

Belloini-1 [GEN-5] cont.

Thanks, guys.

EXECUTIVE ASST. GUERRA: Please come to the podium: Sheryl Davis; Henry -- and I'll spell the last name -- it's K-A-R-H-O-L-O-W-I-T-Z [sic]; Jim Lazarus; Abe Evans, and Elizabeth Kirk.

ADAM GREENSTEIN: Good afternoon, Commissioners. My name is Adam Greenstein, and I'm a resident of San Francisco and business owner, and I'm

Greenstein-1 [GEN-5]

here to support the Warriors arena in Mission Bay.

Greenstein-1 [GEN-5] cont.

I reviewed the plans, and what really stands out to me is the steps that the architects have taken to minimize the impact this project has on our environment.

They made a promise to offset 100 percent of the arena's greenhouse gas emissions by paying to the state's Carl Moyer program, which funds the upgrade of vehicles such as dirty school buses, in terms of getting clean, fuel-burning buses. This focus on climate-change mitigation is the future of responsible building, and I'm proud that the Golden State Warriors are leading the way.

Greenstein-2 [AB-1, GHG-2]

I'd also like to point out there were similar concerns when the San Francisco Giants built their stadium, but I've witnessed how that stadium has revitalized the SOMA area. And as a future homeowner in Mission Bay, because I plan to buy a place this year, I'd like to see that same transformation happen in Mission Bay.

Greenstein-3 [GEN-5]

Thank you very much for your time.

CHAIRPERSON ROSALES: Thank you.

KEVIN CARROLL: Good afternoon, Commissioners. My name is Kevin Carroll. I'm the executive director of the Hotel Council of San Francisco.

I have the pleasure of working for an industry that employs 24,000 people, the majority of whom live and work it San Francisco. And I'm here to fully support the Warriors arena in Mission Bay.

We do believe that by having the arena there, we will continue to attract more events and other activities to the City that will help not only those who are participating in the events, but those who are working in industries like the hotel industry that will get extra hours and be able to work to be able to support the events as well.

Carroll-1
[GEN-5]

The public space that's part of it, I know, is equivalent to the size of Union Square, and it's something that's adding public space to the project. And working with the project as well as it's done is something that would be important to both us and to our hotel guests as well.

Guests who stay at our hotels spend more money outside our hotels as they do inside. So, if we can attract more people to come in for the events that are part of the arena, they'll spend more money, which will benefit all those who not only work in the hotels, but those who have businesses around them and many small businesses that rely on the visitors as well.

So, again, I'm here to fully support the arena, and I really thank you for your time today.

CHAIRPERSON ROSALES: Thank you.

JIM LAZARUS: Good afternoon. Jim Lazarus, San Francisco Chamber of Commerce.

The Chamber of Commerce represents over 1,500 businesses of all sizes throughout the City, employing over 200,000 people, including the City's hospitals, including the Warriors, including many businesses in Mission Bay.

If the issue is traffic congestion, it can be managed. Hospitals throughout San Francisco are in locations that deal with access issues every day.

Lazarus-1
[TR-4]

How many of us have driven by Saint Mary's Hospital on Fulton and Stanyan on an afternoon or when JFK Drive is closed? Or C.P.M.C. building a new hospital at Van Ness and Post? Or U.C.S.F. Parnassus, which for decades was a neighbor of Kezar Stadium, with 70,000 people going to 49er games, college and high school sports in that facility for decades before it was reduced in size about 30 years ago?

I took a look at the March 1996 voter handbook in San Francisco when the voters were asked to approve the ballpark. Some unnamed group called San Franciscans for Planning Priorities '96 had the ballot argument against the ballpark.

They opposed Prop B because, Millions of additional cars and no parking will drive jobs and businesses out of China Basin, will create gridlock over 200 days a year. Well, we all know within weeks of that ballpark opening in 2000 it was a gem on the waterfront that is supported by San Franciscans throughout the City.

The Draft EIR outlines a mitigation plan for traffic and congestion management that will work for U.C.S.F., it will work for the residents, and it will work for the businesses in Mission Bay, and we urge this Commission to support that EIR and to move this project forward as quickly as possible.

Lazarus-2 [TR-3a]

Lazarus-3 [GEN-5]

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

HENRY KARNILOWICZ: Good afternoon, Commissioners. Henry Karnilowicz, and I am the president of the Council of District Merchants, which represents some -- over 2,000 businesses in the City.

I am in full support of the Warriors arena project in San Francisco, knowing it will have a positive impact not only on Mission Bay, but also on our gem of a city. I want to thank the City for taking the time and energy to create a world-class project that is deserving of a world-class city.

Karnilowicz-1 [GEN-5]

Thank you for the opportunity to weigh in

today. I hope you will take my support to consideration.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Please come to the podium: Matt Prieshoff, Drake [sic] Donaldson, Bruce Agid, and Celestino Ellington.

ABE EVANS: Hi, Commissioners. My name is Abe Evans. I'm a student here, and I live in Potrero Hill, and I'm really excited about this stadium and arena, because it's really bike-friendly, and I bike everywhere in the City.

Evans-1 [GEN-5]

I love that it is in line with the City's Bike Plan and the Transit-First policies.

I'm excited because it's going to add to the Blue Greenway, and it will be great to have a lot more of that bike path, especially somewhere where I can drop off and grab a bite to eat at some of the retail that's going to be open on the bike path.

Thank you so much for your time.

CHAIRPERSON ROSALES: Thank you.

ELIZABETH KIRK: Hello, and thank you, Commissioners. My name is Elizabeth Kirk. I'm also a student here and a Warriors fan.

I've come today to fully support the Warriors'

Kirk-1 [GEN-5]

plan to move to Mission Bay.

I'd like to express my support, mostly because of some of the environmental plans that have been made for this project. In reviewing those plans and by looking at many of the renditions, I'm impressed with the emphasis on landscaping and green space, as well as the incorporation of the natural environment with the site.

From trees and grass lawns and all of the green rooftops that have been designed, I think that this project will have a big impact on making our City more green.

Thank you.

Kirk-1 [GEN-5] cont.

CHAIRPERSON ROSALES: Thank you.

SHERYL DAVIS: Hello, Commissioners. My name is Sheryl Davis. I run a non-profit here in San Francisco.

And, first and foremost, I just wanted to thank you for the time and deliberation that you have already taken into looking at the EIR, and then also to express just gratitude for the way that the Warriors and the City have worked together to address some of the issues identified.

I know that we're talking about the Environmental Impact Report, and I just wanted to say

Davis-1 [GEN-5]

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that for us, for me, specifically, in working with young people, really looking at the social impact and the possibility and potential of what the Warriors have already demonstrated as a great partnership, we actually brought young people out here today to be able to see the process.

Davis-1 [GEN-5] cont.

They've been talking about the role of science and technology and engineering and mathematics, and all the different fields, and this has really afforded them to be able to look deeper.

But also looking at sports as more than just sports and the workforce development opportunities that the Warriors have provided -- the community development, the collaboration, the partnerships -- I think that those are all things to be highlighted and supported.

They have been amazing community partners for us, and I can only imagine how much more so that can happen with them here in the City -- the opportunity to actually visit the building and to see that it's more than just a sports arena, but to also see the people that are behind the scenes, even in things like this today, to understand that the Warriors is an organization and that there's a commitment for community giving and support and giving back and being able to learn that process.

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So, I think, for me, it's much bigger than just the idea of the team, but it's really about the organization itself, and what they represent, and what they're doing for community, and allowing young people to be able to see that firsthand and see that happening in the City for a team that, right now, is being celebrated for the championship, but I think should be celebrated for work that they've already done with the community.

Thank you.

CHAIRPERSON ROSALES: Thank you.

BRUCE AGID: Good afternoon, Commissioners. My name is Bruce Agid. I'm the transportation rep and a board member of the South Beach/Rincon Hill/Mission Bay Neighborhood Association. However, today, I'm speaking on behalf of myself as a resident of Mission Bay.

I'm a supporter of the arena project and look forward to the Warriors coming home to San Francisco. Agid-1 [GEN-5]

My comments today are focused on the transportation aspect of the EIR and the associated mitigation plans. Agid-2 [TR-3a]

A review of the Draft EIR clearly indicates a detailed account regarding the traffic and transit impacts on Mission Bay. There is no sugarcoating of the assumptions, and all the impacts of the traffic and

traffic congestion appear to have been identified.

Those of us who live in the area understand the congestion that exists today, can anticipate the impacts of events at the arena, and the assumptions outlined in the EIR seem to align with my intuitive perspective on the subject.

With that said, I've attended public meetings and have reviewed the mitigation measures outlined in the Event Management Plan. Some of those included transit improvements, supplemental service, a robust Traffic Management Plan, and the bike and ped improvements, again, just to name a few -- and have confidence that with the appropriate event coordination, resource availability, and effective implementation of these mitigation measures, the traffic and transit congestion can be managed effectively. Agid-2 [TR-3a] cont.

Thank you.

EXECUTIVE ASST. GUERRA: Will the following people please come to the podium: Michael Sesich, David Siegel, Dennis MacKenzie, Jac Taliaferro, and Christopher Hrones.

DRAKARI DONALDSON: Good afternoon, Commissioners. My name is Drakari Donaldson.

I'm a student, I'm a bicycle advocate, and I'm very impressed by how bike friendly this venue will be. Donaldson-1 [GEN-5]

Furthermore, the project promises to bring new bike lanes to Terry Francois Boulevard and 16th Street, making it simple and easy to get in and out of the area. By making the venue so accessible to bicyclists, they are reducing carbon emissions in cars and traffic congestion in the area as well.

Donaldson-1 [GEN-5] cont.

Thank you for your time and consideration.

CHAIRPERSON ROSALES: Thank you.

CELESTINO ELLINGTON: Good afternoon, Commission. My name is Celestino Ellington.

Not only am I a San Francisco resident, but I'm also the sports and recreation director for the YMCA of San Francisco Bayview-Hunters Point branch. And we've been community partners with the Warriors. I started the program in 2006, and I can remember being a part of the Warriors ever since then. And they've been more than just a sports team to me and the families of our YMCA.

Through the years, we've been able to experience the whole Warriors organization, from inside out, outside of just the game of basketball. And, believe me, those are opportunities that people dream to be a part of, and they were in Oakland this whole time.

They've been amazing community partners who have proven that they will work to address the needs and

challenges, and implement strategies that are best for everybody. You know, the Warriors and the City have worked hard to address the concerns and listening to feedback and incorporating the community's suggestions into their plans, and as a result, they've come up with a project that fits very well in the Mission Bay community, and the community and the whole City is excited.

I'd just like to acknowledge my support on record that I do support this project, and if we'd been able to do this with a relationship across the Bay, imagine how many more organizations that the Warriors can affect right here in the City.

And I really do believe that the Warriors' mission, outside of basketball, is community. We've been a direct result and have been privileged to experience those things, and we're looking forward to those in the future as well.

Ellington-1 [GEN-5]

Thank you.

CHAIRPERSON ROSALES: Thank you.

MICHAEL SESICH: Good afternoon. My name is Michael Sesich. I'm a native San Franciscan. I've lived in Mission Bay for the last three years.

I find the Warriors a good attraction to San Francisco. I'm not opposed to the team moving back

Sesich-1 [GEN-5]

to San Francisco or even a new arena in Oakland, but I do have concerns about the placement of the new arena in the Mission Bay neighborhood.

The proximity to the hospital, which the nurses' association is pointing out, makes it difficult to get to that location. And I know from living two blocks away from the proposed site how bad the traffic is now with just the AT&T traffic in that area.

One time, I was coming home with my wife in the car, and the traffic was so bad on Third Street, I got out and walked and got home before she did in the car. And I think that a woman, pregnant and going to a woman's hospital in Mission Bay, being stuck in traffic -- the problems that can create.

So, I'm deeply concerned. I've voiced these at local community meetings before.

And I must praise the organization of the Warriors too. I think they've done a good job of reaching out. But when I read the Environmental Report, I came across terms like "provide adequate," "various management strategies," "encourage," "should not," "commercially reasonable efforts." All that could be sidestepped and not get what you want.

When the AT&T park went in, we were told that people would take the train and people would take public

Sesich-1 [GEN-5] cont.

Sesich-2 [TR-4]

Sesich-3 [ERP-6]

Sesich-4 [TR-13]

transportation, yet the parking lots of that park are overflowing, and they're looking for new space now that there's a building going in.

So, I'm very concerned about the project's impact on the neighborhood parking and traffic, but not opposed to the Warriors.

Thank you.

CHAIRPERSON ROSALES: Thank you.

DAVID SIEGEL: Good afternoon. David Siegel. 25-year resident of the Dogpatch and vice president of the Dogpatch Neighborhood Association.

The D.N.A. is not opposed to the stadium. However, the development will have direct and lasting impact on our neighborhood, and of course, is of grave concern to the Dogpatch Neighborhood Association and residents of the community.

Our small, beleaguered neighborhood is being severely impacted by the relentless encroachment of U.C.S.F., housing developers, and now, Warriors.

Today, specifically, I want to direct my remarks to the proposed parking lot at Crane Cove. There are a number of issues that we're concerned about regarding this parking lot location.

First of all, Illinois Street is the official route for trucks and bikes as part of the Transportation

Sesich-4 [TR-13] cont.

Siegel2-1 [LU-1]

Siegel2-2 [TR-12a]

Plan of the City. This street would be the nearest street to the proposed parking lot. The Port is also planning on having a 19th Street extension serve as a BAE heavy large-truck route, and Muni is also planing a turnaround loop, as well, directly in that area. Further, Crane Cove is a small patch of green space on the waterfront that serves the community and needs to be protected.

Siegel2-2
[TR-12a]
cont.

Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Joe Boss, Jennifer Davis, Rudy Corpus, John Cornwell, and Silvia Johnson, please make your way to the podium.

DENNIS MACKENZIE: Thank you, Commissioners. I'm Dennis MacKenzie. I'm work in consulting and education, and I teach in the San Francisco public high schools, including at the Juvenile Hall.

I have made a proposal and shared with everyone, requesting the Warriors and all the City departments and leaders, including high school classroom, put a golf program inside the arena.

At the last meeting on May 19th, I shared with the Committee and the other leaders in the City and the Warriors that one the things that I've been asking -- and first of all, I am wholeheartedly in

MacKenzie2-1
[GEN-5]

MacKenzie2-1
[GEN-5]
cont.

support of this arena and believe all City family leaders can get together and find solutions to this traffic part.

I introduced the idea of the Warriors collaborating with Juvenile Hall on what's referred to as Log Haven Ranch, which has the opportunity -- they have a small gymnasium. I just introduced that to the Warriors and the City, that that is an opportunity for this small gym to provide what I mentioned about golf-course training programs in Philadelphia, Pennsylvania -- I'd like to share this with you (Indicating). But the history of using the sports facilities can be a tremendous influence for kids at risk and all students.

So, in the minutes, I just wanted that to be corrected. I meant to say this earlier -- that there's a statement that I -- I admit I was a Giant -- I mean, the Warriors -- I had proposed to them -- have already done tremendous work in this entire Bay Area promoting education, and then the basketball and the community foundation.

So, in the minutes, it states that I was asking the Warriors to do something with the golf course. That was the not my intent. It was to use this golf-course training program as a model, which my

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proposal in the classroom is a model to use for future NBA professional or indoor arenas, which I believe is very tremendously valuable for our country.

Thank you very much.

CHRISTOPHER HRONES: Good afternoon, Commissioners, and thank you for the opportunity to comment on this Draft SEIR.

I'm a new resident of San Francisco, who has followed this project with interest. Prior to this year, I lived in Brooklyn, New York, where I had the opportunity to participate professionally in the planning and public discussion of the Barclays Center Arena and associated Atlantic Yards development. This saw the relocation of the Nets basketball team from New Jersey to Brooklyn.

Although there are obviously some differences between that development and this proposal, there are also some interesting parallels, namely the creation of an 18,000-seat multi-use arena in an urban infill site accessible by transit, but also, there are major concerns in both cases initially expressed by some about traffic and parking impacts. So, I have a number of observations I think are relevant.

In the interest of time, I'm going to focus on three things which seem to come up the most today, which

Hrones2-1 [TR-4]

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are traffic congestion, parking, and emergency vehicle access.

As far as traffic congestion goes, the impact feared by many of the Barclays Center site, for the most part, did not materialize.

As a transportation professional involved in the project from the government agency side, the biggest story for me was that the fears of congestion greatly -- were greatly -- were exceeded by -- greatly exceeded the actual impact, so that when the facility opened, traffic congestion was more or less a nonstory.

This was due to a number of factors, but the two most important were that transit utilization did not meet the project goals, and that vehicle arrivals to the arena were more spread out than projected.

Hrones2-1 [TR-4] cont.

In terms of parking, the main observation is that off-street parking supply provided by the project, combined with existing nearby off-street parking, far exceeded demands. And so, parking availability was not an issue there either.

Hrones2-2 [TR-13]

And finally, for emergency vehicle access, which has been raised as a potential concern here, this was effectively accommodated in Brooklyn, where police and fire stations are located immediately adjacent to Barclays Center, and there are no significant issues

Hrones2-3 [TR-9]

66

Hrones2-3 [TR-9] cont.

that I'm aware of.

CHAIRPERSON ROSALES: Your time is up.

CHRISTOPHER HRONES: Thank you.

EXECUTIVE ASST. GUERRA: Sir, can you please provide your name for the record?

CHRISTOPHER HRONES: Yes. My name is Christopher Hrones.

JAC TALIAFERRO: Good afternoon, ladies and gentlemen. My name is Jac Taliaferro, and I own La Hitz Digital Media. I'm a San Francisco native, and I own a business here.

The tradition of building stadiums here in San Francisco is -- dates back to the first century -- or, two centuries ago, turn of the century. Robert Taylor, who you may not know, in the Polo Fields, was a gold medalist and also the world champion, and he was an attraction for the Polo Fields when it was built at the turn of the last century.

We know that tourism is the number one industry, and that's fueled by entertainment. So, right now we have one the best entertainers in the world, Bobby Ware, back there. He's helping the fight to get the Yoshi's back into our control.

But my main concern here is the business that the Warriors are or are not doing with black-owned

businesses, which is different than non-profits.

I haven't seen one black business come up here, except for myself, and I was born here. So, of course, when the Warriors won, I was here. And it was a great delight.

This time it was bittersweet, because before the Warriors season started, I was told by a Warriors staff person that he was going to keep my business, which is connected to other black businesses, from doing business with the Warriors. I honestly didn't like that.

So, I wrote this article about that and got a call from that person later, but the opportunity was gone for us to start at the beginning of the season and see them all the way through to the championship.

And I know this well because I'm in entertainment. I've been with groups that's went from obscurity to number one, winning Grammies, et cetera, et cetera, and dealing with people who were there before us to when, now, it is different.

So, my company has lost out on maybe from $700,000 to 1.5, an analyst said. This is a question of "Black Lives Matter." "Black Lives Matter" is not about crisis situation. It's about us flourishing, and we need to flourish with the Warriors.

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They're welcome to come here, but you know, if there's an issue about planning, put them out at Candlestick.

Taliaferro-1 [ALT-4]

EXECUTIVE ASST. GUERRA: Sir, your time is up.

JAC TALIAFERRO: Thank you.

This is -- this is the article that I wrote, and I would love the Commission to see that (Indicating).

CHAIRPERSON ROSALES: Thank you.

JAC TALIAFERRO: You're welcome.

Thank you.

JOHN CORNWELL: Hello, Commissioners. My name is John Cornwell, C-O-R-N-W-E-L-L.

I'm actually a third-generation San Franciscan. I have two young kids who will hopefully be long-term, fourth-generation residents. I've been a resident in the area for 20 years.

And, you know, I worked -- was around when the Giants negotiated with community impacts. The traffic density was a lot different back then.

I respect the Warriors. They're a good organization, but they're not this non-profit organization that should be exempt from smart urban planning; right?

Cornwell2-1 [LU-1]

If we had a bank headquarters that was going

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to go in that spot with that traffic density as it now exists, and you're going to have 20,000-some-odd visitors, you would write that off immediately. That's awful urban planning.

They're not a non-profit. They're a multibillion-dollar asset and a very profitable organization. And it does not make sense for a company that is going to put that kind of burden on the community and the region; right?

Cornwell2-1 [LU-1] cont.

I only ask that you guys go out to that area during commutes and see how bad the traffic is now. The Third Street corridor already is saturated.

And, you know, this isn't about the surface streets in the that area. That's bad enough. But you're talking about the Bay Bridge. We all know that the Bay Bridge rush hour starts at 2:30 and goes to 8:30. So, now are we ready to basically have there be no non-rush hour, for the morning rush hour to run into the afternoon rush hour?

Even if you have 80 percent traffic utilization, already traffic is at a breaking point in San Francisco. I think we all know that from everyday experience. It's not smart urban planning.

These EIR statements about, There will be adequate -- yeah, there may be transparency, but that

Cornwell2-2 [TR-4]

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still doesn't change the fact that it is a huge impact, and it's not a proper use. And you can do all the mitigation you want, but there's not the ability to add bandwidth and traffic capabilities around there. That's common sense.

Cornwell2-2 [TR-4] cont.

So, you can offset carbon utilization and all the rest, but the bottom line is this is a really bad regional project.

Cornwell2-3 [GHG-2]

CHAIRPERSON ROSALES: Thank you.

SILVIA JOHNSON: My name is Silvia Johnson and (Unintelligible) a lot of people would be jealous of me playing the guitar and be rich and famous right now.

I'm just (Unintelligible) you know, my priorities were -- over there in the mountains they don't have no (Unintelligible). You know, I think that's where we should be putting places where you can park. (Unintelligible) put the BART system to where it can go to the stadium, and that way, we would have a lot impact with our plans than when we go to see the Warriors.

And I think there's more solutions to those problems -- is that we need to agree with the Warriors, which would eliminate a lot of these impacts. Maybe put that in thought, that -- to build a BART over there behind the mountains there. You see on this picture

Johnson-1 [GEN-6]

PH

right there.

Johnson-1 [GEN-6] cont.

And I think that this is one of our main problems -- is that -- of course, jealousy is really bad out there. And this is one of the reasons why I haven't been able to build up my career with my guitar playing. And I had already 18 guitars already stolen from me. I went to Washington, D.C., played down there. They stole that too.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Will the following people please come to the podium: John deCastro, John Caine, Mr. Al Norman, Mr. Oscar James, Osha Meserve, and Paul Osmundson.

JOE BOSS: Good afternoon, Commissioners. And good to see you, Tiffany.

The -- I am not for or against the Warriors. They're doing a fairly adequate job with their EIR, but the thing is, what will happen with -- I live in Dogpatch. I've been here for 32 years, worked here since I was 16, so I hate to tell you how old I am. But at the end of the day, if the City wants to get something done, it just moves mountains.

They were trying to get a legacy here for someone -- I can't remember who -- keeping the Warriors in San Francisco, not on the pier, but it is in

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San Francisco.

The Warriors actually are a very wonderful team and I love to follow them, and I would love to have them in the City.

We also have, right down the road, the Giants and the Giants attempting to build a rather large development. And being in Dogpatch and -- we've always been up with what's going on, and helped the Port and helped redevelopment in Mission Bay and so forth.

So, I just want to express the opinion that if we really, as a community at San Francisco, wanted to get something done, you would probably crack a whip and have the Warriors have to work with the Giants all on Lot A and B.

And, you know, maybe I'm whistling "Dixie," but you do not have a method of taking care of the traffic. You can say MTA is going to take care of it. MTA couldn't even, in a ten-year period, get a turnaround movement planned and executed. Very, very terrible.

Boss-1 [GEN-6]

Thank you.

EXECUTIVE ASST. GUERRA: Sir, can you please provide your name?

JOE BOSS: Joe Boss.

EXECUTIVE ASST. GUERRA: Thank you.

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RUDY CORPUS: How you doing, Commissioners? My name is Rudy Corpus. I'm born and raised in District 6, South of Market, currently live there.

I run a youth program, United Players Violence Prevention Youth Program, with over a 150 kids run over the summer.

I'm here just in support for the Warriors to be here in our neighborhood and in San Francisco. It would create an enormous amount of opportunity for our people in the community.

Corpus-1 [GEN-5]

South of Market, particularly while I've lived in District 6, has probably the lowest income-paid families in the whole city. I just -- you know, I just want the opportunity -- it would be good for the economy. It would be good for the community, and also, I think it would be good for the City.

I know originally the Warriors was in San Francisco back in the '70's. I think it was the San Francisco Warriors. Then they moved to Oakland, and that's why they called them "Golden State." And so, this gets rightfully their right place where they supposed to be, back here in San Francisco, the San Francisco Warriors.

Thank you.

CHAIRPERSON ROSALES: Thank you.

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AL NORMAN: Madam Chair, Madam Director, Commissioners, Al Norman, Bayview Merchants Association, and we're here in support of the EIR for the Warriors, and we think it would be one big jewel of an anchor tenant for all small businesses in and out of the area, and we support it wholeheartedly and support the other associations who are in favor of you passing this EIR so we can go ahead and go to work and establish a relationship that will benefit everyone economically associated with this project.

Norman-1 [GEN-5]

Thank you.

CHAIRPERSON ROSALES: Thank you.

JOHN deCASTRO: Good afternoon, Commissioners. John deCastro from -- past president of Potrero Boosters Neighborhood Association back about 15 years ago. I'm a 37-year resident of Potrero Hill.

And my biggest concerns are, as I look at 6.2, "significant unavoidable impacts, specifically transportation and transit." Those are a mess today.

And I echo the other speaker that suggested that you might want to come down there between 4:00 and 6:00 in the evening and take a look at that 280 and Mariposa interchange -- Mariposa and Pennsylvania Street, 16th and 7th Street. It is a disaster four nights out of five, especially Thursday night. Every

deCastro2-1 [TR-4]

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PH

time the Giants have a day game, the traffic starts backing up at 2:00 -- 1:30 or two o'clock and never quits.

deCastro2-1 [TR-4] cont.

We talk about a "Transportation Management Plan" in 6.5. Where is it? I don't trust the City or the MTA to come forward with a decent Transportation Management Plan when my wife and I tried to go to a Giants game on Sunday, and we waited -- we checked the next Muni -- 58 minutes to the 10. My wife is disabled. I had to call a taxi so we could make our ballgame. That was the only way we could get there, because she couldn't walk down to the T. It was way too far.

deCastro2-2 [TR-3a, TR-4]

6.2 calls traffic "an unavoidable impact." Today, without a game, the traffic is backed up every night and almost every morning at the 280. I have learned ways around the neighborhood and some way to do that.

deCastro2-3 [TR-4]

The transit doesn't work today. We need better plans in that area if the Warriors are going to come to Mission Bay.

deCastro2-4 [TR-5a]

I agree with the nurses. It is going to be a serious problem. And you're trying to route traffic, I believe, through the Minnesota Street area and through the Dogpatch neighborhood, to get people -- emergency vehicles to the hospital, or people that are in trouble

deCastro2-5 [TR-9]

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that need to get to the hospital. That is not an acceptable alternative.

Thank you.

CHAIRPERSON ROSALES: Thank you.

OSCAR JAMES: Good afternoon, Commissioners. My name is Oscar James. I'm a native resident of Bayview-Hunters Point and a former Model Cities Commissioner, which this area covered.

The area that you have today, you're talking about doing development, we have a Memorandum of Understanding. Whichever comes into this area hires 50 percent community residents, 35 percent contractors -- minority contractors as a whole.

But I want to just thank the Warriors for doing what they have done. Prior to coming into our community, they've hired peoples in our community, and we hope and we really believe that they will hire minority contractors, 50 percent out of Bayview-Hunters Point, 100 percent citywide, following our Memorandum of Understanding we wrote in 1970, which had a grandfather clause in our community.

I support them 100 percent. I would like the U.C., since the nurses are talking about all they're talking about -- traffic and what have you -- is to come up with some scholarships that they should have done

deCastro2-5 [TR-9] cont.

James-1 [GEN-5]

getting that free property -- for scholarships in our community to train peoples in our community for nursing, being doctors, and what have you. Do the same thing that the Golden State Warriors are doing.

I was living and I was -- I once went to the games at Kezar Pavilion when the Warriors were there a long time ago, and I'm saying today welcome back to the San Francisco Warriors, and I support this 100 percent.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

PAUL OSMUNDSON: Good afternoon, Chair Rosales, Commissioners, Executive Director Bohee, Deputy City Attorney Bryan. My name is Paul Osmundson.

I am a partner in the East Street Ventures Restaurant, which is located at 295 Terry Francois Boulevard, with John Caine, one of the previous speakers.

I'm also the former Director of Planning and Development for the Port of San Francisco. I've worked with the San Francisco Giants and the Mayor's Office on the AT&T ballpark and on the Transportation Plan.

I've reviewed the EIR, and I can tell you that the -- when the City and MTA has made commitments to manage the traffic to and from the waterfront, these special-event venues, the Giants system works the way

James-1 [GEN-5] cont.

Osmundson-1 [TR-3a]

they said it would -- the way the Giants said it would, the way the City said it would. That system works. It has worked day in and day out, all 81 home games and the playoff games. It works.

Osmundson-1 [TR-3a] cont.

The project is a perfect fit for this neighborhood. Mission Bay was envisioned as a mixed-use development project. The Port worked -- we worked on it for many years in the late '80's and early '90's. It's a mixed-use development project. It's not just a life science center. So, this is use fits into the City's plan for this area.

Osmundson-2 [LU-1]

There's definitely going to be impacts that have to be mitigated or can't be dealt with -- unavoidable impacts. That's always the situation.

Osmundson-3 [ERP-9]

This a great use for this location. I urge you to approve the project, certify the EIR, and move forward.

It's a great -- we're very lucky to have an organization like the Golden State Warriors willing to come to this City and invest in our City.

Osmundson-4 [GEN-5]

Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: I have Ms. Susan Vaughan.

SUSAN VAUGHAN: Good afternoon, Commissioners.

My name is Susan Vaughan, and I am the current chair of the San Francisco group of the Sierra Club.

We will be submitting more detailed comments later. For now, I'm just going to be speaking for myself.

I'm very concerned that a piece of State legislation, AB 900, was extended purely for the reason just to get this project -- and apparently one in L.A. -- through the fast-track process so that there are fewer hearings, maybe, for the public. And I'm very concerned about that.

Vaughan-1 [AB-1]

We don't know, additionally, in terms of the greenhouse gas emissions. It's my understanding that the project sponsors intend to purchase carbon offsets. We don't know what those offsets are, and we need to see that in the EIR.

Vaughan-2 [GHG-2]

To my knowledge, no greenhouse gas comparison has been done between this proposed project and just keeping the project in Oakland.

Vaughan-3 [GHG-2]

And on that line, I want to add that I think that probably most of the people who work that venue in Oakland right now work -- don't live in San Francisco.

Vaughan-4 [TR-5b]

So, I'm wondering about the impact to BART, and I'm wondering about increased greenhouse gas emissions, because employees might be taking the bridge across the

Vaughan-5 [GHG-2]

river -- or, not the river -- the Bay.

And I would add that I don't think a lot of public transit enhancements are happening in this project, and that really does need to happen. We're not interested in seeing more parking. It's got to be -- we're really serious about dealing with climate change. It's got to be public transportation.

Thank you.

OSHA MESERVE: Good afternoon, Commissioners. My name is Osha Meserve and I represent the Mission Bay Alliance.

The Alliance believes the proposed entertainment center will not work for the site and does not warrant the massive public investment planned by the State.

In particular, we're concerned about the compatibility of the center with the existing health and research facilities in Mission Bay, and while health and related biosciences was planned to expand under the Mission Bay Redevelopment Plan, this project takes this area in a completely new and incompatible direction.

In our review of the Draft EIR so far, we have found that the traffic, parking, and associated health impacts of the facility will be even more devastating than disclosed in the EIR, and there's inadequate

Vaughan-5 [GHG-2] cont.

Vaughan-6 [TR-3a]

Meserve-1 [GEN-5]

Meserve-2 [LU-1]

Meserve-3 [ERP-9]

mitigation.

The project is also being mis-advertised as greenhouse gas neutral. Purchasing unverified assets from a broker for 4,000 tons per year of carbon dioxide is not mitigation and doesn't do anything to help the localized air pollution that will become so much worse under the gridlocked conditions.

With analysis scattered throughout the EIR and other documents prepared over the course of 25 years, the fast-tracking of this project's environmental review process is precluding meaningful public participation.

And the document is not -- because it is not thorough, in that people have said it's thorough, but there are important issues that are relegated to these other 1998 and 1990 documents that the public must also review in order to understand the project. Land use, geology, soils, recreation, and hazardous materials are some of those topics.

For this reason, we have requested an extension of the public review period to better match the complexity of this project, and we look forward to further informing the Commission to review this important project.

Thank you.

CHAIRPERSON ROSALES: Thank you.

Meserve-3 [ERP-9] cont.

Meserve-4 [AB-1, GHG-2]

Meserve-5 [ERP-4]

Meserve-6 [ERP-7]

Meserve-7 [ERP-4]

EXECUTIVE ASST. GUERRA: Are there any others that want to speak?

DAVID PAN: Yes. Hi. My name is David Pan, and I'm here on behalf of a lot of people that really do not have a voice.

I live in an SRO. I live on S.S.I. Disability on 6th and Market Street right now. There are a lot of people that are in hardship in this City. We all know that. There is a very divisive line in the economics of the wealthy and the poor.

I have a dream of working on creating a non-profit that can create paid jobs for people coming out of hardship. The idea is to open a café, eatery, and meeting spaces, community spaces where people can use for meet-up groups, conferences, study groups, and have them adjoining a café so it's free, just buy some food and some drinks.

Making it a non-profit would allow people to have a reintegration into the workforce, would allow the community a place to gather.

And the idea of doing something like this would be hugely tremendous, because there aren't a lot of 9- or 10,000-square-foot plates that are available to be custom-built out in San Francisco. We all know the retail spaces aren't available.

Pan-1 [GEN-6]

So, I'm working on trying to propose this with the Warriors, and I've had some very good feedback from members of the community, from Urban Solutions to Cafe La Vie, to Hayes Valley Bakeworks, Delancey Street Crossroads Café, some of the non-profits that have succeeded on a business model similar to this, and others.

I've spoken with Jane Kim, District Supervisor, District 6. I'd like to say thank you very much for your time.

I very much support the Warriors coming to San Francisco. I think it would help a lot of people in a lot of different ways.

Pan-1 [GEN-6] cont.

Thank you.

I'd like to leave this with you, if I may (Indicating).

CHAIRPERSON ROSALES: Yes.

EXECUTIVE ASST. GUERRA: Are there any others that would like to speak?

(No response)

CHAIRPERSON ROSALES: No.

Okay. Thank you, everyone, for giving us your comments. This is not an action item, but the Commissioners are allowed to also provide comment.

Do I have any comments from the Commissioners?

COMMISIONER MONDEJAR: No.

CHAIRPERSON ROSALES: The only comment I'd like to make is consistent with all the comments I have made in the prior workshops regarding this project, and it deals with two things: Primarily, the traffic impacts and the neighborhood impacts, which are related.

Rosales-1 [TR-4]

And we've heard a lot of concerns, and I will continue to read the document, but I want to make sure that the comments here regarding those impacts and the mitigation measures are kind of looked at in depth and to the extent of exploring funding mechanisms or recommended or suggested mechanisms, so that they don't go into the document -- that the Commission be told of potential funding mechanisms that we might be able to recommend to ensure that those mitigations are essentially guaranteed and those impacts are mitigated.

Rosales-2 [GEN-1b]

I think I can't say more on the record than just a comment. This matter will return to the Commission later this fall.

Should we repeat the opportunity for folks to submit written comments?

DEPUTY DIRECTOR OERTH: Thank you, Chair Rosales. I'll just repeat that if people would like to submit written comments, they can submit them via E-mail to warriors@sfgov.org or they may address them to the

Planning Department. The address of the person to contact at the Planning Department is on page 2-9 of the SEIR.

Thank you.

CHAIRPERSON ROSALES: Thank you.

I think Commissioner Mondejar would like to make a comment.

COMMISIONER MONDEJAR: Sally, can you just explain what the process is after you have -- after the office has received further comment, and also the process of all the public comments that we have received this afternoon?

DEPUTY DIRECTOR OERTH: Yes.

All of the comments provided today, as well as all of the comments provided in writing, will be gathered and responded to in a document called the "Response to Comments," which will be brought back before the Commission later this fall.

And so, we'll be reviewing those and working with the various members of the team to provide the responses, and look at any adjustments that need to be made to the Draft SEIR as appropriate.

COMMISIONER MONDEJAR: And all of these will be made public?

DEPUTY DIRECTOR OERTH: Yes.

COMMISIONER MONDEJAR: So, I just wanted to say that I hope that all of the comments will be taken into consideration and carefully examined. I know I have reviewed the documents that have been presented to us as Commissioners.

Mondejar-1 [ERP-9]

And one other thing that just occurred to me -- that the purchasing of carbon offsets is something that was new to me this afternoon. That, I didn't get out of -- I need a little bit more of an understanding of that, but I'm sure that you could respond to that.

Mondejar-2 [AB-1]

I don't know if you can respond now, since we're not on a -- this is simply informational this afternoon, but it's certainly something that I think we should be communicating -- all of these issues and concerns and the responses to these issues and concerns -- to the public.

DEPUTY DIRECTOR OERTH: Thank you.

COMMISIONER MONDEJAR: Thank you.

CHAIRPERSON ROSALES: So, thank you, everyone.

With that, I think that closes this item. It will be again before us later in the year.

(Whereupon, at 3:02 p.m., Agenda Item 5(b) of the Special Meeting of the San Francisco Commission on Community Investment and Infrastructure was concluded.)

CERTIFICATE OF REPORTER

I, KATY LEONARD, a Certified Shorthand Reporter, hereby certify that the foregoing proceedings were taken in shorthand by me at the time and place therein stated, and that the said proceedings were thereafter reduced to typewriting, by computer, under my direction and supervision;

And I further certify that I am not of counsel or attorney for either or any of the parties to said matter, nor in any way interested in the outcome of the cause named herein.

DATED: July 5, 2015

____
KATY LEONARD
Certified Shorthand Reporter
License No. 11599

APPENDIX TR-X

Technical Memorandum on Off-site Surface Parking Lots

To: Sally Oerth, OCII
Chris Kern and Bill Wycko, San Francisco Planning Department

From: ESA Consultant Team
Adavant Consulting
LCW Consulting
Orion Environmental Associates

Date: October 21, 2015

Subject: Event Center and Mixed Used Development at Mission Bay Blocks 30-32 SEIR
Supplemental Analysis of Off-site Surface Parking Lots

Purpose

The Draft SEIR Transportation section identified mitigation measures to reduce significant traffic impacts under Existing plus Project conditions with an overlapping SF Giants evening game at AT&T Park. One of the measures identified in Mitigation Measure M-TR-11c: Additional Strategies to Reduce Transportation Impacts of Overlapping Events involved the use of off-site parking lot(s) south of the event center and provision of shuttles to the event center. This mitigation is one of several measures identified in the SEIR to reduce the severity of this significant impact, but even with implementation of identified mitigation, Impact TR-11 would remain *significant and unavoidable with mitigation*.

The purpose of this Technical Memorandum is to provide a more detailed description of the potential off-site parking lots that could serve the event center and to identify the potential environmental impacts of implementing those off-site surface parking lots. Environmental review and Port approval is required for implementation of these two parking facilities.

Description of Off-site Parking Lots

The SEIR acknowledged that preliminary discussions with the Port of San Francisco (Port) had identified potential parking lot locations at an area northwest of Pier 70 in the vicinity of the intersection of Illinois and 19th Streets (19th Street site) and an area near Pier 80 referred to as the Western Pacific site. Subsequent to publication of the Draft SEIR and consistent with this mitigation measure, the City has pursued discussions with the Port regarding the feasibility of using these sites for this purpose.

Mitigation Measure M-TR-11c states the following strategy:

> The City has identified two off-site parking lots on Port of San Francisco lands to the south of the event center (19th Street and Western Pacific sites) that can accommodate approximately 250 additional parking spaces for all events and up to approximately 800 additional parking spaces for use during dual events of 12,500 or more event center attendees (for a total of approximately 1,050 additional off-site parking spaces). As long as the Port of San Francisco takes all necessary actions to make the land available for public parking, the project sponsor shall: (1) make commercially reasonable efforts to negotiate with the Port of San Francisco or its designee to acquire sufficient rights for the use of such parking lot(s) through lease, purchase, or other means as necessary; and (2) provide free shuttles to the event center from such off-site parking lot(s) that are more than ½-mile from the event center on a maximum 10-minute headway before and after events.

Figure 1 presents the location of the 19th Street site and Western Pacific site in relation to the project site. The following provides a description of each site's characteristics, anticipated construction details, and expected operation. As described below, the 19th Street parking lot would provide up to 250 spaces, and the Western Pacific parking lot would provide up to 800 spaces (a net increase of up to 50 spaces above the number contemplated in Mitigation Measure M-TR-11c).

Off-site Parking: 19th Street Site

Site Characteristics

The 19th Street site is located at the southeast corner of Illinois and 19th Streets, approximately 0.45 miles south of the project site. The approximately 2-acre 19th Street site is located on Port property within the Pier 70 Area, partially within Assessor's Parcel Number (APN) No. 4046001. The 19th Street site is zoned M-2 (Heavy Industrial) and within Height and Bulk District 65-X. The 19th Street site is immediately bounded by Illinois Street to the west, industrial uses to the north and east, and a four-story office building and vacant land to the south. An aerial of the 19th Street site is presented in **Figure 2**.

The 19th Street site is located within the Port Waterfront Land Use Plan' Southern Waterfront Subarea, and is designated as part of the Plan's Pier 70 Waterfront Opportunity Area. The 19th Street site is located just south of the future planned Crane Cove Park, a 9-acre public park currently undergoing schematic design. The nearest residential use is a six-story residential building (820 Illinois Street) is located across Illinois Street just west of the 19th Street site.

SOURCE: Google Maps, ESA, 2015

OCII Case No. ER 2014-919-97; Planning Department Case No. 2014.1441E:
Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Figure 1
Off-Site Parking Sites in Relation to Project Site

SOURCE: Google Maps, ESA, 2015

OCII Case No. ER 2014-919-97; Planning Department Case No. 2014.1441E:
Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Figure 2
Offsite Parking: 19th Street Site

The 19th Street site is largely undeveloped, with the exception of a vacant three-story building (Building 40, described below) that occupies the southwest corner of the site. Ship building support materials were observed on the site. The 19th Street site is relatively level, with the majority of the site occurring at an elevation of approximately 8 feet above sea level (asl). The 19th Street site is up to ten feet below the elevation of adjacent Illinois Street. The 19th Street site is partially paved, and unpaved areas are sparsely vegetated. Fencing is located along the south, west and east sides of site.

The 19th Street site is located within the Union Iron Works Historic District (Historic District), a maritime industrial district listed on the National Register of Historic Places. The approximately 8,300-square foot Building 40 (former Employment Office Annex) located in the southwest corner of the 19th Street site was determined to be a contributing resource to this Historic District, however it was not hierarchically rated as significant or significant among the 41 buildings in the Historic District. The Port plans to remove Building 40 as part of the construction phase of the rehabilitation of the 20th Street Historic Buildings in order to permit the future development of a continuous sidewalk on the east side of the Illinois Street frontage. The Port determined, and the Planning Department concurred, that Building 40's removal would not affect the historic significance of the Historic District.[1,2] If Building 40 were to remain, it would not affect the capacity (number of spaces) or access points of the proposed parking lot.

Construction

At the 19th Street site, a 24-hour parking facility is currently being pursued by the Port as part of a separate environmental review and permitting process, and the facility is proposed to be operational prior to the operation of the event center. Construction would require about six months to one year to complete. As discussed above, Building 40 located on the 19th Street site would be demolished as part of the construction phase of the rehabilitation of the 20th Street Historic Buildings in order to permit the future development of a continuous sidewalk on the east side of the Illinois Street frontage. Construction of the parking lot would include clearing of debris, minor grading, and installation of improvements such as paving, striping, and installation of permanent night lighting, fencing, a pay station, signage and stormwater management features.

Operations

The 250-space parking lot would be operational prior to the opening of the proposed event center. The lot would be available for public parking 24 hours a day, Monday through Sunday. Vehicular access to the facility would be via 20th Street from the planned Georgia Street (i.e., to the west of Michigan Street, Georgia Street would connect the 19th Street extension and 20th Street.). Event attendees would walk approximately 0.45 miles between the parking lot and the event center, or they could take the T Third light rail line between the 20th Street and UCSF/Mission Bay stations. Pedestrian access to the site would be either via 20th Street or via the planned 19th Street extension

1 Carey and Company, *Analysis of Proposed Demolitions within the Union Iron Works Historic District at Pier 70*, February 20, 2015.

2 Richard Sucre, Preservation Planner, San Francisco Planning Department, *Historic Resource Evaluation Response Pier 70 BAE Ship Repair*, February 20, 2015

(as part of the Crane Cove Park project). Due to the proximity to the event center, no shuttle bus service would be provided from this site.

It is expected that the 19th Street site would be used for parking for all events at the project site, and during non-event times would serve as general parking. The Port would develop an event day rate structure (similar to the parking management strategy currently implemented by the SF Giants at Lot A), whereby non-event parkers would be required to vacate the parking lot prior to the event, or be subject to special event rates.

Off-site Parking: Western Pacific Site

Site Characteristics

The Western Pacific site is located adjacent to Pier 80, approximately one mile south of the project site. The approximate 8.74-acre site is located on Port property, partially or fully within APNs No. 4300001, 4301001, 4302001, 4303001, 4308005, 4308006, and 4310004; the majority of the site is also within Seawall Lot 356. The Western Pacific site is zoned M-2 (Heavy Industrial) and within Height and Bulk District 40-X. The northeast and east-most portions of the Western Pacific site are within San Francisco Bay Conservation and Development Commission's (BCDC) shoreline band. An aerial of the Western Pacific site is presented in **Figure 3**.

The Western Pacific site is located within the Port Waterfront Land Use Plan' Southern Waterfront Subarea, and the site is designated as part of the Plan's Western Pacific Waterfront Opportunity Area. Industrial land uses are located west, south and partially east of the Western Pacific site. Warm Water Cove Park is located approximately 700 feet northwest of the Western Pacific site, and is proposed to be eventually expanded south between the shoreline and the north border of the Western Pacific site.

Vehicular access at the south side of the Western Pacific site is provided via Michigan Street, which extends north from Cesar Chavez Street. The Western Pacific site is largely undeveloped, and is relatively level, ranging in elevation between approximately 6 and 12 feet asl. The Port currently uses the site for storage of trailers for the Moscone Center. The Western Pacific site is currently unpaved and sparsely vegetated along the site perimeter.

Construction

It is assumed that the Western Pacific parking lot construction would require six months to one year to complete, although construction activities would not be continuous for the entire period. Minimal construction activities would occur, such as application of organic surfactant to reduce dust, and installation of temporary night lighting stands and signage.

Operations

If approved by the Port, the up-to-800-space Western Pacific parking lot would be operational in 2018-2019. As under existing conditions, vehicular ingress/egress would occur on the south side of the Western Pacific site via Michigan Street to/from Cesar Chavez Street. The parking lot would

SOURCE: Google Maps, ESA, 2015

OCII Case No. ER 2014-919-97; Planning Department Case No. 2014.1441E:
Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Figure 3
Off-Site Parking: Western Pacific Site

operate for overlapping events (i.e., events at AT&T Park that would overlap with events at the proposed event center with 12,500 or more event center attendees, on average about nine times per year). Vehicular access to this site would be via Cesar Chavez Street and Michigan Street. The facility would open two hours prior to the start of an event at the event center, and close two hours following the end of an event. Free bus service procured by the project sponsor would shuttle event attendees between the project site and the Western Pacific parking lot. The project sponsor would be responsible for accommodating the passenger demand on the shuttle buses. Service frequencies would be sized to accommodate the anticipated event attendee demand.

Impacts of Mitigation Measures

CEQA Guidelines Section 15126.4 states that "if a mitigation measure would cause one or more significant effect in addition to those that would be caused by the project as proposed, the effects of the mitigation measure shall be discussed but in less detail than the significant effects of the project as proposed." This section presents the environmental effects of the off-site parking lots that would be implemented under Mitigation Measure M-TR-11c, with more detail on the resource topics with the most potential to result in environmental effects.

Transportation Impacts

In assessing the potential transportation impacts of Mitigation Measure M-TR-11c, the Draft SEIR on pp. 5.2-178 – 5.2-179 stated that if an off-site parking lot(s) were to be determined to be feasible, it is possible that use of this off-site parking could reduce traffic impacts in the project vicinity. However, drivers who may use these potential additional parking facilities could travel along different routes, which could result in significant traffic impacts south of the project site such as along Third Street, Cesar Chavez Street, 25th Street or other streets that may be used as access to or from affected freeway on-ramps and off-ramps and approaches in the vicinity of the parking lot(s). Mitigation for such traffic impacts may be available depending on the areas affected to maintain a LOS D or better; however, due to the physical limitations of the City's street grid, land may not be available for City purchase that would allow for the expansion of street width to accommodate additional travel lanes or other design techniques to achieve the standard of LOS D or better, and City policies disfavor expansion of roadway capacity in order to achieve the City's Transit First and other goals that attempt to limit private vehicle use. Consequently, until a site-specific analysis of the identified parking lot(s) is conducted, the assessment described in the Draft SEIR concluded that it cannot be determined what mitigation measures may be available for affected areas, and then whether the measures would be feasible given the physical constraints of the street network and the availability of funding to implement the measures. The City would implement those measures that it deems feasible to achieve a LOS D or better in the affected areas, but regardless, the Draft SEIR determined that secondary traffic impacts associated with Mitigation Measure M-TR-11c,-Additional Strategies to Reduce Transportation Impacts of Overlapping Events, involving the use of one or more off-site parking lot(s) at this time would be considered potentially significant and unavoidable with mitigation.

Traffic

With implementation of the 19th Street and Western Pacific parking facilities, project vehicle trips would be dispersed over a broader area south of the project site, reducing the effect of increased traffic at intersections closer to the project site. Attendees traveling to the facilities from the south would be encouraged to park at these facilities instead of seeking parking closer to the event center. In addition, it is expected that during overlapping events at the project event center and AT&T Park, some project vehicles who would otherwise park at public parking facilities closer to AT&T Park, would instead park at the Western Pacific site.

Intersection LOS analysis was conducted for the Basketball Game scenario for conditions without and with a SF Giants evening game at AT&T Park for the weekday p.m. weekday evening, weekday late evening, and Saturday evening peak hours. In addition to the 22 study intersections analyzed for the proposed project, nine additional study intersections in the vicinity of the two parking lots were analyzed. The additional study intersections were selected because they represent intersections along the likely routes of travel between the closest freeway (I-280) and the parking lots. The selected intersections include 18th/I-280 southbound off-ramp, 18th/I-280 northbound on-ramp, Third/20th, Pennsylvania/I-280 southbound off-ramp, Pennsylvania/I-280 southbound on-ramp, Indiana/25th/I-280 northbound on-ramp, Third/25th, Pennsylvania/Cesar Chavez/I-280 northbound off-ramp, and Illinois/Cesar Chavez. The five intersections with the I-280 ramps on 18th, Indiana, and Pennsylvania Streets are unsignalized intersections, and the other four are signalized intersections. Traffic counts for conditions without and with a SF Giants evening game at AT&T Park were obtained from earlier counts conducted in June 2013 and January 2014, supplemented with new counts conducted in July and August 2015.

Existing plus Project conditions without an overlapping SF Giants Evening Game

Table 1 presents the weekday p.m. intersection LOS conditions, **Table 2** presents the weekday evening peak hour conditions, **Table 3** presents the weekday late evening intersection LOS conditions, while **Table 4** presents the weekday evening peak hour conditions for existing, existing plus project, and existing plus project with Mitigation Measure M-TR-11c for conditions without an overlapping SF Giants evening game at AT&T Park.

For the Basketball Game scenario without a SF Giants evening game at AT&T Park, the analysis assumed that all of the 250 parking spaces within the 19th Street parking lot would be available to event center attendees. For these analyses, vehicles that had been assigned to UCSF parking facilities (i.e., the vehicles assigned to the Medical Center and Community Center garages) were reassigned to the 19th Street parking lot.

The intersection LOS analysis results for the weekday p.m., weekday evening, weekday late evening, and Saturday evening indicate that the nine additional study intersections would continue to operate at LOS D or better, with minimal changes in delay. At the original 22 study intersections, average vehicle delay would change minimally and LOS conditions would generally remain the same as identified in Impact TR-2. Use of the 19th Street parking lot would not result in new significant traffic impacts, or eliminate the significant traffic impacts identified in Impact TR-2 (i.e., at King/Fourth, Fifth/Harrison/I-80 westbound off-ramp, Fifth/Bryant/I-80 eastbound on-ramp,

TABLE 1
INTERSECTION LEVEL OF SERVICE - EXISTING PLUS PROJECT CONDITIONS – WITHOUT A SF GIANTS GAME – WEEKDAY PM PEAK HOUR

					Existing plus Project			
			Existing		Basketball Game		Basketball Game with Mit Measure M-TR-11c	
#	Intersection Location		Delay[a]	LOS[a]	Delay	LOS	Delay	LOS
1	King St	Third Street	**72.7**	**E**	**72.7**	**E**	**72.7**	**E**
2	King St	Fourth Street	51.9	D	**60.2**	**E**	**60.4**	**E**
3	King St/Fifth St	I-280 ramps	**59.2**	**E**	**59.2**	**E**	**59.2**	**E**
4	Fifth St/Harrison	I-80 WB off-ramp	48.4	D	49.8	D	49.8	D
5	Fifth St/Bryant St	I-80 EB on-ramp	**>80**	**F**	**>80**	**F**	**>80**	**F**
6	Third Street	Channel Street	38.0	D	46.0	D	46.0	D
7	Fourth Street	Channel Street	< 10	A	11.3	B	11.4	B
8	Seventh Street	Mission Bay Dr	23.1	C	52.3	D	52.0	D
9	TA Francois Blvd	South Street[c]	10.8(eb)	B	< 10	A	< 10	A
10	Third Street	South Street	24.9	C	27.4	C	27.4	C
11	TA Francois Blvd	16th Street	--	--	16.8	A	16.8	A
12	Illinois Street	16th Street	12.6(nb)	B	11.5(nb)	B	11.5 (nb)	B
13	Third Street	16th Street	29.3	C	33.6	C	33.6	C
14	Fourth Street	16th Street[e]	21.5	B	28.0	C	27.8	C
15	Owens Street	16th Street[e]	35.5	C	44.2	D	43.3	D
16	7th/Mississippi	16th Street[e]	**68.6**	**E**	**> 80**	**F**	**> 80**	**F**
17	Illinois Street	Mariposa Street[c]	10.6(eb)	B	17.0	B	17.0	B
18	Third Street	Mariposa Street	36.2	D	42.0	D	42.8	D
19	Fourth Street	Mariposa Street	13.2	B	14.3	B	14.3	B
20	Mariposa Street	I-280 NB off-ramp	25.8	C	25.8	C	25.9	C
21	Mariposa Street	I-280 SB on-ramp[d]	11.9	B	12.8	B	12.8	B
22	Third Street	Cesar Chavez St	43.0	D	47.6	D	47.8	D
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	12.1 (sb)	B	12.1 (sb)	B	12.3 (sb)	B
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A	< 10 (eb)	A
26	Third Street	20th Street	14.0	B	13.0	B	13.1	B
27	Pennsylvania Street	I-280 SB off-ramp	19.0 (sb)	C	19.0 (sb)	C	19.0 (sb)	C
28	Indiana/25th	I-280 NB on-ramp	12.2 (wb)	B	14.3 (wb)	B	15.9 (wb)	C
29	Third Street	25th Street	12.7	B	13.1	B	13.0	B
30	Pennsylvania/Cesar	I-280 NB off-ramp	49.3	D	49.3	D	49.4	D
31	Illinois Street	Cesar Chavez St	< 10	A	< 10	A	< 10	A

NOTES:
a Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).
b Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.
c All-way stop-controlled intersection. The existing intersections of Terry A. Francois/South and Illinois/Mariposa would be signalized as part of the proposed project.
d The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.
e Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

TABLE 2
INTERSECTION LEVEL OF SERVICE - EXISTING PLUS PROJECT CONDITIONS – WITHOUT A SF GIANTS GAME – WEEKDAY EVENING PEAK HOUR

					Existing plus Project			
			Existing		Basketball Game		Basketball Game with Mit Measure M-TR-11c	
#	Intersection Location		Delay[a]	LOS[a]	Delay	LOS	Delay	LOS
1	King St	Third Street	**58.3**	**E**	**64.6**	**E**	**64.7**	**E**
2	King St	Fourth Street	47.9	D	**61.4**	**E**	**61.1**	**E**
3	King St/Fifth St	I-280 ramps	**57.2**	**E**	**56.9**	**E**	**56.9**	**E**
4	Fifth St/Harrison	I-80 WB off-ramp	49.8	D	**>80**	**F**	**>80**	**F**
5	Fifth St/Bryant St	I-80 EB on-ramp	**>80**	**F**	**>80**	**F**	**>80**	**F**
6	Third Street	Channel Street[f]	33.1	C	**>80**	**F**	**>80**	**F**
7	Fourth Street	Channel Street[f]	< 10	A	**72.5**	**E**	**76.0**	**E**
8	Seventh Street	Mission Bay Dr	19.5	B	**>80**	**F**	**>80**	**F**
9	TA Francois Blvd	South Street[c,f]	10.3(eb)	B	< 10	A	< 10	A
10	Third Street	South Street[f]	24.7	C	45.1	D	45.3	D
11	TA Francois Blvd	16th Street[f]	--	--	17.7	B	17.7	B
12	Illinois Street	16th Street[f]	<10(nb)	A	15.7(nb)	C	15.7 (nb)	B
13	Third Street	16th Street[e,f]	27.8	C	34.2	C	34.2	C
14	Fourth Street	16th Street[e,f]	20.6	C	37.0	D	36.8	D
15	Owens Street	16th Street[e]	21.0	C	39.0	D	36.4	D
16	7th/Mississippi	16th Street[e]	**60.1**	**E**	**>80**	**F**	**>80**	**F**
17	Illinois Street	Mariposa Street[c,f]	< 10(eb)	A	45.8	D	45.8	D
18	Third Street	Mariposa Street[f]	34.8	C	37.1	D	39.4	D
19	Fourth Street	Mariposa Street[f]	10.8	B	13.0	B	13.0	B
20	Mariposa Street	I-280 NB off-ramp,[f]	20.0	B	32.5	C	27.7	C
21	Mariposa Street	I-280 SB on-ramp[d]	< 10	A	<10	A	<10	A
22	Third Street	Cesar Chavez St	32.9	C	33.9	C	42.2	D
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	12.3 (sb)	B	12.3 (sb)	B	14.2 (sb)	B
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A	< 10 (eb)	A
26	Third Street	20th Street	11.4	B	11.0	B	11.0	B
27	Pennsylvania Street	I-280 SB off-ramp	11.8 (sb)	B	11.8 (sb)	B	11.8 (sb)	B
28	Indiana/25th	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A	10.4 (eb)	B
29	Third Street	25th Street	13.4	B	12.9	B	12.5	B
30	Pennsylvania/Cesar	I-280 NB off-ramp	29.8	C	29.7	C	30.1	C
31	Illinois Street	Cesar Chavez St	< 10	A	< 10	A	< 10	A

NOTES:

a Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).
b Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.
c All-way stop-controlled intersection. The existing intersections of Terry A. Francois/South and Illinois/Mariposa would be signalized as part of the proposed project.
d The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.
e Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.
f Under the Basketball Game scenario, a PCO would be stationed at this study intersection during the pre-event period, and, as necessary, would manually direct vehicles, pedestrians, transit, and bicyclists through the intersection. LOS reflects conditions without PCO intervention.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

TABLE 3
INTERSECTION LEVEL OF SERVICE - EXISTING PLUS PROJECT CONDITIONS – WITHOUT A SF GIANTS GAME – WEEKDAY LATE EVENING PEAK HOUR

					Existing plus Project			
			Existing		Basketball Game		Basketball Game with Mit Measure M-TR-11c	
#	Intersection Location		Delay[a]	LOS[a]	Delay	LOS	Delay	LOS
1	King St	Third Street	19.0	B	23.6	C	23.1	C
2	King St	Fourth Street	24.1	C	22.5	C	22.9	C
3	King St/Fifth St	I-280 ramps	10.8	B	10.8	B	10.8	B
4	Fifth St/Harrison	I-80 WB off-ramp	22.1	C	22.3	C	22.7	C
5	Fifth St/Bryant St	I-80 EB on-ramp	24.2	C	**>80**	**F**	**>80**	**F**
6	Third Street	Channel Street[f]	< 10	A	37.5	D	23.7	C
7	Fourth Street	Channel Street[f]	10.6	B	**>80**	**F**	**>80**	**F**
8	Seventh Street	Mission Bay Dr	12.0	B	38.8	D	33.6	C
9	TA Francois Blvd	South Street[c,f]	< 10 (eb)	A	13.4	B	14.3	B
10	Third Street	South Street[f]	< 10	A	<10	A	<10	A
11	TA Francois Blvd	16th Street[f]	--	--	16.9	B	18.1	B
12	Illinois Street	16th Street[g,f]	< 10 (nb)	A	< 10 (sb)	A	< 10 (nb)	A
13	Third Street	16th Street[e,f]	10.6	B	15.7	B	15.9	B
14	Fourth Street	16th Street[e]	15.3	B	18.0	B	18.1	B
15	Owens Street	16th Street[e]	12.2	B	31.2	C	31.6	C
16	7th/Mississippi	16th Street[e]	15.9	B	24.1	C	23.6	C
17	Illinois Street	Mariposa Street[c,f]	< 10 (eb)	A	22.6	C	21.8	C
18	Third Street	Mariposa Street[f]	16.2	B	23.6	C	23.5	C
19	Fourth Street	Mariposa Street[f]	< 10	A	<10	A	<10	A
20	Mariposa Street	I-280 NB off-ramp,[f]	15.9	B	24.7	C	24.0	C
21	Mariposa Street	I-280 SB on-ramp[d]	< 10	A	14.3	B	14.9	B
22	Third Street	Cesar Chavez St	21.1	C	21.9	C	22.0	C
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A	< 10 (eb)	A
26	Third Street	20th Street	< 10	A	11.3	B	10.4	B
27	Pennsylvania Street	I-280 SB off-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
28	Indiana/25th	I-280 NB on-ramp	< 10 (eb)	A	12.3 (wb)	B	14.4 (wb)	B
29	Third Street	25th Street	14.5	B	23.8	C	25.4	C
30	Pennsylvania/Cesar	I-280 NB off-ramp	23.1	C	23.1	C	23.0	C
31	Illinois Street	Cesar Chavez St	< 10	A	< 10	A	< 10	A

NOTES:

[a] Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).

[b] Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.

[c] All-way stop-controlled intersection. The existing intersections of Terry A. Francois/South and Illinois/Mariposa would be signalized as part of the proposed project.

[d] The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.

[e] Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.

[f] Under the Basketball Game scenario, a PCO would be stationed at this study intersection during the post-event period, and, as necessary, would manually direct vehicles, pedestrians, transit, and bicyclists through the intersection. LOS reflects conditions without PCO intervention.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

TABLE 4
INTERSECTION LEVEL OF SERVICE - EXISTING PLUS PROJECT CONDITIONS – WITHOUT A SF GIANTS GAME – SATURDAY EVENING PEAK HOUR

					Existing plus Project			
			Existing		Basketball Game		Basketball Game with Mit Measure M-TR-11c	
#	Intersection Location		Delay[a]	LOS[a]	Delay	LOS	Delay	LOS
1	King St	Third Street	26.6	C	29.0	C	30.1	C
2	King St	Fourth Street	22.6	C	31.8	C	29.3	C
3	King St/Fifth St	I-280 ramps	< 10	A	<10	A	<10	A
4	Fifth St/Harrison	I-80 WB off-ramp	29.2	C	**64.9**	**E**	**65.4**	**E**
5	Fifth St/Bryant St	I-80 EB on-ramp	27.0	C	32.8	C	33.3	C
6	Third Street	Channel Street[f]	< 10	A	**78.9**	**E**	**62.7**	**E**
7	Fourth Street	Channel Street[f]	13.6	B	45.7	D	35.4	D
8	Seventh Street	Mission Bay Dr	12.4	B	**>80**	**F**	**>80**	**F**
9	TA Francois Blvd	South Street[c,f]	< 10(eb)	A	<10	A	<10	A
10	Third Street	South Street[f]	< 10	A	15.3	B	15.2	B
11	TA Francois Blvd	16th Street[f]	--	--	18.2	B	18.2	B
12	Illinois Street	16th Street[f]	< 10(nb)	A	11.8 (nb)	B	11.7 (nb)	A
13	Third Street	16th Street[e,f]	10.7	B	14.0	B	13.8	B
14	Fourth Street	16th Street[e,f]	14.3	B	16.2	B	16.1	B
15	Owens Street	16th Street[e]	< 10	A	20.4	C	21.7	C
16	7th/Mississippi	16th Street[e]	18.4	B	40.7	D	39.8	D
17	Illinois Street	Mariposa Street[c,f]	< 10(eb)	A	44.6	D	42.2	D
18	Third Street	Mariposa Street[f]	16.6	B	21.1	C	21.0	C
19	Fourth Street	Mariposa Street[f]	< 10	A	<10	A	<10	A
20	Mariposa Street	I-280 NB off-ramp,[f]	16.1	B	24.8	C	22.6	C
21	Mariposa Street	I-280 SB on-ramp[d]	< 10	A	<10	A	<10	A
22	Third Street	Cesar Chavez St	18.4	B	18.2	B	17.7	B
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	10.1 (sb)	B	10.1 (sb)	B	10.9 (sb)	B
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A	< 10 (eb)	A
26	Third Street	20th Street	12.1	A	11.4	B	11.8	B
27	Pennsylvania Street	I-280 SB off-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
28	Indiana/25th	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A	< 10 (eb)	A
29	Third Street	25th Street	13.3	B	12.3	B	11.8	B
30	Pennsylvania/Cesar	I-280 NB off-ramp	23.3	C	23.1	C	23.5	C
31	Illinois Street	Cesar Chavez St	< 10	A	12.1	B	11.9	B

NOTES:

[a] Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).
[b] Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.
[c] All-way stop-controlled intersection. The existing intersections of Terry A. Francois/South and Illinois/Mariposa would be signalized as part of the proposed project.
[d] The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.
[e] Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.
[f] Under the Basketball Game scenario, a PCO would be stationed at this study intersection during the pre-event period, and, as necessary, would manually direct vehicles, pedestrians, transit, and bicyclists through the intersection. LOS reflects conditions without PCO intervention.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

Third/Channel, Fourth/Channel, Seventh/Mission Bay Drive, Seventh/Mississippi/16th). Thus, without or with the use of the 19th Street parking lot, the project would result in significant and unavoidable traffic impacts at seven study intersections that would operate at LOS E or LOS F conditions under existing plus project conditions without a SF Giants evening game at AT&T Park. This impact is not more severe than described in the SEIR in Impact TR-2.

Existing plus Project conditions with an overlapping SF Giants Evening Game

Table 5 presents the weekday p.m. intersection LOS conditions, **Table 6** presents the weekday evening peak hour conditions, **Table 7** presents the weekday late evening intersection LOS conditions, while **Table 8** presents the weekday evening peak hour conditions for existing, existing plus project, and existing plus project with Mitigation Measure M-TR-11c for conditions with an overlapping SF Giants evening game at AT&T Park.

For the Basketball Game scenario with a SF Giants game at AT&T Park, the analysis assumed use of both parking lots by event attendees, for an additional parking supply of 1,050 vehicle spaces. Similar to the conditions without a SF Giants evening game, vehicles that were assigned to UCSF parking facilities were reassigned to both parking lots. In addition, vehicles that had conservatively been previously assumed to park at Mission Bay garages that were close to or slightly over capacity, such as the 450 South Street or the 1670 Owens Street garages, were also reassigned to the two lots. Due to the two parking facilities south of the project site, vehicle access to/from I-280 would shift from the Mariposa Street ramps to those located at Pennsylvania Avenue and Cesar Chavez Street. The analysis also assumes that for post-event late evening conditions, one to two PCOs would be stationed at the intersection of Third/Cesar Chavez, and that both travel lanes on the westbound approach of Cesar Chavez Street would be westbound through lanes (i.e., the westbound left turn-only lane would temporarily be reassigned to operate as an additional westbound through lane, and westbound left turns at this location would not be permitted; drivers destined to destinations south on Third Street would be required to make a westbound to southbound left turn at Illinois Street). West of Third Street there are two westbound travel lanes on Cesar Chavez Street, and the temporary post-event travel lane configuration can be accommodated. With implementation of the off-site parking facilities, the intersection LOS analysis results indicate that for conditions with overlapping events, intersections LOS would remain similar to those reported for the proposed project, with the following exceptions:

> *Weekday p.m. peak hour* – Implementation of the off-site parking facilities would cause the intersection of Pennsylvania/Cesar Chavez/I-280 northbound off-ramp to operate at LOS E rather than LOS D; however, with the use of the off-site parking facilities, the intersection of Fourth/16th Street would operate at LOS D rather than LOS E.
>
> *Weekday evening peak hour* - Implementation of the off-site parking facilities would cause the intersection of Pennsylvania/Cesar Chavez/I-280 northbound off-ramp to operate at LOS F rather than LOS D; however, with the use of the off-site parking facilities, the intersection of Mariposa/I-280 northbound off-ramp would operate at LOS C rather than LOS E.
>
> *Weekday late evening peak hour* – With implementation of the off-site parking facilities, intersection LOS conditions and identified impacts would remain the same as described in Impact TR-11. As described above, with implementation of traffic management strategies to provide for two westbound through lanes at the intersection of Third/Cesar Chavez, the intersection would operate at overall LOS D conditions.

TABLE 5
INTERSECTION LEVEL OF SERVICE - EXISTING PLUS PROJECT CONDITIONS – WITH A SF GIANTS EVENING GAME – WEEKDAY PM PEAK HOUR

					Existing plus Project			
			Existing		Basketball Game		Basketball Game with Mit Measure M-TR-11c	
#	Intersection Location		Delay[a]	LOS[a]	Delay	LOS	Delay	LOS
1	King St	Third Street	**PCO controlled**		**PCO controlled**		**PCO controlled**	
2	King St	Fourth Street	**PCO controlled**		**PCO controlled**		**PCO controlled**	
3	King St/Fifth St	I-280 ramps	**60.7**	**E**	**60.7**	**E**	**60.8**	**E**
4	Fifth St/Harrison	I-80 WB off-ramp	**62.4**	**E**	**66.7**	**E**	**66.9**	**E**
5	Fifth St/Bryant St	I-80 EB on-ramp	**>80**	**F**	**>80**	**F**	**>80**	**F**
6	Third Street	Channel Street	**PCO controlled**		**PCO controlled**		**PCO controlled**	
7	Fourth Street	Channel Street	11.5	B	11.4	B	11.5	B
8	Seventh Street	Mission Bay Dr	26.5	C	**56.9**	**E**	**56.2**	**E**
9	TA Francois Blvd	South Street[c]	11.4 (eb)	B	< 10	A	< 10	A
10	Third Street	South Street	25.1	C	27.3	C	27.1	C
11	TA Francois Blvd	16th Street	--	--	16.9	B	16.9	B
12	Illinois Street	16th Street	14.1 (nb)	B	13.8 (nb)	B	13.1 (nb)	B
13	Third Street	16th Street[e]	34.4	D	39.3	D	38.1	D
14	Fourth Street	16th Street[e]	28.7	C	**70.9**	**E**	37.7	D
15	Owens Street	16th Street[e]	49.2	D	**71.6**	**E**	**77.0**	**E**
16	7th/Mississippi	16th Street[e]	**> 80**	**F**	**> 80**	**F**	**> 80**	**F**
17	Illinois Street	Mariposa Street[c]	27.6 (eb)	D	26.8	C	25.3	C
18	Third Street	Mariposa Street	35.4	C	44.9	D	47.8	D
19	Fourth Street	Mariposa Street	14.4	B	16.0	B	15.4	B
20	Mariposa Street	I-280 NB off-ramp	21.6	C	22.1	C	22.1	C
21	Mariposa Street	I-280 SB on-ramp[d]	< 10	A	10.9	B	10.9	B
22	Third Street	Cesar Chavez St	44.6	D	47.6	D	51.2	D
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	12.8 (sb)	B	12.8 (sb)	B	13.1 (sb)	B
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A	< 10 (eb)	A
26	Third Street	20th Street	17.4	B	16.8	B	17.1	B
27	Pennsylvania Street	I-280 SB off-ramp	18.4 (sb)	C	18.4 (sb)	C	19.0 (sb)	C
28	Indiana/25th	I-280 NB on-ramp	12.2 (wb)	B	12.2 (wb)	B	13.4 (wb)	B
29	Third Street	25th Street	13.9	B	13.7	B	16.0	B
30	Pennsylvania/Cesar	I-280 NB off-ramp	51.4	D	51.4	D	**59.4**	**E**
31	Illinois Street	Cesar Chavez St	< 10	A	10.5	B	10.1	B

NOTES:

[a] Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).

[b] Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.

[c] All-way stop-controlled intersection. The existing intersections of Terry A. Francois/South and Illinois/Mariposa would be signalized as part of the proposed project.

[d] The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.

[e] Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

TABLE 6
INTERSECTION LEVEL OF SERVICE - EXISTING PLUS PROJECT CONDITIONS – WITH A SF GIANTS EVENING GAME – WEEKDAY EVENING PEAK HOUR

					Existing plus Project			
			Existing		Basketball Game		Basketball Game with Mit Measure M-TR-11c	
#	Intersection Location		Delay[a]	LOS[a]	Delay	LOS	Delay	LOS
1	King St	Third Street	**PCO controlled**		**PCO controlled**		**PCO controlled**	
2	King St	Fourth Street	**PCO controlled**		**PCO controlled**		**PCO controlled**	
3	King St/Fifth St	I-280 ramps	**77.1**	**E**	**>80**	**F**	**77.0**	E
4	Fifth St/Harrison	I-80 WB off-ramp	47.3	D	**>80**	**F**	**>80**	**F**
5	Fifth St/Bryant St	I-80 EB on-ramp	**>80**	**F**	**>80**	**F**	**>80**	**F**
6	Third Street	Channel Street[f]	**PCO controlled**		**PCO controlled**		**PCO controlled**	
7	Fourth Street	Channel Street[f]	< 10	A	11.5	B	10.6	B
8	Seventh Street	Mission Bay Dr	21.2	C	**>80**	**F**	**>80**	**F**
9	TA Francois Blvd	South Street[c,f]	11.5 (eb)	B	< 10	A	< 10	A
10	Third Street	South Street[f]	21.8	C	**>80**	**F**	**>80**	**F**
11	TA Francois Blvd	16th Street[f]	--	--	19.4	B	18.7	B
12	Illinois Street	16th Street[f]	11.7 (nb)	B	19.7 (nb)	C	18.2 (nb)	C
13	Third Street	16th Street[e,f]	27.0	C	28.9	C	28.7	C
14	Fourth Street	16th Street[e,f]	19.7	B	23.7	C	21.2	C
15	Owens Street	16th Street[e]	22.0	C	54.8	D	40.5	D
16	7th/Mississippi	16th Street[e]	**75.6**	**E**	**>80**	**F**	**>80**	**F**
17	Illinois Street	Mariposa Street[c,f]	15.1 (eb)	B	**75.6**	**E**	**58.0**	**E**
18	Third Street	Mariposa Street[f]	34.9	C	47.6	D	46.0	D
19	Fourth Street	Mariposa Street[f]	12.0	B	17.2	B	16.2	B
20	Mariposa Street	I-280 NB off-ramp,[f]	20.2	C	**59.9**	**E**	**28.3**	**C**
21	Mariposa Street	I-280 SB on-ramp[d]	< 10	A	< 10	A	< 10	A
22	Third Street	Cesar Chavez St	32.2	C	33.0	C	39.4	D
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	12.6 (sb)	B	12.6 (sb)	B	14.3 (sb)	B
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	<10 (eb)	A	< 10 (eb)	A
26	Third Street	20th Street	13.5	B	12.9	B	13.6	B
27	Pennsylvania Street	I-280 SB off-ramp	11.7 (sb)	B	11.7 (sb)	B	15.5 (wb)	B
28	Indiana/25th	I-280 NB on-ramp	<10 (eb)	A	< 10 (eb)	A	12.8 (eb)	B
29	Third Street	25th Street	18.0	B	17.3	B	24.4	C
30	Pennsylvania/Cesar	I-280 NB off-ramp	31.5	C	31.8	C	**> 80**	**F**
31	Illinois Street	Cesar Chavez St	< 10	A	< 10	A	< 10	A

NOTES:
[a] Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).
[b] Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.
[c] All-way stop-controlled intersection. The existing intersections of Terry A. Francois/South and Illinois/Mariposa would be signalized as part of the proposed project.
[d] The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.
[e] Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.
[f] Under the Basketball Game scenario, a PCO would be stationed at this study intersection during the pre-event period, and, as necessary, would manually direct vehicles, pedestrians, transit, and bicyclists through the intersection. LOS reflects conditions without PCO intervention.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

TABLE 7
INTERSECTION LEVEL OF SERVICE - EXISTING PLUS PROJECT CONDITIONS – WITH A SF GIANTS EVENING GAME – WEEKDAY LATE EVENING PEAK HOUR

#	Intersection Location		Existing		Existing plus Project			
					Basketball Game		Basketball Game with Mit Measure M-TR-11c	
			Delay[a]	LOS[a]	Delay	LOS	Delay	LOS
1	King St	Third Street	**PCO controlled**		**PCO controlled**		**PCO controlled**	
2	King St	Fourth Street	**PCO controlled**		**PCO controlled**		**PCO controlled**	
3	King St/Fifth St	I-280 ramps	**>80**	**F**	**> 80**	**F**	**>80**	**F**
4	Fifth St/Harrison	I-80 WB off-ramp	22.2	C	22.2	C	22.2	C
5	Fifth St/Bryant St	I-80 EB on-ramp	24.9	C	**> 80**	**F**	**> 80**	**F**
6	Third Street	Channel Street[f]	**PCO controlled**		**PCO controlled**		**PCO controlled**	
7	Fourth Street	Channel Street[f]	**PCO controlled**		**PCO controlled**		**PCO controlled**	
8	Seventh Street	Mission Bay Dr	12.5	B	**> 80**	**F**	**> 80**	**F**
9	TA Francois Blvd	South Street[c,f]	12.9 (eb)	B	41.2	D	28.0	C
10	Third Street	South Street[f]	11.5	B	< 10	A	< 10	A
11	TA Francois Blvd	16th Street[f]	--	--	22.2	C	21.9	C
12	Illinois Street	16th Street[f]	< 10 (nb)	A	< 10 (sb)	A	< 10 (nb)	A
13	Third Street	16th Street[e,f]	18.3	B	33.5	C	33.2	C
14	Fourth Street	16th Street[e,f]	15.1	B	22.3	C	22.2	C
15	Owens Street	16th Street[e]	11.5	B	33.6	C	32.3	C
16	7th/Mississippi	16th Street[e]	25.6	C	29.6	C	30.0	C
17	Illinois Street	Mariposa Street[c,f]	**PCO controlled**		**PCO controlled**		**PCO controlled**	
18	Third Street	Mariposa Street[f]	**PCO controlled**		**PCO controlled**		**PCO controlled**	
19	Fourth Street	Mariposa Street[f]	< 10	A	< 10	A	< 10	A
20	Mariposa Street	I-280 NB off-ramp[f]	17.2	B	24.4	C	23.9	C
21	Mariposa Street	I-280 SB on-ramp[d]	13.2	B	24.6	C	12.8	B
22	Third Street	Cesar Chavez St[g]	35.3	D	35.1	D	54.1	D
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	10.3 (sb)	B	10.3 (sb)	B	10.4 (sb)	B
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A	< 10 (eb)	A
26	Third Street	20th Street	22.4	C	21.5	C	23.8	C
27	Pennsylvania Street	I-280 SB off-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
28	Indiana/25th	I-280 NB on-ramp	< 10 (eb)	A	14.0 (wb)	B	24.1 (wb)	C
29	Third Street	25th Street	18.7	B	30.2	C	29.5	C
30	Pennsylvania/Cesar	I-280 NB off-ramp	23.1	C	23.0	C	25.6	C
31	Illinois Street	Cesar Chavez St	< 10	A	10.5	B	< 10	A

NOTES:

[a] Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).

[b] Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.

[c] All-way stop-controlled intersection. The existing intersections of Terry A. Francois/South and Illinois/Mariposa would be signalized as part of the proposed project.

[d] The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.

[e] Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.

[f] Under the Basketball Game scenario, a PCO would be stationed at this study intersection during the post-event period, and, as necessary, would manually direct vehicles, pedestrians, transit, and bicyclists through the intersection. LOS reflects conditions without PCO intervention.

[g] Under the Basketball Game scenario, when the Western Pacific parking lot would be used during overlapping events, during the post-event period, one to two PCOs would be stationed at the intersection of Third/Cesar Chavez, and both travel lanes on the westbound approach of Cesar Chavez Street would become westbound through lanes.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

TABLE 8
INTERSECTION LEVEL OF SERVICE - EXISTING PLUS PROJECT CONDITIONS – WITH A SF GIANTS EVENING GAME – SATURDAY EVENING PEAK HOUR

#	Intersection Location		Existing		Existing plus Project: Basketball Game		Existing plus Project: Basketball Game with Mit Measure M-TR-11c	
			Delay[a]	LOS[a]	Delay	LOS	Delay	LOS
1	King St	Third Street	**PCO controlled**		**PCO controlled**		**PCO controlled**	
2	King St	Fourth Street	**PCO controlled**		**PCO controlled**		**PCO controlled**	
3	King St/Fifth St	I-280 ramps	41.1	D	54.3	D	40.9	D
4	Fifth St/Harrison	I-80 WB off-ramp	33.1	C	**> 80**	**F**	**> 80**	**F**
5	Fifth St/Bryant St	I-80 EB on-ramp	51.7	D	50.0	D	48.0	D
6	Third Street	Channel Street[f]	**PCO controlled**		**PCO controlled**		**PCO controlled**	
7	Fourth Street	Channel Street[f]	< 10	A	10.3	B	< 10	A
8	Seventh Street	Mission Bay Dr	15.0	B	**> 80**	**F**	**> 80**	**F**
9	TA Francois Blvd	South Street[c,f]	10.4 (eb)	B	< 10	A	< 10	A
10	Third Street	South Street[f]	< 10	A	22.5	C	22.2	C
11	TA Francois Blvd	16th Street[f]	--	--	18.3	B	18.3	B
12	Illinois Street	16th Street[f]	< 10 (nb)	A	12.5 (nb)	B	12.3 (nb)	B
13	Third Street	16th Street[e,f]	12.8	B	24.7	C	24.5	C
14	Fourth Street	16th Street[e,f]	14.0	B	18.0	B	17.3	B
15	Owens Street	16th Street[e]	10.1	B	22.2	C	18.4	B
16	7th/Mississippi	16th Street[e]	28.0	C	**69.2**	**E**	**59.8**	**E**
17	Illinois Street	Mariposa Street[c,f]	< 10 (eb)	A	51.7	D	44.5	D
18	Third Street	Mariposa Street[f]	26.9	C	34.6	C	33.1	C
19	Fourth Street	Mariposa Street[f]	< 10	A	< 10	A	< 10	A
20	Mariposa Street	I-280 NB off-ramp,[f]	16.2	B	19.7	B	17.7	B
21	Mariposa Street	I-280 SB on-ramp[d]	10.5	B	< 10	A	< 10	A
22	Third Street	Cesar Chavez St	32.3	C	31.9	C	36.9	D
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	10.1 (sb)	B	10.1 (sb)	B	10.8 (sb)	B
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A	< 10 (eb)	A
26	Third Street	20th Street	14.1	B	13.3	B	13.4	B
27	Pennsylvania Street	I-280 SB off-ramp	< 10 (sb)	A	< 10 (sb)	A	11.1 (wb)	B
28	Indiana/25th	I-280 NB on-ramp	<10 (eb)	A	<10 (eb)	A	<10 (eb)	A
29	Third Street	25th Street	13.2	B	12.4	B	22.3	C
30	Pennsylvania/Cesar	I-280 NB off-ramp	25.1	C	24.9	C	35.7	D
31	Illinois Street	Cesar Chavez St	< 10	A	< 10	A	< 10	A

NOTES:

a Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).
b Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.
c All-way stop-controlled intersection. The existing intersections of Terry A. Francois/South and Illinois/Mariposa would be signalized as part of the proposed project.
d The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.
e Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.
f Under the Basketball Game scenario, a PCO would be stationed at this study intersection during the pre-event period, and, as necessary, would manually direct vehicles, pedestrians, transit, and bicyclists through the intersection. LOS reflects conditions without PCO intervention.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

As described above, traffic impacts for the Basketball Game scenario with an overlapping SF Giants evening game at AT&T Park were identified as significant and unavoidable at ten study intersections. With implementation of this mitigation measure, the significant project impacts at the intersection of Fourth/16th during the weekday p.m. peak hour, and at the intersection of Mariposa/I-280 northbound off-ramp would not occur. With implementation of this mitigation measure, the proposed project would result in traffic impacts at nine, rather than ten intersections. The change in location of traffic impacts at intersections (i.e., no project impact at the intersections of Fourth/16th and Mariposa/I-280 northbound off-ramp, and a project impact at the intersection of Pennsylvania/Cesar Chavez/I-280) is consistent with the determination noted on TR-X-8 above, that it is possible that use of this off-site parking lots during overlapping events could reduce traffic impacts in the project vicinity, but that drivers who may use these additional parking facilities could travel along different routes, which could result in traffic impacts south of the project site such as along Third Street, Cesar Chavez Street, 25th Street or other streets that may be used as access to or from affected freeway on-ramps and off-ramps and approaches in the vicinity of the parking lots. Use of off-site parking facilities identified in Mitigation Measure M-TR-11c therefore would not result in a substantial increase in the severity of the proposed project's traffic impacts identified in the Draft SEIR for conditions without this measure. With this redirection in impacts at some intersections and increase in others, the overall impact remains essentially the same as described in Impact TR-11 in the Draft SEIR with implementation of Mitigation Measure M-TR-11c, Impact TR-11 conclusion remains the same: the proposed project would result in significant traffic impacts at multiple intersections that would operate at LOS E or LOS F under existing plus project conditions with an overlapping SF Giants evening game at AT&T Park. Impact TR-11 would be considered *significant and unavoidable with mitigation.*

2040 Cumulative Conditions. Cumulative traffic volumes at the nine additional study intersections were developed using the methodology presented in SEIR pp. 5.2-110 -5.2-111. The 2040 cumulative traffic volumes take into account cumulative development projects in the vicinity of the two parking facilities, such as build-out of the Candlestick Point-Hunters Point Shipyard area, development at Pier 70, and 900 Marin Street. Intersection LOS conditions at the study intersections for 2040 cumulative conditions are presented in **Table 9** and **Table 10** for the Basketball Game scenario for the weekday p.m. and Saturday evening peak hours, respectively, for conditions without and with implementation of Mitigation Measure M-TR-11c for conditions without an overlapping SF Giants evening game at AT&T Park.

Under 2040 cumulative conditions for the Saturday evening peak hour, the additional study intersections would continue to operate at LOS D or better, and therefore 2040 cumulative traffic impacts during the Saturday evening peak hour would be less than significant.

During the weekday p.m. peak hour, the intersection of Pennsylvania/Cesar Chavez/I-280 northbound off-ramp is projected to operate at LOS F conditions for 2040 cumulative conditions. As noted above, during overlapping events, implementation of Mitigation Measure M-TR-11c would result in significant traffic impacts at this intersection during the weekday evening peak hour, and therefore the project-specific traffic impact at this intersection would also be considered a significant cumulative impact of the project. This impact, however, does not represent a substantial increase in the severity of Impact TR-11.

TABLE 9
INTERSECTION LEVEL OF SERVICE – 2040 CUMULATIVE CONDITIONS –
WEEKDAY PM PEAK HOUR

#	Intersection Location		Basketball Game		Basketball Game with Mit Measure M-TR-11c	
			Delay[a]	LOS[b]	Delay	LOS
1	King St	Third Street	**>80**	**F**	**>80**	**F**
2	King St	Fourth Street	**>80**	**F**	**>80**	**F**
3	King St/Fifth St	I-280 ramps	23.8	C	23.8	C
4	Fifth St/Harrison	I-80 WB off-ramp	**>80**	**F**	**>80**	**F**
5	Fifth St/Bryant St	I-80 EB on-ramp	**>80**	**F**	**>80**	**F**
6	Third Street	Channel Street	**71.6**	**E**	**71.6**	**E**
7	Fourth Street	Channel Street	18.7	B	18.7	B
8	Seventh Street	Mission Bay Dr	**66.5**	**E**	**65.2**	**E**
9	TA Francois Blvd	South Street	< 10	A	< 10	A
10	Third Street	South Street	38.2	D	38.2	D
11	TA Francois Blvd	16th Street	20.5	C	20.5	C
12	Illinois Street	16th Street[c]	17.9 (nb)	C	17.9 (nb)	C
13	Third Street	16th Street[e]	**70.9**	**E**	**70.8**	**E**
14	Fourth Street	16th Street[e]	24.6	C	24.4	C
15	Owens Street	16th Street[e]	**58.9**	**E**	**57.8**	**E**
16	7th/Mississippi	16th Street[e]	**>80**	**F**	**>80**	**F**
17	Illinois Street	Mariposa Street	21.2	C	21.2	C
18	Third Street	Mariposa Street	48.2	D	44.4	D
19	Fourth Street	Mariposa Street	19.5	B	19.4	B
20	Mariposa Street	I-280 NB off-ramp	37.4	D	37.3	D
21	Mariposa Street	I-280 SB on-ramp[d]	13.1	B	13.1	B
22	Third Street	Cesar Chavez St	**>80**	**F**	**>80**	**F**
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	13.8 (sb)	B	14.2 (sb)	B
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	< 10 (eb)	A
26	Third Street	20th Street	40.2	D	41.2	D
27	Pennsylvania Street	I-280 SB off-ramp	**>50 (sb)**	**F**	**>50 (sb)**	**F**
28	Indiana/25th	I-280 NB on-ramp	26.1 (wb)	D	26.1 (wb)	D
29	Third Street	25th Street	52.3	D	52.1	D
30	Pennsylvania/Cesar	I-280 NB off-ramp	**>80**	**F**	**>80**	**F**
31	Illinois Street	Cesar Chavez St	18.1	B	18.3	B

NOTES:

[a] Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).
[b] Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.
[c] All-way stop-controlled intersection.
[d] The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.
[e] Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

TABLE 10
INTERSECTION LEVEL OF SERVICE – 2040 CUMULATIVE CONDITIONS – SATURDAY EVENING PEAK HOUR

#	Intersection Location		Basketball Game		Basketball Game with Mit Measure M-TR-11c	
			Delay[a]	LOS[b]	Delay	LOS
1	King St	Third Street	**56.8**	**E**	**55.1**	**E**
2	King St	Fourth Street	**70.8**	**E**	**68.6**	**E**
3	King St/Fifth St	I-280 ramps	< 10	A	< 10	A
4	Fifth St/Harrison	I-80 WB off-ramp	**>80**	**F**	**>80**	**F**
5	Fifth St/Bryant St	I-80 EB on-ramp	**71.4**	**E**	**69.4**	**E**
6	Third Street	Channel Street[f]	**>80**	**F**	**>80**	**F**
7	Fourth Street	Channel Street[f]	**67.5**	**E**	**58.8**	**E**
8	Seventh Street	Mission Bay Dr	**>80**	**F**	**>80**	**F**
9	TA Francois Blvd	South Street[f]	<10	A	<10	A
10	Third Street	South Street[f]	15.0	B	14.8	B
11	TA Francois Blvd	16th Street[f]	19.0	B	19.0	B
12	Illinois Street	16th Street[c,f]	13.3 (nb)	B	13.2 (nb)	B
13	Third Street	16th Street[e,f]	18.0	B	17.8	B
14	Fourth Street	16th Street[e,f]	20.3	C	22.6	C
15	Owens Street	16th Street[e]	24.8	C	23.1	C
16	7th/Mississippi	16th Street[e]	**61.2**	**E**	**60.4**	**E**
17	Illinois Street	Mariposa Street[f]	16.9	B	16.9	B
18	Third Street	Mariposa Street[f]	24.2	C	24.1	C
19	Fourth Street	Mariposa Street[f]	<10	A	<10	A
20	Mariposa Street	I-280 NB off-ramp[f]	35.3	D	29.0	C
21	Mariposa Street	I-280 SB on-ramp[d]	<10	A	<10	A
22	Third Street	Cesar Chavez St	22.8	C	25.4	C
23	Pennsylvania Street	I-280 SB on-ramp	< 10 (sb)	A	< 10 (sb)	A
24	18th Street	I-280 SB off-ramp	10.7 (sb)	B	11.6 (sb)	B
25	18th Street	I-280 NB on-ramp	< 10 (eb)	A	< 10 (nb)	A
26	Third Street	20th Street	24.4	C	24.7	C
27	Pennsylvania Street	I-280 SB off-ramp	11.7 (sb)	B	11.7 (sb)	B
28	Indiana/25th	I-280 NB on-ramp	11.0 (eb)	B	11.0 (eb)	B
29	Third Street	25th Street	19.9	B	19.6	B
30	Pennsylvania/Cesar	I-280 NB off-ramp	23.3	C	23.6	C
31	Illinois Street	Cesar Chavez St	10.4	B	10.3	B

NOTES:

[a] Delay presented in seconds per vehicle. For unsignalized intersections, delay and LOS presented for worst approach. Worst approach indicated in ( ).
[b] Intersections operating at LOS E or LOS F conditions highlighted in **bold**. Significant project impacts shaded.
[c] All-way stop-controlled intersection.
[d] The traffic signal at the intersection of Mariposa/I-280 southbound on-ramp is part of the roadway improvements on Mariposa Street between the I-280 northbound off-ramp and I-280 southbound on-ramp and the extension of Owens Street between 16th and Mariposa Streets, and is currently planned to be operational by fall 2015.
[e] Includes implementation of the 22 Fillmore Transit Priority Project, which includes converting one mixed-flow lane in each direction to a side-running transit-only lane.
[f] Under the Basketball Game scenario, a PCO would be stationed at this study intersection during the pre-event period, and, as necessary, would manually direct vehicles, pedestrians, transit, and bicyclists through the intersection. LOS reflects conditions without PCO intervention.

SOURCE: Adavant Consulting/Fehr & Peers/LCW Consulting, 2015

At the unsignalized intersection of Pennsylvania/I-280 southbound off-ramp, traffic signal warrants would be met for 2040 cumulative conditions without and with the proposed project, due primarily to development proposed at Pier 70. During the weekday p.m. peak hour, the proposed project would not contribute considerably to the LOS F operating conditions at this intersection for conditions without a SF Giants evening game. However, during overlapping events, implementation of Mitigation Measure M-TR-11c would contribute considerably to LOS F operating conditions, and therefore, would contribute to the 2040 cumulative impacts at this intersection. Signalization of this intersection is not currently contemplated by Caltrans; however, a new signal has been identified as a project-specific mitigation measure in the analysis being conducted for the development proposed at Pier 70.

To address traffic impacts of the proposed project after implementation of the parking facilities at the 19th Street site and Western Pacific site, Mitigation Measure M-TR-11c is augmented as follows:

- In the event that the off-site parking lots at 19th Street and the Western Pacific sites are implemented, Mitigation Measure M-TR-11c addresses potential cumulative impacts under 2040 conditions to improve traffic operations at the unsignalized intersection of Pennsylvania/I-280 southbound off-ramp. As part of that mitigation measures, the SFMTA shall consult with Caltrans in assessing the feasibility of signalizing the intersection of Pennsylvania/I-280 southbound off-ramp. If determined feasible by the SFMTA and Caltrans, the SFMTA and Caltrans shall establish the level of traffic volumes that would trigger the need for a signal, and the project sponsor shall fund its fair share cost of the design and implementation of the new signal, based on project contributions to annual average weekday traffic volumes at this intersection.

  In addition, as part of monitoring of traffic conditions during overlapping events, the SFMTA shall consult with Caltrans regarding the need to deploy an SFMTA PCO or CHP officer to expedite traffic exiting I-280 southbound (i.e., waving vehicles exiting I-280 southbound and turning left onto southbound Pennsylvania Street through the existing stop sign) during overlapping events when the Western Pacific parking lot is used for project event parking. The PCO or CHP officer could be deployed during those events prior to installation of a traffic signal or if signalization of this intersection is determined not to be feasible.

Signalization of this intersection would mitigate 2040 cumulative traffic impacts at this intersection to less than significant. However, because coordination with Caltrans and their approval regarding installation of a new signal at this location has not been conducted, the feasibility is uncertain and therefore cumulative traffic impact at this location would be significant and unavoidable. With implementation of Mitigation Measure M-TR-11c, the proposed project would result in cumulative impacts, or contribute to 2040 cumulative impacts at 16 study intersections; however, significant traffic impacts would not occur at the intersections of Fourth/16th or Mariposa/I-280 northbound off-ramp, and instead would occur at the intersections of Pennsylvania/Cesar Chavez/I-280 northbound off-ramp and Pennsylvania/I-280 southbound off-ramp, and these impacts would be *significant and unavoidable with mitigation.* Thus, under 2040 cumulative conditions, implementation of Mitigation Measure M-TR-11c would not result in a substantial increase in the severity of traffic impacts identified for conditions without this measure.

Transit

The additional parking facilities would serve to reduce the number of attendees seeking and finding parking at parking facilities closer to the project site, and are not expected to result in a quantifiable mode shift for access to and from the event center. Therefore, with the two additional facilities accommodating a total of 1,050 vehicle parking spaces, the transit impact analysis related to capacity utilization would remain the same as presented in Impact TR-4 and Impact TR-5 for conditions without an overlapping SF Giants evening game at AT&T Park, and in Impact TR-13 and Impact TR-14 for conditions with an overlapping SF Giants evening game at AT&T Park.

Shuttle buses would connect the event center with the Western Pacific site. Prior to an event, shuttle buses would travel to the event center via Cesar Chavez Street westbound, Illinois Street northbound, and would return via 16th Street westbound, Third Street southbound, and onto Cesar Chavez Street eastbound. Pre-event, the shuttle buses would drop off passengers on the east side of Illinois Street between 16th and Mariposa Streets. The shuttle bus zone on the east curb of Illinois Street would be used by the Muni Special Event 16th Street BART station shuttle post-event, and therefore, would not result in additional temporary parking displacement during overlapping events, although the parking prohibition would be implemented earlier, so that it is available for the Western Pacific parking lot shuttle bus service during the pre-game period. Approximately 200 feet (five automobile parking spaces) would be required for the Western Pacific parking lot shuttle bus zone.

Following an event, shuttle buses would travel to the event center via Cesar Chavez Street westbound, Third Street northbound, 16th Street eastbound, Illinois Street southbound, and would return via Illinois Street southbound, Mariposa Street westbound, Third Street southbound, to Cesar Chavez Street eastbound. Post-event, buses would use the west curb of Illinois Street between 16th and Mariposa Streets to load passengers. A shuttle zone on the west curb of Illinois Street for bus layover and passenger pick-up would require temporary parking prohibition for a portion of the west side of Illinois Street between 16th and Mariposa Streets during overlapping events (currently there are about 40 on-street parking spaces on this section of Illinois Street).

The project sponsor would be responsible for accommodating the passenger demand on the shuttle buses. The majority of the arrivals and departures would occur within one hour of the start and end of the event, and would be greater during the post-event period. During a maximum capacity attendance event, assuming a shuttle capacity of 60 passengers per bus, about eight buses making three round trips between the event center and the Western Pacific parking lot would be needed to accommodate the peak post-event passenger demand of 1,400 passengers (i.e., 800 vehicles each with an average vehicle occupancy of 2.52 passengers, and about 70 percent of the demand occurring within a one-hour period). If shuttle buses with less capacity are used, more shuttle buses would be required to accommodate the passenger demand. Impacts would be less than significant.

Pedestrians

The 19th Street site is located about 0.45 miles south of the project site, and it is anticipated that given this short distance attendees would walk between the event center and the parking lot. Pedestrian access to the 19th Street lot would be via 20th Street where a sidewalk is currently provided on the north side of 20th Street, or via the planned extension of 19th Street as part of the Phase 1 of Crane Cove Park. Because a sidewalk is not currently provided on the east side of Illinois Street between 20th and Mariposa Streets (it is being built out as development on the east side of Illinois Street occurs), pedestrians would walk on the west side of Illinois Street. At Mariposa Street, pedestrians would most likely continue north on Terry A. Francois Boulevard to access the main entrance to the arena north of 16th Street. Some pedestrians may choose to walk between the event center and the 19th Street site on Third Street. The ultimate configuration of the sidewalk on the west side of Terry A. Francois is 22 feet wide, on the west side of Illinois Street is generally 10.5 feet wide, and on the east side of Third Street is 12 feet wide. Pedestrian volumes during the evening and late evening periods are generally low, and the additional pedestrians walking between the event center and the 19th Street parking lot would be accommodated on the sidewalks and at the crosswalks at intersections without substantially affecting pedestrian flows.

Travel for event attendees between the Western Pacific parking lot and the event center would be via a shuttle bus. Pedestrians would board the bus within the Western Pacific parking lot (e.g., similar to a shuttle bus system at an airport parking lot), and alight at a temporary stop on the east side (pre-event) and west side (post-event) of Illinois Street between 16th and Mariposa Streets. For pre-event and post-event conditions, PCOs would be stationed at the intersection of Illinois/16th to manage pedestrian, transit, traffic, and bicycle flows through the intersection.

The two parking lots would result in fewer pedestrians accessing the project site, particularly from parking facilities located primarily east of the project site (i.e., fewer attendees would park at UCSF parking facilities that were assumed to be available for parking during events at the project site), which would instead travel via shuttle. This would reduce the effect of additional pedestrians at the intersections of Third/South and Third/16th. Impacts would be less than significant.

Bicyclists

Illinois Street in the vicinity of both parking facilities is part of Bicycle Route 5 and a bicycle lane is provided in each direction. The additional vehicles traveling to and from the parking lots would primarily travel on Third Street and turn onto or from 20th Street and Cesar Chavez Street to access the lots. Therefore, it is not anticipated that the parking lots would result in a substantial number of project-generated vehicles on Illinois Street. In addition, the use of the sites would result in a reduction in the number of vehicles on streets in the project vicinity, where bicycle lanes are also located, but it would result in an increase of bus shuttles on 16th Street between Third and Illinois Streets, and on Illinois Street, both of which include bicycle facilities. Pre-event, the Western Pacific parking lot shuttle bus would unload passengers on the east curb of Illinois Street between 16th and Mariposa Streets, and post-event would load passengers at the west curb of Illinois Street between 16th and Mariposa Streets. On both sides of Illinois Street, the passenger loading/unloading zones would be adjacent to existing bicycle lanes. Post-event both the Muni Special Event 16th Street BART shuttle buses and the Western Pacific parking lot shuttle buses would load passengers along Illinois Street between 16th and Mariposa Streets, which could result in an increased potential for bus-bicycle conflicts and bicycle safety concerns. As described in the SEIR, post-event 16th Street between Illinois Street and Terry A. Francois Boulevard, as well as northbound Illinois Street between Mariposa and 16th Streets, would be closed to vehicular traffic to facilitate Muni Special Event Shuttle operations (local access to adjacent building from Mariposa Street would be permitted). As the event center bicycle valet parking would be accessed from the north sidewalk along 16th Street in this segment, signage, cones and PCOs would be used to direct departing bicyclists towards the signalized intersection of Terry A. Francois Boulevard/16th Street, where they can safely mount their bicycles and travel northbound and southbound on Terry A. Francois Boulevard within the planned cycle track. At the intersection of Illinois/16th, a PCO would be stationed to facilitate transit, vehicle and bicycle travel along 16th Street, as well as direct southbound pedestrians and vehicles across 16th Street. Thus, post-event bicyclists traveling southbound would be directed towards Terry A. Francois Boulevard, away from Illinois Street between 16th and Mariposa Streets, which would be extensively used by event shuttle buses and vehicles departing the project garage, and instead directed towards the cycle track on Terry A. Francois Boulevard. Thus, implementation of TMP measures during events would facilitate bicycle access and minimize conflicts. Impacts would be less than significant.

Loading

Implementation of the two parking lots would not affect on-site loading operations. However, the Western Pacific site is currently used to stage semi-trailer trucks serving the Moscone Center. With implementation of the parking lot, the staging of trucks would either continue on-site or be relocated to Pier 96. A conceptual facility layout was prepared for the Western Pacific site that confirmed that the maximum truck staging demand (i.e., 100 trailer plus 60 semi-trailer trucks for the Moscone Center operations and 25 project-generated semi-trailer trucks) and the proposed 800 automobile parking spaces could be accommodated within the Western Pacific site.[3] Therefore, the existing uses on the Western Pacific site related to Moscone Center would continue to be accommodated. During overlapping events when the Western Pacific site is proposed to be used for project parking, all the semi-trailer trucks staging at the Western Pacific site would be parked and not circulating, and therefore conflicts between pedestrians, vehicles, and the staging trucks would not occur. Impacts would be less than significant.

Emergency Vehicle Access

With implementation of the off-site parking lots on Port of San Francisco properties, the project-generated vehicles would be dispersed over a broader area south of the project site, reducing the effect of increased vehicle traffic on the roadway network closer to the project site. The operation

3 Western Pacific Site Conceptual Lot Study, Walter P. Moore and Associates, Inc., October 8, 2015.

of the two facilities would not block access to 20th, Illinois, or Cesar Chavez Streets. Impacts would be less than significant.

Construction-related Transportation Impacts

Construction activities associated with the Western Pacific lot would include minimal construction activities, and would primarily include application of organic surfactant to reduce dust, installation of temporary night-lighting stands, and signage. The improvements would occur over a six months to a year. As noted above, the 19th Street parking lot would be constructed by the Port as a separate proposed project currently undergoing environmental review. Impacts would be less than significant.

Air Quality Impacts

The off-site parking lot refinement does not affect the operational traffic health risk assessment (HRA) as presented in the DSEIR. As shown in the Air Quality Appendix Tables 6.1-3 and 6.1-4, a screening level HRA was conservatively performed assuming that each of the trip generated circled a city block, and the highest possible resulting risk from the four roadways was presented. Since the total number of trips generated does not change, this screening level analysis still represents a hypothetical maximum impact.

Noise Impacts

The additional availability of parking at these locations would result in a subtle redistribution of vehicle traffic on the local roadways which could affect the predicted roadway noise impacts. Consequently roadway noise modeling was conducted to evaluate increases in roadside noise levels along local roadways where sensitive receptors exist. **Table 11** below presents the results of this noise modeling considering only operation of the 19th Street parking lot. In addition to the six roadway segments that were analyzed for the proposed project, two new roadway segments were analyzed to assess potential impacts to Third Street between 20th Street and 23rd Street and to 20th Street between Illinois Street and 3rd Street, both of which have residential uses adjacent to roadways. Roadside noise level increases at these two roadway segments would be less than 5 dBA and less than significant. The severity of the significant and unavoidable noise impact along Illinois Street between Mariposa Street and 20th Street would be marginally decreased with this mitigation measure, but the overall impact would remain significant and unavoidable.

In addition modeling was conducted in the cumulative (Year 2040) scenario assuming a basketball game event and a simultaneous Giants Game event at AT&T Park and operation of both the 19th Street lot and the Western Pacific lot, the results of which are presented in **Table 12**. There would still be significant and unavoidable noise impacts along Illinois Street and Mariposa Street as was identified in the SEIR even with the parking lot mitigation.

TABLE 11
MODELED TRAFFIC NOISE LEVELS,
PROPOSED PROJECT WITH GLEN COVE OFF-SITE PARKING MITIGATION[a]

Roadway Segment	Existing (2015)	Existing plus Basketball Game and 19th St. Lot	dBA Difference	Significant Increase?
Weekday Peak Hour Noise Levels (4 PM – 6 PM)				
Third Street between South Street and China Basin Street	69.1	69.5	0.4	No
Third Street between 16th Street and Mariposa Street[b]	69.9	70.0	0.1	No
Illinois Street between Mariposa Street and 20th Street	60.3	62.9	2.6	No
Terry Francois Boulevard between South Street and China Basin Street	59.8	60.0	0.2	No
16th Street between Third Street and I-280	66.4	67.2	0.8	No
Mariposa Street between Third Street and I-280	65.5	66.4	0.9	No
Third Street between 20th Street and 23rd Street	68.7	69.0	0.3	No
20th Street between Illinois Street and 3rd Street	56.7	57.2	0.5	No
Weekday Evening Noise Levels (6 PM – 8 PM)				
Third Street between South Street and China Basin Street	68.5	69.7	1.2	No
Third Street between 16th Street and Mariposa Street[b]	69.1	69.2	0.1	No
Illinois Street between Mariposa Street and 20th Street	58.2	62.9	4.7	No
Terry Francois Boulevard between South Street and China Basin Street	57.5	57.9	0.4	No
16th Street between Third Street and I-280	65.6	67.0	1.4	No
Mariposa Street between Third Street and I-280	65.4	67.6	2.2	No
Third Street between 20th Street and 23rd Street	66.9	67.5	0.6	No
20th Street between Illinois Street and 3rd Street	55.8	57.7	1.9	No
Weekday Late Noise Levels (9 PM – 11 PM)				
Third Street between South Street and China Basin Street	63.4	62.5	-0.9[c]	No
Third Street between 16th Street and Mariposa Street[b]	63.7	63.8	0.1	No
Illinois Street between Mariposa Street and 20th Street	52.1	62.2	**10.1**	**Yes**
Terry Francois Boulevard between South Street and China Basin Street	53.4	60.3	**6.9**	**Yes**
16th Street between Third Street and I-280	60.2	63.4	3.2	No
Mariposa Street between Third Street and I-280	59.7	64.4	4.7	No
Third Street between 20th Street and 23rd Street	63.0	63.8	0.8	No
20th Street between Illinois Street and 3rd Street	52.5	54.5	2.0	No
Saturday Evening Noise Levels (6 PM – 8 PM)				
Third Street between South Street and China Basin Street	64.7	67.1	2.4	No
Third Street between 16th Street and Mariposa Street[b]	65.1	65.4	0.3	No
Illinois Street between Mariposa Street and 20th Street	54.7	61.7	**7.0dec**	**Yes**
Terry Francois Boulevard between South Street and China Basin Street	54.0	54.9	0.9	No
16th Street between Third Street and I-280	61.4	64.0	2.6	No
Mariposa Street between Third Street and I-280	60.4	64.9	4.5	No
Third Street between 20th Street and 23rd Street	64.7	65.6	0.9	No
20th Street between Illinois Street and 3rd Street	55.5	57.3	1.8	No

NOTES:

[a] Road center to receptor distance is assumed to be 50 feet for values shown in this table. Noise levels were determined using the Federal Highway Administration (FHWA) traffic noise model. The average speed on these segments is assumed to be 25, 30 or 35 miles per hour, depending on the roadway. For all other assumptions, refer to Appendix NO. In an existing ambient noise environment of 65 dBA or greater, an incremental increase is considered significant if the noise increase is equal to or greater than 3.0 dBA. In an existing ambient noise environment below 65 dBA, an incremental increase is considered significant if the noise increase is equal to or greater than 5.0 dBA.

[b] This portion of Third Street would not see meaningful increases in traffic volumes during events due to project access limitations and egress routing during events.

[c] Traffic routing during event egress would be conducted such that volumes on Third Street would be reduced compared to a non-event scenario.

SOURCE: ESA 2015

TABLE 12
MODELED CUMULATIVE (20040) TRAFFIC NOISE LEVELS WITH BOTH OFF-SITE PARKING LOTS IN OPERATION AND A BASEBALL GAME AT AT&T PARK

Roadway Segment	Existing	Cumulative + Baseball without Project	Cumulative plus Basketball Event	Project Contribution	dBA Difference Over Existing	Significant Increase?
Weekday Peak Hour Noise Levels (4 PM – 6 PM)						
Third Street between South Street and China Basin Street	69.1	69.1	69.5	0.4	3.1	No[a]
Third Street between 16th Street and Mariposa Street	69.9	69.9	70.0	0.1	1.9	No
Illinois Street between Mariposa Street and 20th Street	60.3	61.9	63.9	3.0	4.3	No
Terry Francois Boulevard between South Street and China Basin Street	59.8	60.5	60.5	<0.1	2.1	No
16th Street between Third Street and I-280	66.4	67.2	67.9	0.7	1.8	No
Mariposa Street between Third Street and I-280	65.5	67.0	67.7	0.7	2.5	No
Third Street between 20th Street and 23rd Street	68.7	68.1	68.5	0.4	-0.2	No
20th Street between Illinois Street and 3rd Street	56.7	58.1	58.5	0.4	1.8	No
Roadway Segment	**Existing**	**Cumulative + Baseball without Project**	**Cumulative plus Basketball Event**	**Project Contribution**	**dBA Difference Over Existing**	**Significant Increase?**
Weekday Evening Hour Noise Levels (6 PM –8 PM)						
Third Street between South Street and China Basin Street	68.5	68.5	69.6	1.1	1.1	No
Third Street between 16th Street and Mariposa Street	69.1	69.1	69.3	0.2	0.2	No
Illinois Street between Mariposa Street and 20th Street	58.2	59.3	63.5	4.2	5.3	**Yes (new)**
Terry Francois Boulevard between South Street and China Basin Street	57.5	60.2	60.2	<0.1	2.7	No
16th Street between Third Street and I-280	65.6	66.0	67.0	1.0	1.5	No
Mariposa Street between Third Street and I-280	65.4	66.4	68.2	1.8	2.8	No
Third Street between 20th Street and 23rd Street	66.9	67.5	68.1	0.6	1.2	No
20th Street between Illinois Street and 3rd Street	55.8	56.7	58.3	1.6	2.5	No
Roadway Segment	**Existing**	**Cumulative + Baseball without Project**	**Cumulative plus Basketball Event**	**Project Contribution**	**dBA Difference Over Existing**	**Significant Increase?**
Weekday Late Hour Noise Levels (9 PM –11 PM)						
Third Street between South Street and China Basin Street	63.4	65.5	63.4	-2.1	0	No
Third Street between 16th Street and Mariposa Street	63.7	65.5	64.9	-0.6	1.2	No
Illinois Street between Mariposa Street and 20th Street	52.1	53.2	62.6	**9.4**	**10.5**	**Yes**

TABLE 12 (Continued)
MODELED CUMULATIVE (20040) TRAFFIC NOISE LEVELS WITH
BOTH OFF-SITE PARKING LOTS IN OPERATION AND A BASEBALL GAME AT AT&T PARK

Roadway Segment	Existing	Cumulative + Baseball without Project	Cumulative plus Basketball Event	Project Contribution	dBA Difference Over Existing	Significant Increase?
Weekday Late Hour Noise Levels (9 PM –11 PM) (cont.)						
Terry Francois Boulevard between South Street and China Basin Street	53.4	60.0	62.5	2.5	**9.1**	**Yes**
16th Street between Third Street and I-280	60.2	61.9	63.9	2.0	3.7	No
Mariposa Street between Third Street and I-280	59.7	63.0	65.6	2.6	**5.9**	**Yes**
Third Street between 20th Street and 23rd Street	63.0	65.0	65.7	0.7	2.7	No
20th Street between Illinois Street and 3rd Street	52.5	57.3	58.2	0.9	5.7	No[a]
Roadway Segment	**Existing**	**Cumulative + Baseball without Project**	**Cumulative plus Basketball Event**	**Project Contribution**	**dBA Difference Over Existing**	**Significant Increase?**
Saturday Evening Noise Levels (6 PM – 8 PM)						
Third Street between South Street and China Basin Street	64.7	65.7	67.4	1.7	2.7	No
Third Street between 16th Street and Mariposa Street	65.1	66.1	66.5	0.4	1.4	No
Illinois Street between Mariposa Street and 20th Street	54.7	56.7	62.4	5.7	**7.7**	**Yes**
Terry Francois Boulevard between South Street and China Basin Street	54.0	55.8	55.8	<0.1	1.8	No
16th Street between Third Street and I-280	61.4	62.8	64.6	1.8	3.2	No
Mariposa Street between Third Street and I-280	60.4	62.6	66.0	3.4	**5.6**	**Yes**
Third Street between 20th Street and 23rd Street	64.7	65.4	66.3	0.9	1.6	No
20th Street between Illinois Street and 3rd Street	55.5	55.4	57.3	1.9	1.8	No

NOTES: Road center to receptor distance is assumed to be 50 feet for values shown in this table. Noise levels were determined using the Federal Highway Administration (FHWA) traffic noise model. The average speed on these segments is assumed to be 25, 30 or 35 miles per hour, depending on the roadway. For all other assumptions, refer to Appendix NO. The incremental increase is considered significant if the noise increase is equal to or greater than 3 dBA with an ambient noise environment greater than 65 dBA.

[a] Although cumulative noise impacts would occur along 20th Street and Third Street, because the projects would contribute less than 1.5 dBA to this increase, the projects contribution is not considered cumulatively considerable.

SOURCE: ESA 2015

Cultural Resources Impacts

The 19th Street site is located within the Union Iron Works Historic District, a maritime industrial district listed on the National Register of Historic Places. The approximately 8,300-square foot Building 40 (former Employment Office Annex) located in the southwest corner of the 19th Street site was determined to be a contributing resource to this Historic District; however it was not hierarchically rates as significant or significant among the 41 buildings in the Historic District. The Port plans to remove Building 40 as a part of the construction phase of the rehabilitation of the 20th Street Historic Buildings in order to permit the future development of a continuous sidewalk on the east side of the Illinois Street frontage. The Port determined, and the Planning Department concurred, that its removal would not affect the historic significance of the Historic District.[4,5] The project's use of the 19th Street site would result in no impacts on historic resources because demolition would be conducted before the project is implemented and is not part of the 19th Street Parking Lot project. At the Western Pacific site, there would be no impacts on historic resources because there would be no demolition or excavation required for construction of the parking lot. While construction of either parking lot would only involve minor grading, there would be the potential to encounter archaeological resources in the shallow soils; but this potentially significant impact would be subject to and reduced to less than significant with implementation of the same mitigation measure as the proposed project.

Biological Resources Impacts

The 19th Street site is partially paved, and unpaved areas are sparsely vegetated. The Western Pacific site is currently unpaved, and sparsely vegetated along the site perimeter. Given the sparse, ruderal, and weedy nature of the vegetation currently present at these sites, impacts on biological resources would be less than significant, and no mitigation would be required.

Hydrology and Water Quality Impacts

Water Quality

The 19th Street site is located within drainage area of the City's combined sewer system. Because the project would disturb an area of more than 5,000 square feet and the site is primarily paved, construction of the parking lot would need to comply with San Francisco's Stormwater Guidelines, including the installation of stormwater controls to reduce the volume and rate of stormwater runoff from the site by 25 percent. Thus, impacts related to constructing new stormwater infrastructure, exceeding the capacity of a stormwater system or providing and additional source of polluted runoff would be less than significant. The project would not contribute to an increase in combined sewer discharges during wet weather because it would result in reduction of stormwater flows to the combined sewer system relative to existing conditions. For this site, the project sponsor would be required to obtain a Construction Site Runoff Control Permit and implement an Erosion and

4 Carey and Company, Analysis of Proposed Demolition within the Union Iron Works Historic District at Pier 70, February 20, 2015.

5 Richard Sucre, Preservation Planner, San Francisco Planning Department, *Historic Resource Evaluation Response Pier 70 BAE Ship Repair*, February 20, 2015.

Sediment Control Plan for construction activities, in accordance with the Construction Site Runoff requirements of Article 4.2 of the *San Francisco Public Works Code*, Section 146.

The Western Pacific site is located within an area served by a separate storm sewer system. There would be no changes to the surface conditions that would result in a change in stormwater runoff from the site. Construction activities at the Western Pacific site would be required to comply with the State Water Resources Control Board General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, so construction impacts would also be less than significant.

Flooding and Tsunami Impacts

The 19th Street site is not located within a 100-year flood zone,[6] therefore there would be no impact related to flooding. The Western Pacific site is partially located within a 100-year flood zone,[7] but, the parking lot project does not include construction of any structures that could be damaged by flood flows or impede flood flows. Both sites are located within a tsunami inundation zone,[8] but the parking lots would not include the construction of any structures in this zone that could be damaged. As for the proposed project, activation of the National Warning System and San Francisco outdoor warning system would allow for evacuation of people prior to a seiche or tsunami and would provide a high level of protection to public safety. Therefore, impacts related to tsunami inundation would be less than significant.

Neither site would be permanently inundated with 11-inches of sea level rise by 2050 or with 36-inches of sea level rise by 2100.[9] Even if flooding were to occur in the future, the project does not include the construction of structures that could be damaged. Further, no people would be put at risk because of the intermittent use of the site. Therefore, impacts related to flooding as a result of sea level rise would be less than significant.

Hazardous Materials Impacts

The 19th Street site is also located within the Pier 70 Master Plan Area and soil may have been contaminated as a result of historic land uses. However, similar to the proposed project, impacts related to exposure to hazardous materials in the soil would be less than significant with implementation of the requirements of the Pier 70 Risk Management Plan.[10] The 19th Street site is underlain by fill that was likely obtained from the nearby Irish Hill which was comprised of serpentinite bedrock. While workers and the public could be exposed to naturally occurring asbestos during construction, impacts related to the potential to encounter naturally-occurring asbestos would be substantially the same or less than that of the proposed project, and the same mitigation measure would apply.

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6 City and County of San Francisco, San Francisco Interim Floodplain Map, East, Final Draft. July, 2008.
7 City and County of San Francisco, San Francisco Interim Floodplain Map, East, Final Draft. July, 2008.
8 California Emergency Management Agency, California Geological Survey, University of Southern California. Tsunami Inundation Map for Emergency Planning, San Francisco North Quadrangle/San Francisco South Quadrangle (SF Bay). June 15, 2009.
9 San Francisco Water, Power, Sewer. Climate Stressors and Impact: Bayside Sea Level Rise Mapping, Final Technical Memorandum. June 2014.
10 Treadwell & Rollo. Pier 70 Risk Management Plan, Pier 70 Master Plan Area, San Francisco, California. July 25, 2013.

The Western Pacific site was a former switchyard for Western Pacific, and the soil and groundwater are contaminated with inorganic and organic chemicals as a result of past activities. The City and County of San Francisco recorded a deed restriction[11] on the property in 2002, which reports that a 2000 Human Health and Ecological Risk Assessment (approved by the RWQCB) determined that the chemicals in the soil would not pose a human health risk under most land uses. In addition, construction of the parking lot at this site would not involve any excavation so workers and the public would not be exposed to hazardous materials or naturally occurring asbestos in the soil (if present).

Other Impacts

Implementation of these two surface parking lots would result in no impacts on land use, wind/shadow, recreation, utilities, public services, and geology, because none of these resources would be affected. Parking uses at these sites would be compatible with the existing uses at the site, no structures would be developed, and the parking use associated with the proposed project would be transient. Impacts associated with population/ housing, GHG emissions, and energy resources would be substantially the same or less than those disclosed for the proposed project and the same mitigation measures would apply.

Conclusions

Overall, as described above, the use of the parking facilities at the 19th Street site (proposed by the Port of San Francisco) and Western Pacific site (implemented as part of this mitigation measure) during evening events at the project site would not result in any new or substantially more severe transportation impacts associated with the proposed project related to vehicular traffic, transit, pedestrians, bicycles, emergency vehicle access, or construction-related transportation impacts. Potential impacts on other resources would be less than significant, assuming implementation of the same mitigation measures as those identified for the proposed project. However, as discussed above, even with implementation of the off-site parking facilities included in Mitigation Measure M-TR-11c, the identified traffic impacts in Impact TR-11 would remain *significant and unavoidable with mitigation.*

As with the Impact TR-11, without or with implementation of the off-site parking facilities included in Mitigation Measure M-TR-11c, under 2040 cumulative conditions described in Impact C-TR-2, the proposed project in combination with other past, present, and reasonably foreseeable future projects would result in significant cumulative traffic impacts at 16 intersections in the project vicinity. Under 2040 cumulative conditions, implementation of Mitigation Measure M-TR-11c would not result in a substantial increase in the severity of traffic impacts identified for conditions without this measure. To further address traffic impacts of the proposed project after implementation of the parking facilities at the 19th Street site and Western Pacific site, Mitigation Measure M-TR-11c is augmented as described above. With implementation of Mitigation Measure M-TR-11c, cumulative Impact C-TR-2 would remain *significant and unavoidable*.

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11 San Francisco Assessor-Recorder. Covenant and Environmental Restriction on Property (Re: Former Western Pacific Property, City and County of San Francisco. April 30, 2002.

APPENDIX UD

Urban Decay

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September 30, 2015

Mr. Paul Mitchell
ESA | Community Development
550 Kearny Street, Suite 800
San Francisco, CA 94108

Re: Response to Philip King, Ph.D. Memo Regarding Proposed Relocation of Golden State Golden State Warriors from Oakland to San Francisco

Dear Mr. Mitchell:

ALH Urban & Regional Economics (ALH Economics) has reviewed the July 13, 2015 memo from Philip King, Ph.D. to Patrick Soluri, Attorney at Law, regarding Dr. King's comments on the EIR for the proposed relocation of the NBA franchise Golden State Golden State Warriors from Oracle Arena in Oakland to San Francisco. Dr. King's opinion is that the EIR did not analyze the potential for urban decay resulting from event reductions at the Oracle Arena, which were referenced in the project's AB900 Application. Further, Dr. King believes that the issue of "urban decay should have been identified in any environmental analysis and mitigated where possible."[1] ALH Economics has prepared the following response to address Dr. King's comments, paralleling the headings in Dr. King's memo where relevant.

SUMMARY OF FINDINGS

The Golden State Warriors EIR did not include analysis of urban decay. In the context of CEQA, economic impacts are not an impact on the physical environment and need not be considered unless as a result of economic impacts, a physical change to the environment results. The probability of a project causing urban decay that requires analysis under CEQA has thus far been largely focused on large-scale retail development, mostly of a big box orientation. These analyses probe whether or not a significant indirect environmental impact of urban decay or deterioration is anticipated to occur in an identified market region due to the large-scale retail development so substantially drawing business away from local retailers that urban decay results. The San Francisco successor agency to the Redevelopment Agency (Office of Community Investment and Infrastructure) has no reason to

[1] Memo to Patrick Soluri, Attorney at Law, from Philip King, Ph.D., regarding Urban Decay Analysis of Proposed Relocation of Golden State Warriors from Oakland to San Francisco, page 9.

anticipate that urban decay would result from the relocation of the Golden State Warriors from Oakland to San Francisco and the development of the proposed Golden State Warriors Event Center.

In Dr. King's summary of his findings, he indicated that there would be a direct loss of $44.9 million in economic activity and 494 jobs in Alameda County when the Warriors move to San Francisco, with even greater indirect and induced economic impacts. Dr. King claims that removing these jobs and economic activity from the East Bay will exacerbate existing conditions of urban decay, and impact the City of Oakland's ability to respond to this decay.

Dr. King does not define urban decay and further does not indicate the extent to which his estimated job losses and economic activity will be localized, and thus associated with localized urban decay. Urban decay may be defined as multiple visible symptoms of physical deterioration that invite such things as vandalism, loitering, and graffiti in a particular location that is caused by a downward spiral of business closures and long-term vacancies. The physical deterioration to properties or structures is so prevalent, substantial, and lasting for a significant period of time that it impairs the proper utilization of the properties and structures and the health, safety, and welfare of the surrounding community.

The ALH Economics analysis conducted in response to Dr. King's memo found that Dr. King greatly overstated the potential jobs and economic impacts that could leave Alameda County with the Golden State Warrior's relocation. Dr. King's analysis is based on the assumption that all Warrior's revenues derive from ticket sales to patrons living in the East Bay, San Francisco, and the Peninsula. However, there are numerous other revenue sources, such as merchandise sales and media revenues, and ALH Economics found that only 76% of ticket sales originate from the areas identified by Dr. King. Further, Dr. King's analysis of a generalized economic impact on Alameda County does not lead to the conclusion that urban decay will result in a specific location.

Other weaknesses in Dr. King's analysis include his assumption that only 21 events will be held annually at the Oracle Arena after the departure of the Warriors. Dr. King based this analysis on the AB900 application, prepared in accordance with the Governor's Office's procedures for the purpose of demonstrating the net change in greenhouse gas emissions that would result from the current operation compared to the proposed development. The EIR contains no such statement. Dr. King also states that there is a strong argument that the Oracle Arena, or any similar venue in a similar situation, will not be viable without a home sports team, citing an example of one facility that closed five years after its last team left the arena. In direct contradiction to Dr. King's statement that it was questionable if similar venues could continue operations, ALH Economics presents case study findings of many indoor arenas in the United States that have continued to operate over an extended period of time. The continued success of these arenas does not necessarily mean that the Oracle Arena will be equally successful, but it demonstrates success when Dr. King said there would be none, refuting Dr. King's position.

Finally, Dr. King mentions that the Oracle Arena is located in a former Redevelopment Project Area, characterized by blight. ALH Economics found that the immediate environs around the Oracle Arena were not characterized by urban decay, whose conditions comprise a subset of blight. While some signs of trash and graffiti on a nearby major road were observed, the presence of existing conditions such as these does not mean that urban decay will prevail at the Oracle Arena or its environs as a result of the relocation of the Golden State Warriors to San Francisco. The Arena has strong locational assets, including highway visibility, highway accessibility, and BART access, which will bode well for future use of the Arena or future use of the Arena site if the Arena is closed.

The City of Oakland adopted the Oakland Coliseum Specific Plan in April 2015, which provides a guiding framework for reinventing the City of Oakland's Coliseum area as a major center for sports, entertainment, residential mixed use, and economic growth. The plan includes provisions for both the retention and demolition of the existing Oracle Arena. Moreover, if one or more of the new sports venues included in the Specific Plan is not constructed, the Specific Plan's allowable development program could provide for non-sports uses, such as science and technology housed within buildings lower in height than the sports venues. Dr. King fails to mention anything about Oakland's proposals for new development in the area of the Arena.

RESPONSE TO DR. KING'S MEMO

Dr. King's memo included analysis on several topics regarding the proposed relocation of the Golden State Golden State Warriors from Oracle Arena in Oakland to San Francisco, including information about the economics of moving a basketball team, implications about reversing directions across the Bay Bridge by fans, economic leakage of Golden State Warriors spending, economic impact of the relocation, and urban decay implications. Each topic starts with a synopsis of Dr. King's analysis, presented in lightly bolded italics, followed by an ALH Economics response. The topics are presented in the same order as in Dr. King's memo.

Dr. King's memo does not include a definition of urban decay. Generally speaking, urban decay is characterized by physical deterioration to properties or structures that is so prevalent, substantial, and lasting a significant period of time that it impairs the proper utilization of the properties and structures, and the health, safety, and welfare of the surrounding community. The focus of CEQA review is on whether a project will result in impacts on the physical environment. CEQA directs the lead agency to consider economic effects, to the extent those effects have the potential to culminate in physical environmental effects (CEQA Guidelines, § 15131). Characteristics of physical deterioration contributing to urban decay include abandoned buildings, boarded doors and windows, parked trucks and long-term unauthorized use of the properties and parking lots, extensive or offensive graffiti painted on buildings, dumping of refuse or overturned dumpsters on properties, dead trees and shrubbery, and uncontrolled weed growth. This is the context of urban decay that ALH Economics deems relevant to the response herein.

Most urban decay analyses prepared for CEQA purposes focus on large-scale retail development projects, and the potential for such projects to cause competitors to go out of business, resulting in vacancies and physical deterioration of buildings. Such analyses include information on the commercial real estate market and other germane real estate conditions. Such analyses rarely if ever focus on sports venues or similar uses.

In his memo, Dr. King makes reference in his response to the West Bay as a geographic area. This is not a standard, recognized geographical reference in the San Francisco Bay Area. Therefore, ALH Economics does not repeat this misnomer in the response to Dr. King. Instead, by context, it appears Dr. King is collectively referring to San Francisco and the Peninsula. ALH Economics makes this reference more explicit in the following response.

Economics of Moving a Basketball Team

Dr. King provides a synopsis of a portion of sports economics literature that addresses the economics of sports teams with the position that sports teams do not have a significant economic impact. The overall position of this literature is that when sports teams relocate, the people who attend games do not increase their leisure time spending, but rather transfer their spending from other leisure time activities. This is the substitution effect. In addition, Dr. King summarizes the literature's view on leakage, which distills down to the expectation that many of the dollars spent by patrons on tickets leak out of the community in the form of payment to players, most of whom do not live in the same areas as their team location, and to investors. Thus funds are transferred out of the metropolitan area where the team is located. Dr. King uses this literature distillation to support statements suggesting that negligible economic impacts result from the relocation of a professional team from one metropolitan area to another. However, Dr. King indicates this is not the case when the relocation occurs within the same metropolitan area, such as the relocation of the Golden State Warriors from Oakland to San Francisco. In this case Dr. King states a belief that economic substitution and leakage will remain the same before and after the relocation, but that the City of San Francisco will take economic activity from the City of Oakland since the same fans will continue to attend Golden State Warriors games.

ALH Economics believes the purpose of Dr. King's summary of the literature is to set the stage for his position that the City of Oakland will incur economic impacts associated with the relocation of the Golden State Warriors to San Francisco. As a general opinion, with no direct bearing on Dr. King's position on urban decay, this section does not warrant any response. Instead, responses are provided to other sections of Dr. King's memo where he further develops this position.

Reversing Directions Across the Bay Bridge

In this section of his memo, Dr. King discusses the substitution effect of leisure spending and the degree to which he anticipates it occurring in association with relocation of the Golden State Warriors from Oakland to San Francisco. He concludes that most fans will continue attending games after the relocation, thus fans will not seek local substitutions for their Golden State Warrior game-related spending, and associated economic activity will therefore be redistributed. Dr. King additionally presents an analysis of the amount of leisure spending he estimates will be redistributed based upon assumptions regarding Golden State Warriors revenues, the distribution of fans, and the associated distribution of revenue originating from the East Bay as one geographic area and San Francisco and the Peninsula as a second geographic area. Dr. King's estimate of Golden State Warriors revenues of $168 million in revenue was obtained from a Forbes.com website. His analysis is then predicated upon the assumption that the revenue is generated by spectators, and that it is sourced proportionate with the distribution of the Bay Area's population in the East Bay, San Francisco, and the Peninsula. Pursuant to his analysis, Dr. King concludes that $99.4 million in Golden State Warriors revenue (59%) is generated by spectators living in the East Bay and $68.6 million (41%) is generated by spectators living in San Francisco and the Peninsula.

ALH Economics believes there are significant fallacies in Dr. King's analysis, which substantially inflate the extent to which he estimates revenues will relocate across the Bay. He is incorrect in assuming all revenues are derived from spectators, and the proportion of spectators from the East Bay. As a result, he errs in assuming the degree to which the relocation affects the location of origin of revenue. More importantly, he fails to demonstrate what any of his calculations have to do with urban decay, as his point seems to be that the East Bay generally will lose jobs and revenue, and not that a particular localized current use, such as existing small retail establishments, will go out of business as a result of his estimated relocation of revenues.

Specifically, Dr. King implicitly assumes that 100% of the Golden State Warriors revenues are derived from spectators, or essentially ticket sales. This is clear from his assumption of $168 million in revenue; with 59% of revenue generated by East Bay residents and 41% generated by San Francisco and Peninsula residents. While Dr. King does not define what he means by the East Bay in his analysis, the typical understanding in the Bay Area is that the East Bay comprises Alameda and Contra Costa counties.[2] Thus, in his discussion of the East Bay, ALH Economics assumes Dr. King is referencing these two counties. Further, the definition for the Peninsula typically includes San Mateo County and the northwestern part of Santa Clara County, including the cities of Cupertino, Los Altos, Mountain View, and Palo Alto.

Ticket sales are only one revenue source for an NBA franchise such as the Golden State Warriors, with many others contributing various levels of revenues. As noted in the Public Offering for the Brooklyn Arena Local Development Corporation PILOT Revenue Bonds, series 2009, home to New Jersey Basketball, other revenue categories in addition to ticket sales include merchandise bearing the team name or logos, media revenues, game day temporary signage and advertising revenues, and other team revenues.[3] In the case of the Golden State Warriors, these other revenues include a share of game day food and drink sales, a share of parking revenues, among others.

There are no public revenue reporting requirements for NBA teams. Information presented by sources such as Forbes therefore cannot be validated by publically available information. Thus, there is no way to validate the Forbes revenue estimate of $168 million on which Dr. King bases his analysis. In like manner, there is no way to validate NBA team net operating income estimates presented in "The Wages of Wins Journal," which in 2011 presented estimated net operating income and franchise value for NBA teams in 2010-2011.[4] For all NBA teams in 2010-2011, this source estimated the following components of net operating income: estimated gate; share of national TV contracts, money going to Spirits of St. Louis, and other revenues. Based upon the estimates presented in this article for all teams, on an average basis these revenues sources are distributed as follows:

- 41.0% Estimated Gate (i.e., ticket sales);
- 25.8% Share of National TV Contracts;
- -0.5% Money going to Spirits of St. Louis; and
- 34.8% Other Revenues.

[2] https://en.wikipedia.org/wiki/San_Francisco_Bay_Area. In addition to the East Bay comprising Alameda and Contra Costa counties, the definition for the Peninsula typically includes San Mateo County and the northwestern part of Santa Clara County, including the cities of Cupertino, Los Altos, Mountain View, and Palo Alto.

[3] "Brooklyn Arena Local Development Corporation, PILOT Revenue Bonds, Series 2009 (Barclays Center Project), page 69.

[4] See "The Wages of Wins Journal," "The Bottom Line on the NBA Finances," November 8, 2011, http://wagesofwins.com/2011/11/08/the-bottom-line-on-the-nba-finances/

While the validity of these figures is indeterminate, they clearly indicate that there are many other sources of revenue beyond ticket sales. And if the figures derived from The Wages of Wins Journal 2011 article are a reasonable indication, ticket sales comprise less than 50% of NBA team revenues. Hence Dr. King's estimation of the magnitude of revenues originating from the East Bay and San Francisco/Peninsula areas from ticket sales appears to be grossly overstated, regardless of the actual volume of team revenues.

Moreover, with a minor locational shift of the Golden State Warriors from Oakland to San Francisco, ALH Economics does not believe there will be a significant shift in the location of origin for other major revenue sources. A media market is a region where the population receives the same or similar television and radio station offerings, and may include other types of media including newspapers. The Bay Area, including the cities of San Francisco, Oakland, and San Jose, comprises a single media market.[5] The geographic source of radio broadcast rights and advertising payments are not likely to change based on the relocation of the Golden State Warriors within the San Francisco Bay Area. Media outlet locations and hence the geographic origin of media revenues are not going to change because the Golden State Warriors move from Oakland to San Francisco. In addition, the Golden State Warriors are already a regional asset, thus corporations that choose to engage in game day and other associated advertising are also not likely to change significantly. In sum, Dr. King's assumptions that all sources of revenue were from ticket sales is unsupported.

Regarding Dr. King's assumption as to the place of residence of Warrior's patrons, ALH Economics obtained information from the Golden State Warriors that shows that his assumption split of 59% patrons from the East Bay and 41% from San Francisco and the Peninsula is overstating patronage for both areas. The information from the Golden State Warriors indicates the following place of residence for patrons:[6]

- Alameda County, 30%
- Contra Costa County, 17%
- San Francisco County, 15%
- Santa Clara County, 12%
- San Mateo County, 10%
- Marin County, 4%
- Solano County, 3%
- Sonoma County, 2%
- Santa Cruz County, 1%
- San Joaquin County, 1%
- Napa County, 1%
- Other, 4%

Thus, based upon this information, the share of patrons from the East Bay, comprising Alameda and Contra Costa counties is 47%. This is lower than Dr. King's 59% assumption. The share of patrons from San Francisco and the Peninsula, assuming this area includes 1/3 of the patronage from Santa Clara County since the Peninsula includes only the northernmost cities in Santa Clara County, totals

[5] https://en.wikipedia.org/wiki/Media_market#United_States
[6] E-mail communication from Clarke Miller of the Golden State Warriors to Paul Mitchell, ESA, August 27, 2015.

29%, compared to Dr. King's 41% assumption. This leaves a balance of 24% of patrons from areas other than the ones referenced by Dr. King and reflected in his analysis. This information indicates that Dr. King is overstating Golden State Warriors patronage from the East Bay, San Francisco, and the Peninsula by a significant factor. Neither of Dr. King's assumptions that all revenues are from ticket sales and that 59% of patrons are from the East Bay is a correct assumption.

ALH Economics believes Dr. King is significantly overestimating the degree to which Golden State Warriors revenues will "reverse directions across the Bay Bridge," as worded by Dr. King. And even if the analysis were done correctly, the fact that some portion of revenues and employment now found in East Bay counties will relocate to San Francisco fails to provide any useful information that urban decay will result in the area of the existing Oracle Arena.

Leakage

In this memo section Dr. King takes the estimated level of Golden State Warriors revenues, estimates how these revenues are expended, and estimates the resulting level of expenditures that are historically spent in the East Bay (versus the dollars that leak out of the region). He then concludes that this level of expenditures will be redistributed from the East Bay to the San Francisco/Peninsula area. In conducting this analysis, while not attributed as such, Dr. King assumes expenditures are distributed pursuant to information included in the aforementioned Forbes.com article. The categories he uses include operating income, player's salaries, and other expenses. Dr. King then assumes that none of the operating income expenditures, comprising funds that go to the owners and investors of the Golden State Warriors, are spent within the region, and thus none will shift geographically following the team's relocation. He similarly assumes that very little of the player's salaries accrue to player's living in the region, as he cites a source indicating that few NBA players live within the same larger metropolitan area as the team they play for, and thus he assumes only 10% will shift geographically. However, Dr. King implicitly assumes that 80% of all other expenditures (e.g., wages, inventory, etc.) accrue to the benefit of people and businesses located in the East Bay, and that all of these expenditures will shift from the East Bay to the San Francisco/Peninsula area with the team's relocation. Based on these assumptions, Dr. King concludes that $7.8 million in player's salaries and $36.1 million in other expenses (wages, inventory, etc.) will shift from the East Bay to the San Francisco/Peninsula area, totaling $43.9 million.

In this section, Dr. King further refines the degree to which employment and revenues of the Warriors will relocate from the East Bay to San Francisco. ALH Economics disagrees with Dr. King's approach. First, Dr. King provides no support for his assumption that 80% of existing "Other Expenses" are spent within the East Bay. Second, Dr. King's assumption that 100% of these expenditures will shift from the East Bay to the San Francisco/Peninsula area when the team relocates to San Francisco is inappropriate because it implicitly assumes all Golden State Warriors employees living in the East Bay would move to San Francisco or the Peninsula, an illogical assumption. And finally, and most importantly, he again fails to demonstrate how his predicted shift in employment and revenue leads to a localized urban decay condition in the location of the Arena in Oakland.

Dr. King does not comment on the composition of the portion of "Other Expenses" that he estimates is spent locally other than to cite that it includes wages, inventory, etc.[7] Other line items that surely would be included in this category for the Golden State Warriors are other employee-related expenses, such as FICA, retirement, unemployment compensation, worker's compensation, and health insurance. Dr. King may or may not have included these costs in his 20% allocation of "Other Expenses" that is not spent locally, but as his assumption was not articulated there is no knowing if this was or was not the case. Regardless, these are expenditures that will be unlikely to be redirected to the San Francisco/Peninsula area after relocation of the Warriors. The same is the case with team expenses (other than salaries), such as travel-related expenses, which are likely substantial given the number and location of away games for the team. Other types of expenses that might be relevant but also unlikely to change geographically could include promotion and publicity and player development.

ALH Economics recognizes there are some team expenses that are likely to be shifted geographically upon team relocation to the Event Center. These will certainly include office-related expenses, such as rent, janitorial service, and office supplies, and any arena-related costs borne by the team. Based upon Dr. King's analysis, however, it is unlikely these costs will total $43.9 million. Thus, ALH Economics believes that Dr. King is overstating by a significant factor the potential shift in economic activity resulting from the relocation of the Golden State Warriors from Oakland to San Francisco.

Moreover, at the very beginning of the next section of Dr. King's analysis, he references that this $43.9 million will comprise a direct loss to the City of Oakland. This is very inconsistent with Dr. King's earlier statements that these expenditures will be redistributed from the East Bay. By making this statement about a loss to Oakland, Dr. King is implicitly indicating that he believes that 80% of all the Golden State Warrior's "Other Expenses" are made in Oakland, including distribution of employee payroll, governmental benefits, and promotion and publicity. Yet in his memo, Dr. King cites "we assume that 80%, or $36.1 million, was spent within the larger metropolitan area."[8] By context, as well as later reference by Dr. King, his analysis at this point is based upon anticipated redistribution of $43.9 million from the East Bay.[9] These are two inconsistent statements, and thus inconsistent assumptions, since Oakland does not meet the definition of "larger metropolitan area." Thus, this reference to Oakland is an inconsistent shift from Dr. King's earlier analysis predicated upon the East Bay.

Finally, Dr. King's analysis of "Other Expenses" implicitly assumes that 80% of non-player wages will be geographically redistributed when the Golden State Warriors relocates its headquarters from Oakland to San Francisco, a relatively minor geographical shift in an office location of approximately 12 miles. The Bay Area workforce is used to substantial work commutes. As reported by KQED in 2013, in reporting on a U.S. Census Bureau study, the San Francisco-Oakland-Fremont metro area[10] has more workers than anywhere else in the country who travel at least 50 miles **and** 90 minutes (one

[7] King, page 5.
[8] Ibid.
[9] King, page 6.
[10] Until 2013 this MSA definition included 5 Bay Area counties, e.g., Alameda, Contra Costa, Marin, San Francisco, and San Mateo counties (see https://en.wikipedia.org/wiki/San_Francisco%E2%80%93Oakland%E2%80%93Hayward,_CA_Metropolitan_Statistical_Area

way) to work.[11] This suggests that a minor relocation of an office location, entailing a potential increase in commute time for some workers, is not likely to prompt employees to change the location of their residence. Moreover, the relocation may instead reduce commute times for those employees who already reside in San Francisco or the Peninsula.

This minor work location shift is compounded by the cost of residential real estate in the San Francisco Bay Area. Relatively speaking, the cost of homes and apartment rents in the East Bay region of Alameda and Contra Costa counties is lower than costs in San Francisco and the Peninsula. For example, as reported by the San Francisco Chronicle in August 2015, and sourced by the Chronicle to CoreLogic,[12] the average price of homes sold for July 2015 and the percent change from the prior July was as follow:

- $491,000 in Contra Costa County, 2.0% increase;
- 656,000 in Alameda County, 12.1% increase;
- $840,000 in Santa Clara County, 16.3% increase;
- $997,500 in San Mateo County, 17.4% increase; and
- $1,075,000 in San Francisco County, 11.4% increase.

A similar pattern is in place for apartment rents. While dated, the average monthly rents by county in October 2014 and increases over the prior year were reported in the Mercury News, sourced to RealFacts, as follows:[13]

- $1,659 in Contra Costa County, 8.8% increase;
- $1,994 in Alameda County, 11.6% increase;
- $2,369 in Santa Clara County, 10.7% increase;
- $2,580 in San Mateo County, 10.7% increase; and
- $3,400 in San Francisco County, 9.8% increase.

As these housing price data indicate, housing costs are lower in the East Bay than in San Francisco or the Peninsula. Thus, it is unlikely that Golden State Warriors employees would choose to relocate their home from the relatively lower cost East Bay region to San Francisco or the Peninsula, which are significantly more costly, to gain a minor reduction in commute time. Further, as noted in the average home sales price findings, year to year increases tend to be greater overall in the combined San Francisco/Peninsula area than in the East Bay. Thus, the cost differentials are likely to become more extreme over time, making it relatively more affordable for Golden State Warriors employees that live in the East Bay to remain in the East Bay.

In sum, Dr. King's "Leakage" analysis provides no support that the local area of the Arena will experience urban decay from some shift in revenue from the East Bay to San Francisco.

[11] http://ww2.kqed.org/news/2013/03/05/san-francisco-bay-area-nations-capital-for-megacommuting
[12] http://www.sfchronicle.com/business/networth/article/Bay-Area-median-home-price-approaches-record-6454098.php
[13] http://www.mercurynews.com/business/ci_26733312/bay-area-apartment-rents-at-record-high

Economic Impact

Dr. King uses the IMPLAN Input/Output software model to assess the economic impacts of the $43.9 million in Golden State Warriors expenditures that he believes will shift from Alameda County to San Francisco and the Peninsula. By inputting the $43.9 million in expenditures he derives an employment impact in Alameda County from the Golden State Warrior's operations of 805.6 jobs (including 494.3 direct jobs), $45.3 million in labor income (including $28.5 million in direct labor), and $86.6 million in output. He further identifies, through the IMPLAN model, which industries the IMPLAN model indicates comprise the job impacts and their associated labor income and output.

IMPLAN Model Application. ALH Economics has several comments on this analysis conducted by Dr. King. First, ALH Economics replicated the analysis to ensure proper implementation by Dr. King. ALH Economics concludes that Dr. King implemented the IMPLAN model appropriately, relative to applying the model input and reporting the outputs. However, Dr. King did not use the most current model, and thus misrepresented his findings by allusion as current to the time period reflected by his Forbes.com revenue source.

ALH Economics identified a fallacy regarding the $43.9 million estimate used as the primary model input. As stated earlier, the validity of the revenue figure used as a basis for Dr. King's analysis is not known. Further, Dr. King's analysis assumes this expenditure level will be shifted to San Francisco and the Peninsula. It is unclear what jurisdiction Dr. King anticipates these expenditures will be shifted from, as he variously refers to them as expenditures in the East Bay, in Oakland, or in Alameda County.[14] Even if this level of expenditures does occur in one of the geographies assumed by Dr. King, ALH Economics demonstrated that only a portion will shift when the Golden State Warriors relocate.

In like manner, Dr. King also confuses his reference to geography for his IMPLAN findings. The ALH Economics replication determined that Dr. King's analysis was conducted for Alameda County; however, Dr. King variously refers to the IMPLAN study area as the City of Oakland, Alameda County, or the East Bay (i.e., Alameda and Contra Costa counties). Thus his data presentation is confusing.

As is true of all models, the results will only be as good as the data used in the analysis. As already demonstrated, the basic revenues attributable to the East Bay from Warrior's operations by Dr. King are not supportable. Consequently, the results of the modeling exercise performed by Dr. King, although apparently modeled correctly, provide no useful information as to the amount of revenues from Warriors operations that might shift from the East Bay to San Francisco. And, most importantly, provide no support that urban decay in the area of the Arena will occur.

IMPLAN Model Outputs. The way IMPLAN works, the data one uses as inputs to the model comprise the economic stimulus that is the basis for the analysis. In this case, the economic stimulus is the Golden State Warrior's operations. The findings generated by the model labeled "direct" are then the estimated characteristics associated with just the stimulus. Thus, based on the findings reported by Dr. King, the IMPLAN analysis indicates Golden State Warriors employment excluding most of the players (i.e., King only includes 10% of player's salaries in the $43.9 million) totals at least 494.3 people, with $28.5 million in wages. Examination of the EIR for the Golden State Warriors relocation indicates that

[14] See reference to Alameda County in King, page 6.

existing employment is estimated at 150 FTEs, or full-time equivalents. This is less than one-third the level of staff employment estimated by IMPLAN. This indicates that IMPLAN is either not an appropriate medium for analysis of the Golden State Warriors or the inputs were not appropriate for the analysis. Thus, the inappropriateness of this fundamental finding pertaining to the Golden State Warriors suggests there is limited validity to Dr. King's IMPLAN analysis and his corresponding conclusions regarding the Golden State Warriors' economic impact upon relocation to San Francisco.

Finally, as with his earlier "Reversing Directions Across the Bay Bridge Analysis," Dr. King fails to explain how his IMPLAN analysis is related to concerns regarding urban decay, as urban decay is a very site or area specific condition. The findings from IMPLAN are only specific to the geography matching the dataset included in the IMPLAN modeling, which in Dr. King's analysis is all of Alameda County. Dr. King does not refine his findings specific to the Oakland Coliseum Area, thus they have no merit relative to concerns regarding urban decay associated with the Golden State Warriors no longer playing at the Oracle Arena.

Urban Decay

In this section of his memo, Dr. King claims that the AB900 Application conclude that the Oracle Arena will continue to operate with approximately 21 events per year, and that this will result in one of two possible outcomes. One outcome is that the Oracle Arena will continue to operate and the other outcome is that it will close without the Golden State Warriors. Dr. King references speaking with an expert on the subject of the business and financing of sporting arenas, and cites that, based on the information obtained, a strong argument exists that without a sports team the Oracle Arena will not be viable. Dr. King further cited an example of an arena that lost its NBA basketball team in 2010 (IZOD Center) and shut down earlier in 2015 because of a lack of demand by other events. In addition, Dr. King states that the issue of urban decay was not addressed in association with reduced events at Oracle Arena, and that an economic impacts analysis should have been included to assess the impacts to the physical environment. Dr. King states that if the Arena closes he believes it would be difficult to repurpose the Arena and that it would be shuttered and possibly demolished, comprising a magnet for signs of urban decay. Dr. King further cites crime statistics in Oakland, claims that the need to mitigate urban decay would require the City of Oakland to divert funds from the General Fund, especially if the City defaults (jointly with the County) on its portion of the bond funds remaining to be repaid on a Lease Revenue Bond for the Arena. He further claims that the area is blighted by virtue of being a Redevelopment Project Area, and that even with the cessation of Redevelopment the blight issues remain, especially since there are no more tax increment revenues available to fund project area improvements.

Dr. King's memo demonstrates a misinterpretation of the relevancy of the AB 900 application to the EIR. The AB process is a separate process from the preparation of an EIR under CEQA, with separate and distinct review and approval requirements, and the analyses conducted under the AB 900 and EIR satisfy different requirements and consequently use different assumptions. Contrary to Dr. King's statement that "the EIR and AB900 Application conclude that that [*sic*} Oracle Arena will continue to operate with approximately 21 events per year,"[15] the EIR does not conclude that the Arena will continue to operate with only 21 events a year. Rather, the EIR assumes that, while Warriors' games

[15] King, page 7.

will relocate from Oracle Arena to the Event Center, other programming at the Oracle Arena will remain the same as its current level of use. This assumption used in the EIR air quality analysis represents a conservative forecast of what is expected to occur if the Golden State Warriors relocate for the purposes of CEQA. The actual level of activity at Oracle Arena may prove to be different – some uncertainty is unavoidable when forecasting future events. Thus, the number of non-sporting events at Oracle Arena may instead decline by 50% if the Warriors move, as assumed in the AB 900 application. The AB 900 application was prepared for a different purpose, for a different decision-maker, and the assumptions set forth in the AB 900 application may or may not be the same as those set forth in the EIR. Because this analysis is being prepared as part of the City and County of San Francisco's CEQA analysis, the appropriate assumptions to rely upon are those that form the basis of the EIR. Those assumptions are considered a reasonable, albeit conservative, prediction of what will occur if the project is approved. As noted above, the EIR assumes the number of non-sporting events at Oracle Arena will not decline if the Warriors move. As discussed further below, case studies from other sports arenas indicate that this is a reasonable assumption. Moreover, Dr. King's premise that this would be a static level of events at the Arena may not be correct, with the potential for a greater number of events to occur pending market supportability.

In his discussion of urban decay, Dr. King references a discussion with an expert on the business and financing of sporting arenas. No mention of the content of this discussion is provided, just Dr. King's statement that based on this conversation a "strong argument exists that the Oracle Arena (or indeed any similar venue in a similar situation) will not be viable without the Golden State Warriors and there are no other sports teams in the offing for this venue."[16] ALH Economics sought out Dr. King's expert, Alexander Michael, to gain an understanding of the nature of his communication with Dr. King. These advances were met with a suggestion that substantive questions might be better addressed by a recommended attorney who has represented National Basketball Association Players in their historic antitrust lawsuit against the NBA. This referral puts into question how much Mr. Michael, who has worked for LivingSocial since 2011, considers himself an expert on the subject referenced by Dr. King. In any event, as summarized below, Dr. King fails to provide support for an assumption that the Arena will host only 21 events a year or that the area will experience urban decay.

As Dr. King touched upon several issues or topics in this section of his memo, ALH Economics includes several sub-topics to best address his topics. These sub-topics are reviewed below, and include Case Studies of Arenas Lacking a Sports Team, Redevelopment Context for the Oracle Arena, and Coliseum Area Specific Plan.

Case Studies of Arenas Lacking a Sports Team. In his memo, Dr. King provides information on only one arena that lost its last sports team in 2010. This was the IZOD Center in East Rutherford, New Jersey. Dr. King presents information on this facility as the sole example of an arena that could not continue to function in the long-term after it lost its sports team. Thus, on the basis of this example, he suggests the Oracle Arena will also shut down after the Golden State Warriors leave the arena for San Francisco. Further, as quoted above, Dr. King believes there is a strong argument that no indoor arena will be viable after losing its sports team, especially if no other sports team will take their place.

At this point in time it appears likely that once the Golden State Warriors leave the Oracle Arena no additional sports team will claim the Arena as its home. This is after a long history of being home to

[16] King, page 8.

many sports teams. The Oracle Arena, originally called the Oakland Coliseum Arena, opened in November 1966 with approximately 13,500 seats, shortly after the opening of the adjacent outdoor Coliseum in September 1966.[17] The Arena, the neighboring Coliseum, and the associated 10,000 parking spaces are located on 132 acres.[18] Thirty years after its development the Arena underwent a major interior renovation, valued at $100 million and increasing the maximum seating capacity to 19,200 and adding 72 luxury suites and three exclusive clubs.[19] Owned by the Oakland-Alameda County Coliseum Authority, collaboration between Alameda County and the City of Oakland, the Arena has successively been home to a multitude of professional sports teams. These teams include the following:

- Golden State Golden State Warriors (NBA) from 1966 to 1967, 1971 to 1996, and 1997 to present;
- Oakland Oaks (ABA) from 1967 to 1969;
- California Seals (WHL) from 1966 to 1967
- California Golden Seals (NHL) from 1967 to 1976
- San Francisco Golden Gaters (WTT) from 1974 to 1978
- Golden Bay Earthquakes (NASL/MISL) from 1982 to 1984
- Oakland Skates (RHI) from 1993 to 1995
- San Jose Sharks (NHL) from 1992 to 1993; and
- California Golden Bears from 1974 to 1985 (NCAAB), part-time from 1966 to 1997, and full-time from 1997 to 1999.[20]

The Arena has also hosted events such as concerts, ice skating shows, circuses, boxing, rodeos, and religious speakers.[21]

When the Golden State Warriors leave the Oracle Arena it will join the company of other indoor arenas throughout the country that are no longer home to sports teams, many after similar strong sports team use over the course of decades as the Arena. Many of these arenas continue to be operational years after losing their last sports team, demonstrating that Dr. King's IZOD Center example is not characteristic of all such arenas and in direct contradiction to Dr. King's argument about viability. As proof of this new life for arenas ALH Economics prepared a number of case studies to demonstrate that roughly similarly-sized indoor arenas can continue to function after losing a major sports franchise. The case studies were selected for their size comparability to the Oracle Arena, as well as their older age, again comprising a match to the Oracle Arena. The purpose of these case studies is not to say the Oakland Arena will perform exactly like the case studies, but rather to show that indoor arenas do not necessarily cease operations after losing their sports teams similar to the IZOD Center example presented by Dr. King. The case studies are presented in order of year built, which ranges from 1955 to 1999, recognizing that the Oracle Arena opened in 1966, and was renovated in the 1996/1997 timeframe. The case studies also reference seating capacity, especially for basketball, which range from 13,800 to 18,000, recognizing that the Oracle Arena was built with approximately 13,500 seats, increasing to a maximum of 19,200 with the renovation. The case study

[17] Oraclearena.com, "History," http://www.oraclearena.com/about-us/history
[18] Ibid.
[19] Oraclearena.com, "History," http://www.oraclearena.com/about-us/history
[20] Wikipedia, "Oracle Arena, "https://en.wikipedia.org/wiki/Oracle_Arena
[21] Oraclearena.com, "History," http://www.oraclearena.com/about-us/history

review also includes two arenas that lost their sports teams to newer facilities built nearby, similar to what will happen to the Oracle Arena when the Golden State Warriors relocate to the Event Center.

- **Community Choice Credit Union Convention Center (formerly Veteran's Memorial Auditorium) (Des Moines, Iowa) (built 1955; seating capacity 18,000)**

The Community Choice Credit Union Convention Center (the "Auditorium") was built in 1955 as the Veteran's Memorial Auditorium, an auditorium with a seating capacity of approximately 18,000. The venue has hosted concerts, wrestling, and various sports teams including the Drake Bulldogs (NCAA) from 1957 to 1992, the Des Moines Dragons (basketball) from 1997 to 2001, and the Iowa Barnstormers (football) from 1995 to 2001. In 2005, the Wells Fargo Arena was built adjacent to the Auditorium and took over the major events leading to the closure of the Auditorium in 2010. The Auditorium was renovated with an additional 28,000-square-foot ballroom and 25 meeting rooms and reopened in 2012 as a convention facility.[22]

The new Convention Center, with the addition of Wells Fargo and Hy-Vee Hall, is known as the Iowa Events Center. The facility is owned by Polk County and operated by Global Spectrum. In the past Polk County subsidized the operations of the Auditorium and Convention Complex at over $800,000 a year. After the development of the Wells Fargo Arena and Hy-Vee Hall, Polk County hired Global Spectrum to manage all of the Events Center facilities. Since taking over operations, Global Spectrum has managed to bring in a profit, significantly lessening the amount of subsidy paid by the County.[23] In addition to the new operator, the County sold the naming rights to Community Choice Credit Union to help pay for maintenance and operations, to help lessen any subsidies the County will have to pay.[24] In fiscal year 2014-2015, Global Spectrum presented the County with a 58% increase in profit from the previous year with 534 events at the three venues within the Iowa Events Center, 388 of them being at the Convention Centers. This profit enabled 2014-2015 to be the first year of operations without any subsidy from the County.[25]

- **Arizona Veterans Memorial Coliseum (built 1965; seating capacity14,870)**

The Arizona Veterans Memorial Coliseum (the "Coliseum") located in Phoenix, AZ was built in 1965 by the Arizona State Fair Commission as a multi-purpose arena to be used during the State Fair as well as year-round. The Coliseum has a maximum seating capacity of 14,870 and was host to the Phoenix Suns (NBA) from 1968 to 1992, the Phoenix Roadrunners (hockey) from 1974 to 1977, the Phoenix Inferno (indoor soccer) from 1980 to 1984, the Phoenix Mustangs (hockey)

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[22] Wikipedia, "Community Choice Credit Union Convention Center," https://en.wikipedia.org/wiki/Hampton_Coliseum

[23] Facilitiesonline.com, "Global Spectrum Provides Profit of $510,505 to Polk County for Fiscal Year 2012-2013 Operation of Iowa Events Center," http://www.facilitiesonline.com/hot_news/news/737/, August 27, 2013

[24] The Des Moines Register, "Veterans Auditorium gets new name: Community Choice Credit Union Convention Center," December 15, 2011, http://blogs.desmoinesregister.com/dmr/index.php/2011/12/15/community-choice-credit-union-gets-naming-rights-at-veterans-auditorium

[25] Spectra by Comcast Spectator, "Spectra Delivers $1.9M Record Profit to Polk County for 2014-15 at Iowa Events Center," www.spectraexperiences.com/wp-content/.../Press_Release_1.9Profit.pdf

from 1997 to 2001, the Phoenix Eclipse (basketball) from 2001 to 2002, and the Arizona Thunder (indoor soccer) from 1998 to 2000.[26]

As a part of the Arizona Exposition and State Fairgrounds, the Coliseum is a self-supporting state agency and no tax monies are used in its operations.[27] In addition to the State Fair, the Coliseum is home to a roller derby team and hosts events such as concerts, gun shows, garden shows, the state fair, and dog shows.[28] The Coliseum is booked on average 60-80 days a year; some of these days include events such as a month of a world tour concert rehearsal. The fairgrounds hold around 320 events a year, being located in Phoenix allows for many outside events due to the warm weather.[29]

In 1992 the Phoenix Suns relocated to a brand new arena called the America West Arena, now the Talking Stick Resort Arena. The new arena is a scant 2.9 miles away from the Coliseum. The last year of Coliseum use by the remaining professional sports teams was 2002. The Coliseum is an example of an indoor arena that has continued to successfully operate after the professional sports teams relocated to a nearby venue.[30]

- **The Forum (built 1967; seating capacity 17,500)**

The Forum, located in Inglewood, CA, was built in 1967 by the then-owner of the Lakers. The indoor arena has a maximum seating capacity of 17,500 and was home to the LA Lakers and the LA Kings from the time it opened until 1999, when both teams moved to downtown LA into the newly built Staples Center. The LA Sparks (WNBA) also called the Forum home until 2001, when they also moved to the Staples Center.[31] The Faithful Central Bible Church bought the Forum in 2000 and utilized the space for church services as well as continuing to lease the space for sporting events, concerts, etc., until the Church sold the facility in 2012.

The Madison Square Garden Company (MSG) purchased the Forum in 2012 and renovated and reopened it in 2014. In 2014 the Forum was placed on the National Register of Historic Places.[32] With a multi-million dollar makeover, MSG took a risk dedicating a former sports arena into a music-and entertainment-oriented venue. The gamble paid off as the Forum hosted 32% of the arena-sized concerts in the LA area in 2014, with 50 shows and an estimated 80 shows for

[26] Wikipedia, "Arizona Veterans Memorial Coliseum," https://en.wikipedia.org/wiki/Arizona_Veterans_Memorial_Coliseum#cite_note-inflation-US-2
[27] Arizona Community Foundation, "Arizona State Fair Foundation," https://www.azfoundation.org/donors/profilesinleadership.aspx
[28] Arizona Exposition and State Fair, "Events," https://arizonaexposition.com/events
[29] Shannon Miller, Arizona Exposition and State Fair, Phone Interview done on September 1, 2015.
[30] Wikipedia, "Arizona Veterans Memorial Coliseum," https://en.wikipedia.org/wiki/Arizona_Veterans_Memorial_Coliseum#cite_note-inflation-US-2
[31] Wikipedia, "The Forum (Inglewood, California)," https://en.wikipedia.org/wiki/The_Forum_(Inglewood,_California)#cite_note-Vincent-6
[32] LA Times, "Forum in Inglewood honored by National Trust for Historic Preservation," November 12, 2014, http://www.latimes.com/entertainment/arts/culture/la-et-cm-forum-inglewood-national-trust-for-historic-preservation-20141112-story.html

2015.[33] The venue also hosts wrestling, boxing, awards ceremonies, etc. In early 2015, LA Curbed named Inglewood LA's Neighborhood of the Year for 2014, citing the renovation of the Forum as one of the contributors to the up-and-coming neighborhood. In addition work is being done on a Crenshaw line for LA Metro, as well as much new development, including a proposed NFL stadium.[34]

When they left the Forum in the 1999-2001 timeframe, the LA Lakers, LA Kings, and LA Sparks professional sports teams moved 10 miles away to the Staples Center. Today, the Forum continues to operate lucratively even after having lost the professional sports teams to the nearby Staples Center.[35]

- **Hampton Coliseum (Virginia) (built 1970; seating capacity 13,800)**

The Hampton Coliseum (the "Coliseum") is located in Hampton, VA and was built in 1970. The City of Hampton owns and operates the Coliseum.[36] To help promote and develop the area adjacent to the Coliseum the City created the Coliseum Central Business District, Inc. in 1996. The commercial properties within the district pay an additional tax to help pay for economic development, the City levies this tax to help pay for Coliseum operations.[37] With a maximum seating capacity of 13,800, the multipurpose arena hosted the Virginia Squires (basketball) from 1970 to 1976, the Virginia Wings (hockey) from 1971 to 1975, the Hampton Gulls (hockey) from 1974 to 1978, the Hampton Aces (hockey) from 1978 to 1981, and the Old Dominion Monarchs basketball from 1970 to 1995.

The Coliseum currently hosts events such as concerts, conventions, wrestling, and Disney on Ice. The City of Hampton is currently in the process of updating the Coliseum Central Master Plan. The City recognizes the value of the Coliseum; the master plan vision includes the development of indoor sport facilities in addition to the Coliseum and Convention Center to take advantage of the growing sports tourism industry. The City also wants to, "Create a festival park to support these civic facilities and provide an outdoor event space to serve the overall Coliseum Central Business Improvement District. In addition, there are opportunities to include additional hotel and entertainment/dining opportunities."[38]

- **Mississippi Coast Coliseum & Convention Center (built 1977; seating capacity 15,000)**

The Mississippi Coast Coliseum & Convention Center (the "Coliseum) is located on the beach in Biloxi, MS. The Coliseum opened in 1977 as a multi-purpose facility and provides a maximum

[33] LA Times, "Rejuvenated Forum making a huge impact on SoCal concert scene," December 29, 2014, http://www.latimes.com/entertainment/music/la-et-ms-forum-return-20141229-story.html
[34] LA Curbed, "Inglewood is Los Angele's 2014 Neighborhood of the Year," January 2, 2015, http://la.curbed.com/archives/2015/01/inglewood_is_los_angeless_2014_neighborhood_of_the_year.php
[35] Wikipedia, "The Forum (Inglewood, California)," https://en.wikipedia.org/wiki/The_Forum_(Inglewood,_California)#cite_note-Vincent-6
[36] Wikipedia, "Hampton Coliseum," https://en.wikipedia.org/wiki/Hampton_Coliseum
[37] City of Hampton, "Comprehensive Annual Financial Report for the Fiscal Year Ended June 30, 2014," page 43, http://hampton.gov/Archive.aspx?AMID=50
[38] City of Hampton, "Coliseum Central Master Plan Update," http://hampton.gov/coliseumcentralupdate

seating capacity of 15,000.[39] This venue is owned and operated by the Mississippi Coast Coliseum Commission, a political subdivision of the State of Mississippi. The State of Mississippi imposes a 2% tax on the gross proceeds on room rentals of all hotels and motels in Harrison County to help subsidize the Coliseum.[40] The Coliseum has hosted sports teams such as the Mississippi Coast Gamblers (professional basketball, spring season) in 1994, the Mississippi Beach Kings (indoor soccer) in 1998, the Mississippi Fire Dogs (indoor football) from 1999-2000, the Mississippi Sea Wolves (AA Hockey) from 1999-2009, the Mississippi Fire Dogs (indoor football) from 2001-2002, the Gulf Coast Bandits (World Basketball) in 2005, the Mississippi Blues (American Basketball Association) from 2009-2010, and the Mississippi Surge (hockey) from 2009-2014.[41] The venue is currently home to a local radio station and hosts events such as an annual crawfish festival, rock festival, concerts, wrestling, monster truck shows, and conventions.[42] In fiscal year 2012-2013 the Coliseum held 124 events, 142 events in fiscal year 2013-2014, and 152 events in fiscal year 2014-2015.

The City of Biloxi Comprehensive Plan envisions the Mississippi Coast Coliseum & Convention Center area to be:

> a high-quality, walkable visitor destination with multi-modal transportation access and connections to Sand Beach, the Biloxi Peninsula Path, and other attractions and anchor uses in the West Biloxi Regional Business District. Hospitality uses that support the Coliseum and Convention Center, such as hotels and restaurants, are encouraged. The scenic quality of Highway 90 should be maintained and buffers and transitions provided to lower density residential uses.[43]

Examples of how to achieve this vision are included in the Neighborhood Improvement Strategies in West Biloxi, which includes items such as a proposed street car line in the Coliseum district, a transit hub near the Coliseum, improved pedestrian facilities, sand beach improvements, and provide development plan that includes incentives and design standards to boost hotel and retail development within walking distance to the Coliseum.[44]

- **Tacoma Dome (built 1993; basketball seating capacity 17,100)**

The Tacoma Dome (the "Dome") is an indoor arena located in Tacoma, WA. The Dome was built in 1983 and is owned, operated, and paid for by the City of Tacoma. The maximum seating capacity ranges from 5,000-23,000, with 20,824 for indoor soccer, 17,100 for basketball, and 10,000 for American football.[45] The Dome hosted the Seattle Supersonics from 1994-1995 while

[39]Wikipedia, "Mississippi Coast Coliseum, https://en.wikipedia.org/wiki/Mississippi_Coast_Coliseum
[40]State of Mississippi Department of Revenue, "Tourism and Economic Development Taxes," https://www.dor.ms.gov/taxareas/sales/SpecialTourismTax.html, page 16.
[41]Wikipedia, "Mississippi Coast Coliseum, https://en.wikipedia.org/wiki/Mississippi_Coast_Coliseum,
[42]Mississippi Coast Coliseum & Convention Center, "Events," http://www.mscoastcoliseum.com/events
[43]The City of Biloxi, "The City of Biloxi Comprehensive Plan – Adopted December 2009," page 38, http://www.biloxi.ms.us/departments/community-development/comprehensive-plan/
[44] The City of Biloxi, "Neighborhood Improvement Strategies – West Biloxi," pages 159, 168, http://www.biloxi.ms.us/departments/community-development/comprehensive-plan/
[45] Wikipedia, "Tacoma Dome," https://en.wikipedia.org/wiki/Tacoma_Dome, accessed August 13, 2015.

their stadium was undergoing renovations. The Dome was the permanent host to the Tacoma Rockets Western Hockey League team from 1991-1995, the Tacoma Sabercats of the West Coast Hockey League from 1997-2002, the Tacoma Stars indoor soccer team of the MISL from 1984-1992, the Tacoma Express Football in 1990, and the Seattle Sounders Soccer team in 1994. The Supersonics have since moved to Oklahoma City and the other teams are either defunct or have moved locations as well. In addition, the Dome has also hosted other major sporting events such as the 1990 Goodwill Games and the 1987 United States Figure Skating Championships.[46]

In 2012 the City of Tacoma had a study completed on the feasibility of bringing back a professional sports team to the Dome. The study determined that it was not a financially feasible idea based on a multitude of reasons such as competition from other area arenas, the area's small population base, the city's financial position, and the area's lower national profile. The study did allow that a more affordable plan existed for the Dome to exist successfully, "Modernize the arena so it's more competitively viable for amateur sports, concerts and events other than pro hoops or hockey."[47] Following this advice, the Dome is currently used for events such as concerts, comedy shows, beer festivals, wedding expos, gun shows, circus, monster trucks, motocross, conventions, etc.[48] The number of booked events at the Dome increased 22% between 2011 and 2014 and is estimated to continue to increase in 2015 and 2016.[49] Moreover, various improvements to the Dome and the area are underway. The Tacoma City Council recently approved plans for the outside of the Dome to be adorned in an Andy Warhol flower, an idea that was brought to the City before the Dome was even built.[50] In addition, Sound Transit is working on a potential expansion to the Tacoma line that would link the Tacoma Dome station with downtown Tacoma.[51] Also, Sound Transit and Amtrak are demolishing the existing single-track Tacoma trestle and are rebuilding a larger double-track one, which can support more passengers and keep up with increasing demand; construction is estimated to be complete in 2018.[52]

- **Verizon Arena (North Little Rock) (built 1999; seating capacity 18,000)**

The Verizon Arena (the "Arena"), formerly called Alltel Arena, is located in the City of North Little Rock, AR across the river from the City of Little Rock. The Arena, which opened in 1999, has a seating capacity of 18,000 and conference space of 28,000 square feet. The venue is publicly

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[46]Tacoma Dome, "Venue History and Facts," http://tacomadome.org/about-us/venue-history-facts
[47] The Tacoma News Tribune, "Tacoma Dome could do just fine by steering clear of the big leagues," http://www.thenewstribune.com/news/business/biz-columns-blogs/article25860565.html
[48]Tacoma Dome, "Event List," http://tacomadome.org/events-tickets/buy-tickets
[49]City of Tacoma, "2015-2016 City of Tacoma Adopted Biennial Operating & Capital Budget," Page 156, http://www.cityoftacoma.org/cms/One.aspx?portalId=169&pageId=76920
[50]NBC King 5, "Tacoma city council approves Warhol dome flower plan," http://www.king5.com/story/news/local/tacoma/2015/02/11/tacoma-dome-warhol-flower/23217839/
[51] Sound Transit, "Tacoma Link Expansion," http://www.soundtransit.org/tacomalinkexpansion and NBC King 5, "Sound Transit seeks feedback on Tacoma Link expansion," http://www.king5.com/story/news/traffic/2015/07/15/tacoma-link-expansion-light-rail/30189765/
[52]KiroTV, "100-year-old train trestle to be replaced in Tacoma," http://www.kirotv.com/news/news/100-year-old-train-trestle-be-replaced-tacoma/nnHKm/

owned by the Multi-Purpose Civic Center Facilities Board for Pulaski County.[53] The Arena hosted the Arkansas Diamonds (indoor football) from 2000-2010, Arkansas RimRockers (NBA D-League) from 2004–2007, Little Rock Trojans (NCAA men's basketball) from 1999–2005, and the Arkansas Riverblades (AA Hockey) from 1999–2003.[54] The Arena no longer hosts a permanent sporting team; it holds events such concerts, rodeos, auto racing, professional wrestling, trade shows, meetings, banquets, and conventions. In 2013 the Arena hosted 50 events, 43 events in 2014, and a total of 50 scheduled events in 2015.[55]

The Arena was fully funded by a mix of local, state, and private firms as a sports and entertainment facility. The Arena does not receive any regularly scheduled public funds to operate; in the past they have received some small amounts from the state for capital improvements.[56] The Arena is situated on the Arkansas River across from Downtown Little Rock with adjacent pedestrian and automobile bridges connecting the cities of Little Rock and North Little Rock. The Arena played a large part in the development of Little Rock's River Market and the expansion of Little Rock Convention Center. The district the Arena is located in also features other attractions such as the Arkansas State Capitol, the Clinton Presidential Library, and the North Little Rock Main Street Restaurant Row and Art District.[57]

The preceding seven case studies provide examples of indoor arenas that continued to meet with success after losing sports teams that were historically associated with the arenas. The case studies include a wide mix of characteristics, such as geographic location, ownership, and facility management, all of which provide examples of arenas that were repositioned to achieve facility success without being home to a sports team. Until the Oracle Arena is certain that the Warriors will be leaving the facility it is premature to actively market the space to attract other events and venues. However, the examples above indicate that market success is possible for similar types of facilities. The Arena has several assets to its advantage. These include highway visibility, easy highway access, strong public transit access, and inclusion in an area with a long-range vision for improvement in the form of the Coliseum Area Specific Plan.

As noted above, two of the case studies include arenas that lost their sports teams to newer facilities built nearby, similar to what will occur in Oakland when the Golden State Warriors relocate to the Event Center. These arenas include the following: the Arizona Veterans Memorial Coliseum in Phoenix, AZ, whose sports teams relocated to a new area less than 3.0 miles away; and The Forum in Los Angeles, whose sports teams all relocated to the Staples Center approximately 10 miles away. These two case studies demonstrate that an arena that loses sports teams to another nearby arena can continue to be successful, and thus not fall into disrepair and indirectly result in the physical condition of urban decay.

[53]Verizon Arena, "About the Arena," http://www.verizonarena.com/about-the-arena
[54]Wikipedia, "Verizon Arena," https://en.wikipedia.org/wiki/Verizon_Arena
[55]Verizon Arena, "Concerts & Shows," http://www.verizonarena.com/concerts-and-shows/
[56]Michael Marion, CFE, General Manager Verizon Arena
[57]Verizon Arena, "About the Arena," http://www.verizonarena.com/about-the-arena

Redevelopment Context for the Oracle Arena. In 1995 the Arena and its environs became part of the City of Oakland's Coliseum Redevelopment Area totaling approximately 5,700 acres.[58] The main objective of the redevelopment area was, "Abating physical and economic blight by redeveloping vacant and underutilized properties and replacing obsolete infrastructure."[59] The redevelopment area comprised four target areas: Fruitvale BART Station area; Coliseum City/Oakland Airport Area including Coliseum BART Station area; International Boulevard Infill area; and an expanded focus on neighborhood capital projects. In 1995 approximately 75% of the Coliseum Redevelopment Project Area consisted of commercial, industrial, and airport-related uses. The remainder of the area was residential. In a similar timeframe to the creation of the Coliseum Redevelopment Project Area, the Arena underwent a major interior renovation in June 1996, although this was not achieved with Redevelopment funds. The $100 million renovation increased the maximum seating capacity to 19,200 and added 72 luxury suites and three exclusive clubs.[60]

Since inception of the Coliseum Redevelopment Project Area there were a number of executed redevelopment projects designed to enhance the area. Some of these improvements were near the Arena while others were in other portions of the Project Area. Up until the dissolution of Redevelopment agencies in the State of California in 2012 the City of Oakland classified the following projects as successes within the Coliseum Redevelopment Area:

- **Fruitvale Transit Village Phase I**—Mixed-use transit-oriented development
- **Hegenberger Gateway Shopping Center**—240,000-square-foot retail and restaurant space
- **Oakland Unified School District (OUSD) Cesar Chavez Education Center**—Community-based complex
- **Coliseum Lexus and Infiniti of Oakland Dealerships**—26,000-square-foot auto center
- **Zhone Technologies Corporate Campus** —Research and development facilities
- **Damon Slough / MLK Shoreline Public Access Park**
- **81st Avenue Branch Public Library**— New 21,000-square-foot library
- **East Oakland Sports Center**— New recreational indoor pool facility
- **Airport Gateway Street Improvement Project** — Improvements to Hegenberger Road, 98th Avenue, Airport Access Road and Doolittle Drive included extensive landscaping and widening of some roads, new lighting, colorful banners, new sidewalks and palm trees.
- **Coliseum Transit Hub Streetscape and Coliseum Amtrak Station**— Improvements to San Leandro Street and construction of commuter rail station near Coliseum BART
- **Sunshine Court Street Improvements**— Improvements to existing residential area
- **66th Avenue Streetscape Project**— Improvements along 66th Avenue between San Leandro Street and International Boulevard.[61]

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[58] City of Oakland, "Coliseum Project Area," http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/o/Coliseum/index.htm
[59] City of Oakland, "Coliseum Project Area," http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/o/Coliseum/index.htm
[60] Oraclearena.com, "History," http://www.oraclearena.com/about-us/history
[61] City of Oakland, "Coliseum Project Area," http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/o/Coliseum/index.htm

Following the dissolution of redevelopment in 2012, the City of Oakland created the Redevelopment Successor Agency, which is part of the City's Project Implementation Division.[62] A portion of The Coliseum Redevelopment Area (800 acres) subsequently became the focus of the Coliseum Area Specific Plan, which was adopted in March 2015 along with the Environmental Impact Report (see following section).[63]

Dr. King states that even though Redevelopment Areas have been disbanded, the blight issues in the former Coliseum Redevelopment Project Area remain. ALH Economics toured the area immediately surrounding the Oracle Arena. This area is a mixture of industrial, service, and commercial uses, with extensive residential land uses several blocks to the east of the Oracle Arena, primarily including affordable housing. The industrial, service, and commercial uses include businesses engaged in printing, upholstery, auto and truck parts, truck and auto repair, restaurant supply, structural steel, solar power, party rental, and distribution, among others. San Leandro Street is a major north south road in the area, with access to the Coliseum BART station. This roadway was littered with some trash at the time of ALH Economics' area tour, and ALH Economics saw one visible incidence of graffiti on a portion of San Leandro Street somewhat close to the Oracle Arena. There were very few visible commercial or industrial vacancies, thus the area appears to be relatively well-occupied.

The land uses in the area most proximate to the Oracle Arena do not appear to be dependent upon events occurring at the Arena. There is only one small food vendor, a taqueria, within walking distance of the Arena, across the street from the BART Station. Thus, ALH Economics anticipates that any diminution in use at the Oracle Arena attributable to relocation of the Warriors to San Francisco will not impact any of the existing businesses around the Oracle Arena. Thus, no existing businesses are anticipated to experience a decline in business or risk closure, minimizing the risk of urban decay, which is a condition different from the blight conditions upon which redevelopment project area designation is predicated. Blight conditions include many of the characteristics of urban decay, but go beyond these characteristics, and include conditions such as poor or overcrowded housing conditions, unsafe or unhealthy vacant and underutilized properties, functionally obsolete structures, and obsolete infrastructure. Many of these issues were addressed by the projects identified above during the life of the Redevelopment Project Area, but any residual conditions would be considered pre-existing, and not attributable to any changes in operations or function of the Oracle Arena.

In summary, the land uses proximate to or adjacent to Oracle Arena do not appear to rely on activity at the arena in order to be economically viable. Nor are these uses 'in competition' with those that occur at the Arena. In both of these respects, the current circumstances differ from those that can typically arise in the context of urban decay analysis. Generally, urban decay analysis focuses on economic harm to marginal businesses caused by competition from lower-priced, high volume retailers competing in the same retail market. Neither of those conditions exists here. The Warriors do not 'compete' with any other businesses in the region. Nor is there evidence that the relocation of the

[62] City of Oakland, "Project Implementation Division," http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/index.htm

[63] City of Oakland, "Coliseum Area Specific Plan," http://www2.oaklandnet.com/Government/o/PBN/OurOrganization/PlanningZoning/OAK040453

Warriors will have a substantial impact on any businesses located near Oracle Arena, insofar as those businesses do not appear to rely on Warriors' fans as a significant source of revenue.

Most importantly, Dr. King states that once the Oracle Arena is shut down, "it would be difficult and expensive to repurpose the arena for other activities and thus it will almost certainly be shuttered and perhaps demolished at some future date."[64] Yet there is no certainly that the Arena would close down. As the preceding case studies demonstrated, in most cases arenas find new life after the departure of their last active sports team. The Oracle Arena already houses events other than Warriors games. This suggests the venue is usable by other users, with the potential to ramp up these additional uses over time. The Arena's locational advantages are a strong asset to support these additional uses. However, if the Arena does close, these locational advantages will work to the benefit of the site, with the long term potential for site reuse, in accordance with the Coliseum Area Specific Plan (see below).

Relative to the operations of the Arena after the Warriors relocation, Dr. King expresses concern that a reduction in economic activity would reduce the City's tax base and hence reduce revenues available to maintain upkeep at the closed Arena and constrain the City's ability to provide other services. As ALH Economics demonstrated earlier, Dr. King overestimated the extent of economic activity that would likely shift away from Alameda County. And since he did not tie or demonstrate the extent of this activity exclusive to Oakland it is specious to comment upon how City finances might change, and the City's expenditure pattern. Moreover, the City of Oakland's General Fund expenditures are over $500 million, thus costs to monitor conditions near the Oracle Arena are likely to comprise a very insignificant portion of the City's budget. [65]

Coliseum Area Specific Plan. One of the goals of the Oakland Coliseum Redevelopment Project Area was to continue to support a Coliseum City project in an effort to retain sports teams and create an entertainment, retail/mixed-use destination.[66] Toward this end, the City of Oakland worked for many years on the formulation of a Coliseum Area Specific Plan. In April 2015, after the end of Redevelopment in California, the City of Oakland adopted the "Coliseum Area Specific Plan," focused on providing a guiding framework for reinventing the City of Oakland's Coliseum area as a major center for sports, entertainment, residential mixed use, and economic growth.[67] This plan includes provisions for both the retention and demolition of the existing Oracle Arena. The Specific Plan establishes the basis for land use and regulatory policies and public and private investment that will coordinate phased development in the area over the next 20 to 25 years. Accordingly, the plan is a guide for decision-makers in determining the nature, scale, type and functional relationships among future land uses in the Specific Plan Area.

The Coliseum Area Specific Plan was developed as a mechanism to help the City of Oakland maximize the retention of the professional sports franchises in the area that they do not control (the Oakland A's and the Raiders, in addition to the Golden State Warriors) with a politically and financially feasible plan that includes new sports facilities plus retail, restaurant, hotel, office, R&D and

[64] King, page 8.
[65] https://magic.piktochart.com/output/5111124-oakland-5-year-forecast-16-20-
[66] http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/o/Coliseum/index.htm
[67] See "Coliseum Area Specific Plan," Final Adopted Plan, City of Oakland, April 2015.

residential development. However, given the uncertainty regarding the future of the sports teams (made real by the current Golden State Warriors plans to relocate to San Francisco and the A's stated desire to relocate to San Jose) the Specific Plan, of necessity, is a flexible strategy that can accommodate all - or none - of the sports facilities. The Specific Plan establishes a land use and development framework, identifies transportation and infrastructure improvements, and recommends implementation strategies. While the proposed Project presents one vision for how the Coliseum Area might ultimately be developed, it also provides flexibility for other potential land use outcomes.

In October 2014 the City of Oakland entered into an Exclusive Negotiating Agreement (ENA) with New City Development LLC, led by Floyd Kephart, to spearhead development of Coliseum City, a planned 120-acre development that would combine new housing and retail and a stadium for the Raiders. This ENA was extended in April 2015, but just recently was not extended further given the lack of developer progress formulating a financing plan, thus removing New City Development from the planning process for the area. This puts future retention plans of the Raiders and the Oakland A's into continued flux, as alternative locations for each team have been under investigation for a number of years in the midst of negotiations with the City of Oakland. The flexibility of the Specific Plan, however, includes strategies that will be able to adapt to future decisions regarding the sports franchises and respond to changes in market conditions. Accordingly, the Plan allows for a variety of alternative development scenarios within the limits of available and future infrastructure. For example, if one or more of the new sports venues included in the Specific Plan is not constructed, the Specific Plan's allowable development program could provide for non-sports uses, such as science and technology housed within buildings lower in height than the sports venues.[68]

The existence of the Specific Plan is not a guarantee that the Plan's vision will be realized. However, the City's formulation of the Coliseum Area Specific Plan demonstrates a vision and long-term commitment to creating a guiding structure for area revitalization. The existence of this plan was not acknowledged by Dr. King in his memo.

CLOSING

It is ALH Economics' conclusion that the area of Oracle Arena is not currently experiencing urban decay and there is no information that is currently available for ALH Economics to conclude that urban decay is likely to occur. While the future use of the Arena area is uncertain, in the event the Warriors relocate to San Francisco, many arenas throughout the country have been repurposed under similar circumstances, the site is well-positioned geographically to attract new uses, and the City of Oakland is actively committed to implementing a flexible use specific plan that would bring new uses to the area. In light of this analysis, ALH Economics is of the opinion that urban decay at the Arena site is not a reasonably foreseeable consequence of the relocation of the Golden State Warriors to San Francisco.

[68] Ibid, page 11.

ALH Economics appreciated the opportunity to prepare this analysis for ESA. Please let me know if you have any questions regarding the analysis and findings.

Sincerely,

ALH Urban & Regional Economics

Amy L. Herman, AICP
Principal

ALH Econ/2015 Projects/1513 ESA Golden State Warriors/Report/1513.r02.doc

ASSUMPTIONS AND GENERAL LIMITING CONDITIONS

ALH Urban & Regional Economics has made extensive efforts to confirm the accuracy and timeliness of the information contained in this study. Such information was compiled from a variety of sources, including review of City, County, and State documents, and other third parties deemed to be reliable. Although ALH Urban & Regional Economics believes all information in this study is correct, it does not warrant the accuracy of such information and assumes no responsibility for inaccuracies in the information by third parties. We have no responsibility to update this report for events and circumstances occurring after the date of this report. Further, no guarantee is made as to the possible effect on development of present or future federal, state or local legislation, including any regarding environmental or ecological matters.

The accompanying projections and analyses are based on estimates and assumptions developed in connection with the study. In turn, these assumptions, and their relation to the projections, were developed using currently available economic data and other relevant information. It is the nature of forecasting, however, that some assumptions may not materialize, and unanticipated events and circumstances may occur. Therefore, actual results achieved during the projection period will likely vary from the projections, and some of the variations may be material to the conclusions of the analysis.

Contractual obligations do not include access to or ownership transfer of any electronic data processing files, programs or models completed directly for or as by-products of this research effort, unless explicitly so agreed as part of the contract.

APPENDIX AQ2

Supplemental Air Quality Supporting Information

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Air Quality Appendix

1 Introduction

At the request of Environmental Science Associates (ESA), on behalf of the Golden State Warriors (GSW or Sponsor), ENVIRON International Corporation (ENVIRON) conducted a California Environmental Quality Act (CEQA) analysis of criteria air pollutants (CAPs) and precursor emissions associated with the proposed construction of a multi-purpose event center and ancillary development Mission Bay Blocks 29-32 in San Francisco, CA (“Project” or “Site”).[1] The analysis prepared by ENVIRON will be used to inform preparation of the Subsequent Environmental Impact Report (SEIR) on the project. This Air Quality Protocol describes the methodology used for evaluation of air quality impacts from construction and operational sources.

The proposed project is not located in an Air Pollution Exposure Zone (APEZ) as defined by the San Francisco Planning Department, Environmental Planning Division (SFEP). However, in the event that the proposed project could result in increased emissions over those assumed for prior approved development for the site in the Mission Bay Final Subsequent Environmental Impact Report (FSEIR), the project impacts could be substantial enough to create a new APEZ. Therefore, preparation of a construction health risk assessment (HRA) and operational HRA are included as part of the air quality impact analysis to demonstrate that the Project will not create an APEZ at nearby sensitive receptors.

1.1 Project Understanding

The proposed Project would be located at Blocks 29-32 of Mission Bay, as designated in the Mission Bay Redevelopment Area. The Mission Bay Redevelopment Area has a Final Supplemental Environmental Impact Report (FSEIR) from1998.

Two alternatives to the project are also considered, as discussed below.

1.1.1 Proposed Project

The Project would be located at Blocks 29-32 of Mission Bay within the Mission Bay Redevelopment Area of San Francisco. The rectangular site is bound by Third Street to the west, South Street to the north, Terry Francois Boulevard to the east, and 16th Street to the south. Blocks 29-32 are approximately 11 acres, which are currently vacant. Currently, there are residential land uses to the northwest and south of the proposed Project site, but none immediately adjacent to the site.

The GSW, the Project proponent, propose to create a new approximately 18,000-seat multi-purpose event center and ancillary development including multiple office buildings, retail, restaurants, structured parking, plaza areas, and other amenities. Based on data provided by the GSW, the Project build-out for Blocks 29-32 would include approximately 750,000 gross square feet (gsf) for a multi-use events center and 25,000 gsf for the GSW offices; 580,000 gsf of non-GSW office space; 475,000 gsf of parking (950 spaces); 125,000 gsf of retail space including sit-down restaurants, quick-service restaurants, and soft goods retail.[2] The privately

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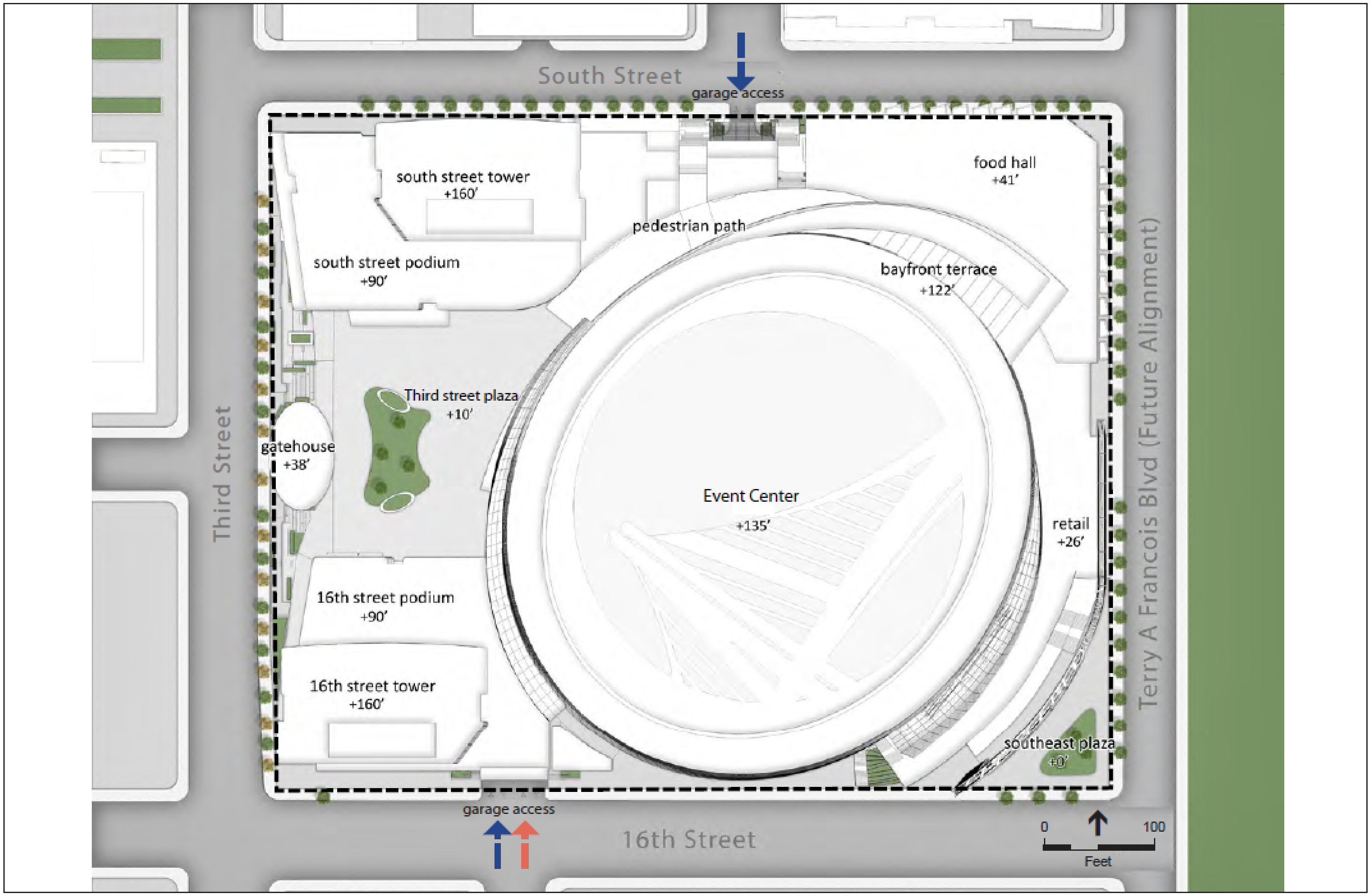
[1] A separate greenhouse gas inventory will be prepared using similar methods as part of an application for judicial streamlining under Public Resources Code 21178-21189.3.

[2] Notice of Preparation, Table 1. November 19, 2014.

Figure 1. Conceptual Design Site Plan



Project Site Boundary
Auto Access Location
Truck Loading Access

financed events center would host the Bay Area's National Basketball Association (NBA) basketball team, the GSW, during the NBA season, as well as provide a year-round venue for a variety of other uses, including, but not limited to, concerts, cultural events, family shows, conferences, and conventions. The preliminary, conceptual layout is shown in Figure 1 of this Air Quality Protocol. The Project will also include new back-up engines.

Construction of the Project is anticipated to proceed with the offices and arena being built concurrently. The air quality analysis used the construction schedule and phases proposed by the Project Sponsor to estimate construction impacts.

1.1.2 Project Alternatives

The SEIR alternatives analysis included the No Project Alternative (the currently approved development on Blocks 29-32) and one other alternative, a reduced intensity project. These alternatives are analyzed qualitatively in this study.

Alternative A: No Project

- Under the first alternative, all aspects of the current operation at Oracle Arena in Oakland are retained.
- In Alternative A, the No Project Alternative, 1,056,000 square feet of office space would be constructed at the Project site instead of the proposed arena plus office buildings and other uses. As part of the 1998 Mission Bay Redevelopment Area SEIR, Blocks 29-32 are entitled for up to 1,056,000 square feet of office space. Alternative A also includes up to 31,700 gsf of retail use.
- ENVIRON evaluated construction and operation of Alternative A to an equal level of detail as the Project. ENVIRON modeled construction emissions using accepted methodologies such as modeling with California Emissions Estimator Model (CalEEMod®). Because there is no change at the Oracle Arena in Alternative A, the sole impacts come from the office and retail space at Blocks 29-32. As such, only the office and retail space is considered in the impacts analysis.

Alternative B: Reduced Intensity at Blocks 29-32

- Under Alternative B, Blocks 29-32 adjustments will be made to retail uses, office uses, and parking spaces at Blocks 29-32. All other aspects of the proposed Project will remain unchanged.
- From an air quality perspective, this Alternative is expected to have reduced impacts from those of the Project because of its reduced scope.

1.2 Objective

The purpose of the air quality analysis is to assess potential criteria pollutant emissions and ozone precursor emissions that would result from construction and operation of the proposed Project consistent with guidelines and methodologies from air quality agencies, specifically, the Bay Area Air Quality Management District (BAAQMD), the California Air Resources Board (ARB), and the US Environmental Protection Agency (USEPA).

Consistent with CEQA requirements, this Air Quality Analysis evaluates mass emissions of CAPs from both construction and operational activities (including traffic generated from the proposed Project). The scope of this Air Quality Analysis also includes a construction HRA and operational HRA to determine whether the Project contributes to cumulative effects at nearby receptors over the significance thresholds used by SFEP.

1.3 Project Methodology

Construction emissions associated with the Project would be from off-road construction equipment and on-road mobile sources. There would also be operational emissions associated with the Project from traffic-related sources and stationary sources such as boilers and five standby emergency generators. An equivalent level of detail was used in analyzing the Project and the Alternatives. To that extent, the "Project Methodology" discussed throughout this document applies to all Alternatives.

The City of San Francisco, in conjunction with the BAAQMD, has recently completed a City-wide HRA to evaluate cumulative cancer risks and fine particulate matter less than 2.5 micrometer in diameter ($PM_{2.5}$) concentrations from existing stationary and mobile sources. The construction HRA and operational HRA in this Air Quality Analysis was conducted to be consistent with the City-wide HRA.

1.3.1 Project Impacts

The following three sources of emissions were analyzed in the Project build-out year of 2018. For the construction years, ENVIRON assumed uncontrolled emissions based on the construction fleet statewide average for that year. For example, in 2015, the fleet-average emission factor for 2015 were used, and in 2016 the fleet-average emission factor for 2016 were used. Estimation of trip lengths relied on state survey data and season ticket holder addresses.

The three sources of emissions considered are:

1. Project construction (both without implementation of measures to reduce Project impacts and with such measures in place as per Section 5 of this Analysis);
2. Project stationary source emissions in the first Project operation year; and
3. Project traffic emissions in the first Project operation year.

2 Emissions Estimates

The methods used to estimate the emissions of CAPs and Toxic Air Contaminants (TACs) from the Project are described here. Because estimation techniques are different for construction and operation, they are discussed separately below.

2.1 Calculation Methodologies for Construction Emission Sources

Construction emission calculation methodologies cover off-road equipment, which is primarily diesel-fueled, on-road vehicles, and architectural coatings. Calculation methodologies for each type of emissions are explained separately. The methodology used to calculate emissions from each category is presented in Table 1: Emissions Calculations Methodology.

2.1.1 Off-road Diesel Equipment

Project-specific construction equipment inventories that include details on the type, quantity, construction schedule, and hours of operation anticipated for each piece of equipment for each construction phase were provided by the Sponsor. For the diesel-fueled equipment, ENVIRON used methodologies consistent with CalEEMod® to estimate emissions.[3] Where Project-specific equipment information is not available, CalEEMod® default values were used. Load factors for each piece of equipment were based on the default load factor in ARB's 2011 Off-Road Equipment Model (OFFROAD2011).

2.1.2 On-road Haul Trucks and Delivery Trucks and Vans

On-road truck emissions were calculated using the total number of trucks provided by the Sponsor as part of the SEIR project description and emission factors from ARB's EMission FACtor model (EMFAC2011) model. For haul trucks, a 20-mile one-way trip length was used, based on CalEEMod® default truck trip lengths, and for vendor trucks a 7.3-mile trip length was used, based on the regional default vendor trip length from CalEEMod®. The emission factors for running emissions for criteria pollutants were generated with the last version of the EMFAC2011, released on September 30, 2011, and updated in January 2013. The model includes updated information on California's car and truck fleets and travel activity.

Emissions reported by the model were converted to units of grams of pollutant emitted per vehicle mile traveled (VMT) using the daily VMT for running emissions, or grams of pollutant emitted per trip for idling, starting, and evaporative emissions.

2.1.3 Construction Worker Commuting Vehicles

Worker commute trip emissions were included in the emissions inventory for construction. The number of trips by workers was estimated based on data received from ESA in coordination with the Sponsor with regard to construction phasing. ENVIRON used emission factors from EMFAC2011 and default construction worker trip lengths from CalEEMod® to estimate worker trip emissions.

[3] http://caleemod.com/

Table 1: Emissions Calculations Methodology
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Type	Source	Methodology and Formula	Reference
Construction Equipment	Off-Road Equipment[1]	$Ec = \Sigma(EFc * HP * LF * Hr * C)$	ARB/USEPA Engine Standards USEPA NONROAD
Construction and Operational On-Road Mobile Sources[2]	Running Exhaust and Running Losses	$E_R = \Sigma(EF_R * VMT * C)$, where $VMT = Trip\ Length * Trip\ Number$	EMFAC2011
	Starting Exhaust and Evaporative ROG	$E_S = \Sigma(EF_S * Trip\ Number * C)$	EMFAC2011
	Idling Exhaust	$E_I = \Sigma(EF_I * Trip\ Number * T_I * C)$	EMFAC2011
Operational On-Road Mobile Sources	Fugitive Road Dust from Paved Roads[3]	$E_{ext} = [k*(sL)^{0.91}*(W)^{1.02}]*(1-P/4N)$	USEPA 2011
Operation	Generator[4]	$E = EF * HP * Hr$	ARB/USEPA Off-Road Engine Standards

Notes:
1. E_C: off-road equipment exhaust emissions (lb).

2. On-road mobile sources include all diesel truck trips

E_R: running exhaust and running losses emissions (lb).

E_S: vehicle starting exhaust and evaporative ROG emissions (lb).

E_I: vehicle idling emissions (lb).
EF_I: vehicle idling emission factor (g/hr-trip). From EMFAC2011.
T_I: idling time
C: unit conversion factor.

3. E_{ext}: annual or other long-term average emission factor (lb/VMT).
k: particle size multiplier for particle size range (lb/VMT); sL: road surface silt loading (g/m^2); W: average weight (tons) of all the vehicles traveling the road; P: number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period; N: number of days in the averaging period (365 for annual).

4. E: generator engine emissions
EF: compression-ignition (diesel) engine emission factor. ARB/USEPA engine PM standard based on engine tier will be used.
HP: generator horsepower; Hr: generator hours. Assume 50 hours of operation annually as a conservative assumption.

Other Abbreviations:
ARB: California Air Resources Board; BAAQMD: Bay Area Air Quality Management District;; EF: Emission Factor; EMFAC: Emission Factor Model EP: Environmental Planning; g: gram; HP: Horsepower; lb: pound; LF: Load Factor; mi: mile; USEPA: United States Environmental Protection Agency; VMT: vehicle miles traveled

References:
ARB/USEPA. 2013. Table 1: ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards. Available online at: http://www.arb.ca.gov/msprog/ordiesel/documents/Off-Road_Diesel_Stds.xls
ARB. 2011. EMission FACtors Model, 2011 (EMFAC2011).
USEPA. 2011. AP 42, Volume I, Fifth Edition. §13.2.1. Paved Roads. Available online at: http://www.epa.gov/ttnchie1/ap42/ch13/final/c13s0201.pdf

2.1.4 Architectural Coating and Consumer Products Emissions

ENVIRON used CalEEMod® to estimate reactive organic gas (ROG) emissions from architectural coating. Compliance with BAAQMD regulations restricting the volatile organic compound (VOC) content of commercial paints was assumed. ENVIRON used the San Francisco-specific area source emission factors developed by SFEP for ROG from consumer products which is 1.51E-05 lb/ROG/sqft/day.

2.1.5 Summary of Project Construction Criteria Pollutant Emissions

CAPs from Project construction phases were added and then normalized over the number of days in the construction period.

2.2 Calculation Methodologies for Operational Emission Sources

Operational emission calculation methodologies are divided into stationary, area, and mobile sources. For each category, emissions are estimated based on data from the Project Sponsor. The methodology used to calculate operational emissions from each category is presented in Table 1: Emissions Calculations Methodology.

2.2.1 Stationary Sources

The proposed Project will include new natural gas-fired boilers and five diesel back-up engines. Emissions were calculated based on information provided by the Project Sponsor and assume Tier 4 ARB and USEPA off-road diesel engine standards (ARB 2013). It should be noted that these stationary sources will be permitted with the BAAQMD and all sources are expected to comply with applicable Best Available Control Technology (BACT) and Best Available Control Technology for Toxics (TBACT) requirements.

2.2.2 Area Sources

The proposed Project includes area sources such architectural coatings, landscape equipment, and consumer products use. These emissions were estimated using CalEEMod®, based on the type and size of land uses associated with the Project. ENVIRON used San Francisco-specific area source emission factors developed by SFEP for ROG from consumer products.

2.2.3 Mobile Sources

The proposed Project would generate vehicle trips, which were provided by SEIR transportation analysts in coordination with ESA. Project traffic was evaluated using EMFAC2011 for the vehicle fleet mix in the San Francisco Bay Area. Additionally, Project-specific types of traffic such as delivery trucks were evaluated using vehicle-type specific emission factors from EMFAC2011, based on Project-specific traffic data as provided by ESA in coordination with the Sponsor. Fugitive road dust emissions are estimated using methodologies consistent with CalEEMod®. The methodologies used to calculate operational mobile emissions can be found in Table 1: Emissions Calculations Methodology.

3 Health Risk Assessment

3.1 Introduction

The objective of the HRA is to evaluate the potential impacts of construction and operation of the Project on off-site receptors in the Mission Bay neighborhood of San Francisco. The criterion for whether or not the Project presents a significant air quality impact under the CEQA is if the Project will "expose sensitive receptors to substantial pollutant concentrations," from Appendix G of the CEQA Guidelines.[4] To evaluate impacts in San Francisco, SFEP requires an HRA for an Environmental Impact Report (EIR) if a project is within an APEZ,[5] defined as an area in which modeled air pollution exceeds "either: (1) a cancer risk of greater than 100 per one million exposed, and/or (2) $PM_{2.5}$ concentrations in excess of 10 microgram per cubic meter (µg/m^3) (including ambient)."[6]

The Project is not in an APEZ, based on air dispersion modeling performed by the San Francisco Department of Public Health in conjunction with SFEP and the BAAQMD.[7] The Project is not bounded by an APEZ, either, with the nearest APEZ falling over the University of California, San Francisco (UCSF) Mission Bay campus, to the west of the Project. The parcels immediately surrounding the Project have average excess cancer risks below 50 in one million persons, with lower risks to the east of Third Street. The nearest residential parcel is the UCSF dormitory to the northwest of the Project; risks at this parcel are below 26 in one million, although the average period of residence in the dormitory is less than the 70 years assumed in excess cancer risk calculations. Another sensitive receptor is located at the UCSF Medical Center at Mission Bay to the southwest of the Project; risks at this parcel are below 45 in one million, but again the average period of residence is less than 70 years. At the dormitory, background $PM_{2.5}$ concentration from the City-wide modeling is 8.5 µg/m^3. At the UCSF Medical Center, background $PM_{2.5}$ concentration is 8.6 µg/m^3.

Since the Project is not in an APEZ, the subsequent criterion of significance is whether or not the Project will create an APEZ. The Project's excess cancer risk and $PM_{2.5}$ contribution is evaluated for contributions from two schemes, construction and operation. A lifetime cumulative risk and annual average $PM_{2.5}$ concentration including both construction and operation is considered and compared against the APEZ thresholds. Annual average $PM_{2.5}$ concentration

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4 Appendix G to the CEQA Guidelines, California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000-15387.

5 San Francisco Planning Department, Environmental Planning. AQ Interim Standard Language – Negative Declarations and Environmental Impact Reports.

6 Department of Public Health, Environmental Health, City and County of San Francisco. 2014. Memorandum to file Re 2014 Air Pollutant Exposure Zone Map. April 9.

7 See Air Pollutant Exposure Zone map (http://www.sfdph.org/dph/files/EHSdocs/AirQuality/AirPollutantExposureZoneMap.pdf) and DPH website (http://www.sfdph.org/dph/eh/Air/Article38.asp).

For parcel-specific information, see the Zoning designation for Mission Bay South Redevelopment Plan Blocks 29-32; Assessor's Block 8722, Lots 001 and 008. This is the parcel bounded by South Street on the north, Third Street on the west, 16th Street on the south, and roughly by the future planned realigned Terry A. Francois Boulevard on the east.

The Project is not in a "health vulnerability layer" as defined in the 2014 Air Pollutant Exposure Zone Map memorandum, either, as it is not in the affected zip codes or within 500 feet of a freeway.

during both construction and after operation of the Project as considered individually and compared against the APEZ thresholds.

To show that the Project will not create an APEZ at nearby residential or sensitive receptors, ENVIRON performed a construction HRA using the USEPA AERMOD model[8] and performed an operational HRA using the BAAQMD screening tools and the USEPA SCREEN3 model.[9]

Many elements of the HRA are designed to provide conservative (that is, health protective) overestimates of impacts to off-site receptors. For residential receptors, the assumption of 24 hours per day of exposure represents a maximum exposure, since based on USEPA activity studies people spend on average 58 to 82% of their time at home, depending on age group (USEPA 2011). In addition, indoor air concentrations are not the same as outdoor air concentrations, however this analysis assumes that there is no filtration or attenuation in the indoor air. ~~Other conservative assumptions made here include the use of BAAQMD screening tables for on-road traffic and the maximum generator risk of 30 in one million, assuming the generators are permitted as three separate projects.~~ The BAAQMD HRA guidelines are also designed to be protective of human health, for example relying on the 80th percentile breathing rate for adults rather than the average and the upper 95th percentile breathing rate for children rather than the average (BAAQMD 2010).

3.2 Estimated Air Concentrations for Construction HRA

Consistent with the City-wide HRA, the air toxics analysis evaluated health risks and $PM_{2.5}$ concentrations resulting from the Project upon the surrounding community. Project construction is planned for a 27-month period starting in late 2015. The Project Sponsor provided ENVIRON with the proposed construction off-road equipment list, count, and activity; and on-road vehicle traffic. ARB tools and methods were used to estimate emissions of diesel particulate matter (DPM) and other TACs from the off- and on-road equipment list.

3.2.1 Chemical Selection

The cancer risk analysis in the construction HRA is based on DPM concentrations and total organic gases (TOGs) from diesel equipment and on-road vehicles. Diesel exhaust, a complex mixture that includes hundreds of individual constituents (California Environmental Protection Agency [Cal/EPA] 1998), is identified by the State of California as a known carcinogen (Cal/EPA 2014). Under California regulatory guidelines, DPM is used as a surrogate measure of carcinogen exposure for the mixture of chemicals that make up diesel exhaust as a whole (Cal/EPA 2014). Cal/EPA and other proponents of using the surrogate approach to quantifying cancer risks associated with the diesel mixture indicate that this method is preferable to a component-based approach. A component-based approach involves estimating risks for each of the individual components of a mixture. Critics of the component-based approach believe it will underestimate the risks associated with diesel as a whole because the identity of all chemicals in the mixture may not be known or exposure and health effects information for all chemicals identified within the mixture may not be available. Furthermore, Cal/EPA has concluded that "potential cancer risk from inhalation exposure to whole diesel exhaust will exceed the multi-

8 Available at http://www.epa.gov/ttn/scram/dispersion_prefrec.htm#aermod.

9 Available at http://www.epa.gov/ttn/scram/dispersion_screening.htm.

pathway cancer risk from the speciated components (Cal/EPA 2003)." The analysis of DPM for this Project is based on the surrogate approach, as recommended by Cal/EPA.

3.2.2 Project Sources

Near-field air dispersion modeling of DPM and $PM_{2.5}$ from Project construction sources was conducted using the USEPA AERMOD model.[10] For each receptor location, the model generates average air concentrations that result from emissions from multiple sources.

Air dispersion models such as AERMOD require a variety of inputs such as source parameters, meteorological parameters, topography information, and receptor parameters. When site-specific information was unknown, ENVIRON used default parameter sets that are designed to produce conservative (i.e., overestimated) air concentrations.

3.2.3 Meteorological Data

Air dispersion modeling applications require the use of meteorological data that ideally are spatially and temporally representative of conditions in the immediate vicinity of the site under consideration. For this HRA, BAAQMD's Mission Bay meteorological data for the year 2008 was used, which aligns with the San Francisco City-wide HRA Methodology (BAAQMD 2012).

3.2.4 Terrain Considerations

Elevation and land use data was imported from the National Elevation Dataset (NED) maintained by the United States Geological Survey (USGS 2013). An important consideration in an air dispersion modeling analysis is the selection of whether or not to model an urban area. Due to the urban nature of San Francisco, the site was modeled with the urban population of 805,235, corresponding to the 2010 US Census.

3.2.5 Emission Rates

Emitting activities were modeled to reflect the actual hours of construction. Emissions were modeled using the χ/Q ("chi over q") method, such that each phase has unit emission rates (i.e., 1 gram per second [g/s]), and the model estimates dispersion factors (with units of [$\mu g/m^3$]/[g/s]).

For annual average ambient air concentrations, the estimated annual average dispersion factors are multiplied by the annual average emission rates. The emission rates will vary day to day, with some days having no emissions. For simplicity, the model assumed a constant emission rate during the entire year.

In the construction model, modeled meteorological hours of the day are restricted to 7:00 am to 1:00 am, the likely hours for emissions to occur. This way, only representative meteorological data was considered in determining the dispersion factors. Emission rates are adjusted such that on average, unit emission rates are modeled, i.e. 1 g/s for 24 hours a day, 7 days a week. Thus, the model provides an annual average concentration that can be incorporated directly into the health risk calculations assuming 24 hours of daily exposure.

[10] On November 9, 2005, the USEPA promulgated final revisions to the federal Guideline on Air Quality Models, in which it recommended that AERMOD be used for dispersion modeling evaluations of criteria air pollutant and toxic air pollutant emissions from typical industrial facilities.

3.2.6 Source Parameters

Source location and parameters are necessary to model the dispersion of air emissions. The duration of construction on Blocks 29-32 is anticipated to be up to 27 months, with arena and office building construction proceeding concurrently. At any given time there will be multiple emissions sources associated with construction equipment within the construction zone.

Table 2: Modeling Parameters summarizes the source parameters associated with the construction HRA. The construction area was modeled as an Area source encompassing the entire Project site, following City-wide HRA Methodology. The Area source model included emissions from both off-road construction equipment and off-site trucks (trucks going to and from construction zones[11]). A release height of 5 meters was used, with an initial vertical dimension of 1.4 meters. Emissions were distributed uniformly throughout the area source representing construction of that phase.

Table 2: Modeling Parameters
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Period	Source	Source Dimension	Number of Sources[1,2]	Release Height[3]	Initial Vertical Dimension[4]	Initial Lateral Dimension
		[m]		[m]	[m]	[m]
Construction	Construction Equipment and On-Road Trucks	Project Area	2	5.0	1.4	N/A

Notes:
1. Due to lack of specific instructions on modeling of construction emissions from BAAQMD, ENVIRON used methodology from the City-wide HRA when setting up the model. According to the City-wide HRA methodology, construction sources are modeled as area sources.
2. The number of sources is to be determined based on the geometry of the truck routes.
3. According to the City-wide HRA methodology, release height of the modeled construction was set to 5 meters
4. According to the City-wide HRA methodology, initial vertical dimension of the modeled construction sources was set to 1.4 meters.

Abbreviations:
BAAQMD: Bay Area Air Quality Management District
HRA: Health Risk Assessment
K: Kelvin
m: meter
s: second

Reference:
BAAQMD, 2012. *The San Francisco Community Risk Reduction Plan: Technical Support Documentation, V9.*

11 ENVIRON assumed a 20 mile one-way trip length for Construction Hauling, based on CalEEMod™ default values, if Project-specific data is not available.

Table 2b: Modeling Parameters
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Period	Source	Source Type[1]	Stack Parameters[1]			
			Height	Diameter	Temperature	Velocity
Operation	Emergency Generators	Point	3.66 m	0.18 m	739.8 K	45.3 m/s

Notes:

1. Ramboll Environ used methodology from the City-wide HRA (BAAQMD 2012) when setting up the model. According to the City-wide HRA methodology, generators are modeled as point sources.

Abbreviations:

K: Kelvin
m: meter
s: second

References:

Bay Area Air Quality Management District (BAAQMD). 2012. The San Francisco Community Risk Reduction Plan: Technical Support Document. December.

3.2.7 Receptors

Offsite receptors were placed at locations collocated with the grid receptors used in the City-wide HRA and within 2,000 feet of the Project site. Receptors were modeled at a height of 1.8 meters above terrain height, a default breathing height for ground-floor receptors, consistent with the City-wide HRA analysis. As discussed previously, average annual dispersion factors were estimated for each receptor location.

3.2.8 Modeling Adjustment Factors

Cal/EPA (2003) recommends applying an adjustment factor to the annual average concentration modeled assuming continuous emissions (i.e., 24 hours per day, 7 days per week), when the actual emissions are less than 24 hours per day and exposures are concurrent with construction activities occurring at the Project.

Off-site residents are assumed to be exposed to construction emissions 24 hours per day, seven days per week. This assumption is consistent with the modeled emission rates (24 hours per day, 7 days per week), even though actual construction operations may occur for fewer than 24 hours per day and fewer than 7 days per week. Thus, the annual average concentration need not be adjusted. This approach simplifies the model set up, yet does not underestimate exposure since ENVIRON is evaluating chronic health risk impacts and follows City-wide HRA Methodology.

3.3 Risk Characterization Methods for Construction HRA

The following sections discuss in detail the various components required to conduct the HRA.

3.3.1 Exposure Assessment

3.3.1.1 Potentially Exposed Populations

The Construction HRA conservatively evaluated impacts at the off-site receptors assuming child residents.[12] As the residential exposure assumptions are more conservative than those for other sensitive receptor types, a conservative approach of considering all receptors as residential receptors was used. In addition, for the purposes of the cumulative APEZ analysis, the HRA also evaluated impacts at the UCSF Medical Center at Mission Bay assuming a child receptor. The impacts at the hospital consider outdoor air concentrations only, although indoor air at hospitals is filtered to lower indoor air particulate matter concentrations versus outdoor air.

3.3.1.2 Exposure Assumptions

The exposure parameters used to estimate excess lifetime cancer risks for all potentially exposed populations for the construction and operation scenarios are based on risk assessment guidelines from Cal/EPA (2003) and BAAQMD (2010), unless otherwise noted, and are presented in Table 3: Exposure Parameters.

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[12] As Child Resident exposure assumptions are more conservative than those for Adult Residents, a conservative approach of considering all off-site receptors as Child Residents during Construction scenario is used in this HRA.

Table 3: Exposure Parameters
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Exposure Parameter	Units	Construction	
		Child Resident	Hospital Child
Daily Breathing Rate (DBR)[1]	[L/kg-day]	581	581
Exposure Time (ET)[2]	[hours/24 hours]	24	24
Exposure Frequency (EF)[3]	[days/year]	350	365
Exposure Duration (ED)[4]	[years]	2	1
Averaging Time (AT)	[days]	25,550	25,550
Intake Factor, Inhalation (IF_{inh})	[m^3/kg-day]	0.016	0.0083

Notes:
1. Daily breathing rate for child resident reflects default breathing rate from BAAQMD 2010.
2. Exposure time for child resident reflects default exposure time from BAAQMD 2010.
3. Exposure frequency for child resident reflects default exposure frequency from BAAQMD 2010.
4 The exposure duration was assumed to be 2 years for child resident reflecting the actual construction duration. Exposure time was conservatively assumed to be 1 year for hospital child.

Abbreviations:
BAAQMD = Bay Area Air Quality Management District; L = liter; kg = kilogram; m^3 = cubic meter

Reference:
BAAQMD. 2010. Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. January.

3.3.1.3 Calculation of Intake

The dose estimated for each exposure pathway is a function of the concentration of a chemical and the intake of that chemical. The intake factor for inhalation, IF_{inh}, can be calculated as follows:

$$IF_{inh} = \frac{DBR * ET * EF * ED * CF}{AT}$$

Where:

IF_{inh}	=	Intake Factor for Inhalation (m^3/kg-day)
DBR	=	Daily Breathing Rate (L/kg-day)
ET	=	Exposure Time (hours/24 hours)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
AT	=	Averaging Time (days)
CF	=	Conversion Factor, 0.001 (m^3/L)

The chemical intake or dose is estimated by multiplying the inhalation intake factor, IF_{inh}, by the chemical concentration in air, C_i. When coupled with the chemical concentration, this calculation is mathematically equivalent to the dose algorithm given in Office of Environmental Health Hazard Assessment (OEHHA) Hot Spots guidance (Cal/EPA 2003).

3.3.2 Toxicity Assessment

The toxicity assessment characterizes the relationship between the magnitude of exposure and the nature and magnitude of adverse health effects that may result from such exposure.

Following City-wide HRA Methodology for cancer risk calculations, ENVIRON included toxicity for DPM for all source categories, and additionally included organic gases from on-road gasoline-powered vehicles. Toxicity values are summarized in Table 4: Carcinogenic Toxicity Values.

Table 4: Carcinogenic Toxicity Values
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Source	Analysis	Chemical	Cancer Potency Factor $[mg/kg\text{-}day]^{-1}$
Construction Diesel Vehicles	Cancer Risk	Diesel PM	1.1
Construction Gasoline Vehicles	Cancer Risk	1,3-Butadiene	0.6
		Acetaldehyde	0.01
		Benzene	0.1
		Ethylbenzene	0.0087
		Formaldehyde	0.021
		Naphthalene	0.12

Abbreviations:
ARB: Air Resources Board; Cal/EPA: California Environmental Protection Agency; mg/kg-day: per milligram per kilogram-day; OEHHA - Office of Environmental Health Hazard Assessment; PM: Particulate Matter

Reference:
Cal/EPA. 2014. OEHHA/ARB Consolidated Table of Approved Risk Assessment Health Values. July.

3.3.3 Calculated Age-Specific Sensitivity Factors

The estimated excess lifetime cancer risks for a resident child were adjusted using the age sensitivity factors (ASFs) recommended in the Cal/EPA OEHHA Technical Support Document (TSD) (2009) and the cancer risk adjustment factors (CRAFs) recommended by BAAQMD (2010). This approach accounts for an “anticipated special sensitivity to carcinogens” of infants and children. Cancer risk estimates are weighted by a factor of 10 for exposures that occur from the third trimester of pregnancy to two years of age and by a factor of three for exposures that occur from two years through 15 years of age. No weighting factor (i.e., an ASF of one, which is equivalent to no adjustment) is applied to ages 16 to 70 years.

3.3.4 Estimation of Cancer Risks

Excess lifetime cancer risks are estimated as the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to potential carcinogens. The estimated risk is expressed as a unitless probability. The cancer risk attributed to a chemical is calculated by multiplying the chemical intake or dose at the human exchange boundaries (*e.g.,* lungs) by the chemical-specific Cancer Potency Factor (CPF).

The equation used to calculate the potential excess lifetime cancer risk for the inhalation pathway is as follows:

$$Risk_{inh} = C_i \times CF \times IF_{inh} \times CPF \times ASF$$

Where:

$Risk_{inh}$	=	Cancer Risk; the incremental probability of an individual developing cancer as a result of inhalation exposure to a particular potential carcinogen (unitless)
C_i	=	Annual Average Air Concentration for $Chemical_i$ ($\mu g/m^3$)
CF	=	Conversion Factor (mg/μg)
IF_{inh}	=	Intake Factor for Inhalation (m^3/kg-day)
CPF_I	=	Cancer Potency Factor for $Chemical_i$ (mg chemical/kg body weight-day)$^{-1}$
ASF	=	Age Sensitivity Factor (unitless)

3.4 Operational Traffic Screening

BAAQMD on-road traffic tools were used along with Project-specific data to estimate $PM_{2.5}$ and health-risk impacts from on-road traffic. The BAAQMD San Francisco County Surface Street Screening Tables[13] provide screening risk estimates for this level of traffic for north-south roadways and east-west roadways in San Francisco County. All traffic generated by the Project was assumed to travel along the four segments surrounding the Project Site, resulting in a conservative estimate of impacts from mobile sources, as all Project traffic may not take these routes.

3.5 Operational Stationary Sources

The Project will include new natural gas-fired boilers to provide heating to the proposed arena. According to the BAAQMD,[14] non-diesel boilers are regarded as minor, low-impact sources that can be excluded from the CEQA process. The Project will also include 5 stationary emergency diesel engines which will require stationary source permits from the BAAQMD. ~~BAAQMD Rule 2-5-302 limits project risks to 10 in one million, so for screening purposes incremental risk from the generators is assumed to be 10 in one million. In the worst case, the generators might have up to 3 different owners, resulting in 3 permits with risks of up to 10 in one million each, for a total potential generator risk of 30 in one million.~~

$PM_{2.5}$ impacts were modeled using the USEPA SCREEN3 model. SCREEN3 is a Gaussian air dispersion model that uses a worst-case, not site-specific, meteorological dataset to estimate maximum impacts.

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[13] BAAQMD. 2011. Roadway Screening Analysis Tables. December. Available online at : http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/County%20Surface%20Street%20Screening%20Tables%20Dec%202011.ashx?la=en

[14] BAAQMD. 2012. Recommended Methods for Screening and Modeling Local Risks and Hazards. Available online at : http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/Risk%20Modeling%20Approach%20May%202012.ashx?la=en

4 Measures to Reduce Project Impacts

Based on the analysis above, a consultation was conducted with OCII, EP, ESA, and the Project sponsor to identify and develop feasible control measures that would reduce Project impacts. For construction emissions two compliance levels of emissions control measures were assessed: use of construction equipment with EPA Tier 2 engines with Level 3 Verifiable Diesel Emission Control Strategy (VDECS) and EPA Tier 4 engines. While use of equipment with Tier 4 would be the most effective emissions control strategy, the analysis also considers a minimum compliance scenario using use of equipment with EPA Tier 2 engines with Level 3 VDECS, acknowledging that there may be instances where a particular piece of off-road equipment with a Tier 4 engine is: (1) technically not feasible, (2) would not produce desired emissions reductions due to expected operating modes, or (3) there is a compelling emergency need to use off-road equipment that do not have Tier 4 engines.

5 References

Bay Area Air Quality Management District (BAAQMD). 2010. Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. January. Available online at: http://www.baaqmd.gov/~/media/Files/Engineering/Air%20Toxics%20Programs/hrsa_guidelines.ashx.

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California Environmental Protection Agency (Cal/EPA). 1998. Findings of the Scientific Review Panel on The Report on Diesel Exhaust, as adopted at the Panel's April 22, 1998, meeting. Available online at: http://www.arb.ca.gov/toxics/dieseltac/de-fnds.htm.

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Cal/EPA. 2009. Technical Support Document for Cancer Potency Factors: Methodologies for Derivation, Listing of Available Values, and Adjustment to Allow for Early Life Stage Exposures. May. Available online at: http://oehha.ca.gov/air/hot_spots/2009/TSDCancerPotency.pdf.

Cal/EPA. 2014. OEHHA/ARB Consolidated Table of Approved Risk Assessment Health Values. July. Available online at: http://www.arb.ca.gov/toxics/healthval/contable.pdf.

United States Geological Survey (USGS). National Elevation Dataset. Available online at: http://www.mrlc.gov/viewerjs.

6 Results

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Project Tables

Table 6.1-1
Toxicity-Weighted Construction Emissions
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Chemical	Unit Risk Factor[1] $(ug/m^3)^{-1}$	Uncontrolled Project Emissions[3] (lb/project)	Weighted (lb/project)-(m^3/µg)	Percent Contribution to Risk
Diesel PM[4]	3.0E-04	4,112	1.2	99.8%
TACs from Speciated Gasoline TOG due to Tailpipe Emissions[2]	1.81E-06	1,263	0.0023	0.18%
TACs from Speciated Gasoline TOG due to Evaporative Losses[2]	1.07E-07	1,861	0.0002	0.02%

Chemical	Unit Risk Factor[1] $(ug/m^3)^{-1}$	Controlled Tier 4 Project Emissions[3] (lb/project)	Weighted (lb/project)-(m^3/µg)	Percent Contribution to Risk
Diesel PM[4]	3.0E-04	586	0.18	98.6%
TACs from Speciated Gasoline TOG due to Tailpipe Emissions[2]	1.81E-06	1,263	0.0023	1.3%
TACs from Speciated Gasoline TOG Evaporative Losses[2]	1.07E-07	1,861	0.0002	0.1%

Notes:

1. From Cal/EPA 2013.
2. From BAAQMD 2012.
3. Emissions estimates are subject to change before publication of draft Environmental Impact Report.
4. Includes DPM emissions from off-road equiment and on-road sources. Emissions in the controlled scenario reflect the use of Tier 4 off-road equipment.

Abbreviations:

PM: particulate matter
lb: pound
g: gram
s: second
TOG: Total Organic Gas
µg: microgram

References:

Bay Area Air Quality Management District (BAAQMD). 2012. Recommended Methods for Screening and Modeling Local Risks and Hazards. May. http://baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/Risk%20Modeling%20Approach%20May%202012.ashx?la=en

Cal/EPA. 2013. OEHHA/ARB Consolidated Table of Approved Risk Assessment Health Values. August. http://www.arb.ca.gov/toxics/healthval/contable.pdf

Refined Table 6.1-2
Construction Particulate Matter Emissions
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Emissions	Units	Uncontrolled Scenario	Controlled Tier 4 Scenario	Controlled Tier 2 + ARB NOx VDECS Scenario
Project construction $PM_{2.5}$ emissions[1]	[lb/project]	~~4,118~~ 4,078	592	~~706~~ 705
Project construction DPM emissions[1]	[lb/project]	~~4,112~~ 4,073	586	~~701~~ 699
Dewatering generator $PM_{2.5}$ emissions[2]	[lb/project]	15	15	15
Dewatering generator DPM emissions[2]	[lb/project]	15	15	15
Muni platform construction $PM_{2.5}$ emissions[3]	[lb/project]	7.4	4.2	7.4
Muni platform construction DPM emissions[3]	[lb/project]	7.4	4.2	7.4
Construction duration	[years]	2	2	2
Annual Project DPM emissions	[lb/year]	~~2,056~~ 2,036	293	~~350.25~~ 349
Annual dewatering generator DPM emissions	[lb/year]	7.4	7.4	7.4
Annual muni platform DPM emissions	[lb/year]	3.7	2.1	3.7
Average Project $PM_{2.5}$ emissions	[g/s]	~~0.030~~ 0.029	0.004	0.005
Average Project DPM emissions	[g/s]	~~0.030~~ 0.029	0.004	0.005
Average dewatering generator $PM_{2.5}$ emissions	[g/s]	1.1E-04	1.1E-04	1.1E-04
Average dewatering generator DPM emissions	[g/s]	1.1E-04	1.1E-04	1.1E-04
Average Muni platform $PM_{2.5}$ emissions	[g/s]	5.3E-05	3.0E-05	5.3E-05
Average Muni platform DPM emissions	[g/s]	5.3E-05	3.0E-05	5.3E-05

Notes:

1. Includes emissions from off-road equiment and on-road sources. Emissions in the controlled scenario reflect the use of Tier 4 or Tier 2 + ARB NOx VDECS off-road equipment. The pug mill generator (with Tier 4 engine) is included in each scenario.

2. Includes emissions from nine small generators that will operate 24 hours/day during the first six months of construction. The Project Sponsor has committed to Tier 4 engines for all generators used during construction, so those emissions are presented for all scenarios.

3. Includes emissions from 12 weekends of construction for the Muni platform extension.

Abbreviations:
DPM: Diesel particulate matter
lb: pound
g: gram
m^2: square meter
s: second

Table 6.1-3
Annual Average Daily Traffic from Project Operation
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Trip Type	Scenario	Days Per Year	Daily One-way Vehicle Trips[1]
Mission Bay, Weekday Trips	Basketball Event Days	30	13,691
	Concert Event Days[2]	45	13,691
	Convention Event Days	61	9,023
	No Event Days	125	6,990
Mission Bay, Weekend Trips	Basketball Event Days	30	12,330
	Concert Event Days[2]	55	12,330
	No Event Days	19	5,877
		Annual One-way Vehicle Trips:	3,610,691
		Annual Average Daily Traffic (AADT):	**9,892**

Notes:
1. Based on preliminary traffic data from Adavant Consulting.
2. Trips conservatively assumed to be equal to basketball event days.

Table 6.1-4
Screening $PM_{2.5}$ Concentrations and Cancer Risks from Operational Traffic
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Impact[1]	North-South Roadway Impact	East-West Roadway Impact	Total Impact from 4 Adjacent Roadways
$PM_{2.5}$ Concentration (ug/m^3)	0.080	0.078	0.32
Lifetime Cancer Risk (in a million)	2.2	1.4	7.2

Notes:

1. Based on BAAQMD County Surface Street Screening Tables for San Francisco County. A distance of 10 feet from the roadway is conservatively assumed and impacts are interpolated for estimated traffic volume.

References:

Bay Area Air Quality Management District (BAAQMD). 2011. Roadway Screening Analysis Tables. December. Available online at :
http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/County%20Surface%20Street%20Screening%20Tables%20Dec%202011.ashx?la=en

Refined Table 6.1-5
AERMOD Construction Screening Inputs and Outputs
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Parameter	**Inputs and Outputs**						
Source	Construction			Dewatering Generators[1]	Muni Platform		
Source Type	Area				Area		
Emission Rate (g/s-m^2)	2.19869E-05				3.32E-04		
Release Height (m)	5				5		
Area (m^2)	45481.57185				3,015		
Receptor Height (m)	1.8				1.8		
Urban/Rural (U/R)	U				U		
Meteorological Station	Mission Bay 2008				Mission Bay 2008		
Dispersion Factor (µg/m^3 per g/s)							
Annual Average Dispersion Factor at Dormitory Receptor	10.41			14.7	126		
Annual Average Dispersion Factor at Hospital Receptor	10.36			12.7	13		
Annual Average Dispersion Factor at Child Daycare Receptor	40.7			58.5	143		
Emission Rate (g/s)	**Uncontrolled**	**Tier 4**	**Tier 2 + ARB NOx VDECS Controlled**	**Tier 4**	**Uncontrolled**	**Tier 4**	**Tier 2 + ARB NOx VDECS Controlled**
$PM_{2.5}$ Emission Rate	~~0.030~~ 0.029	0.0043	0.0051	1.1E-04	5.3E-05	3.0E-05	5.3E-05
Diesel PM Emission Rate	~~0.030~~ 0.029	0.0042	0.0050	1.1E-04	5.3E-05	3.0E-05	5.3E-05
Concentration (µg/m^3)	**Uncontrolled**	**Tier 4**	**Tier 2 + ARB NOx VDECS Controlled**	**Tier 4**	**Uncontrolled**	**Tier 4**	**Tier 2 + ARB NOx VDECS Controlled**
Annual Maximum $PM_{2.5}$ Conc at Dormitory Receptor	0.31	0.044	0.053	0.0016	0.0067	0.0038	0.0067
Annual Maximum $PM_{2.5}$ Conc at Hospital Receptor	~~0.31~~ 0.30	0.044	0.053	0.0014	7.1E-04	4.0E-04	7.1E-04
Annual Maximum $PM_{2.5}$ Conc at Child Daycare Receptor	1.2	0.17	0.21	0.0063	0.0077	0.0043	0.0077
Annual Maximum DPM Conc at Dormitory Receptor	~~0.31~~ 0.30	0.044	0.052	0.0016	0.0067	0.0038	0.0067
Annual Maximum DPM Conc at Hospital Receptor	~~0.31~~ 0.30	0.044	0.052	0.0014	7.1E-04	4.0E-04	7.1E-04
Annual Maximum DPM Conc at Child Daycare Receptor	1.2	0.17	0.20	0.0063	0.0077	0.0043	0.0077

Notes:
1. The Project Sponsor has committed to Tier 4 engines for all generators used during construction, the dispersion factors differ due to 24 hour use of the generators.

Abbreviations:
g: gram
m: meter
m^2: square meter
m^3: cubic meter
PM: particulate matter
s: second
µg: microgram

Refined Table 6.1-6
Screening $PM_{2.5}$ Concentration Results
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Scenario	Concentration [µg/m³]		
	Dormitory Receptor	**Hospital Receptor**	**Daycare Receptor**
Construction			
$PM_{2.5}$ Concentration from Uncontrolled Construction Emissions[1]	0.31	0.31	1.2
$PM_{2.5}$ Concentration from Tier 4 Controlled Construction Emissions[1]	~~0.044~~ 0.050	~~0.044~~ 0.046	~~0.17~~ 0.18
$PM_{2.5}$ Concentration from Tier 2 + ARB NOx VDECS Mitigated Construction Emissions[1]	~~0.053~~ 0.061	~~0.053~~ 0.055	~~0.021~~ 0.22
2014 Background $PM_{2.5}$ Concentration[2]	8.5	8.6	8.4
Total $PM_{2.5}$ Concentration (Construction, Uncontrolled scenario)	8.8	8.9	9.6
Total $PM_{2.5}$ Concentration (Construction, Tier 4 Controlled scenario)	8.5	8.7	8.5
Total $PM_{2.5}$ Concentration (Construction, Tier 2 + ARB NOx VDECS Controlled scenario)	~~8.5~~ 8.6	8.7	8.6
Cumulative Threshold[3]	10	10	10
Total $PM_{2.5}$ Concentration Exceeds Threshold? (Uncontrolled scenario)	No	No	No
Total $PM_{2.5}$ Concentration Exceeds Threshold? (Tier 4 Controlled scenario)	No	No	No
Total $PM_{2.5}$ Concentration Exceeds Threshold? (Tier 2 + ARB NOx VDECS Mitigated scenario)	No	No	No
Operational			
$PM_{2.5}$ Concentration from Operational Traffic	0.32	0.32	0.32
~~$PM_{2.5}$ from Emergency Diesel Generators[3]~~	~~0.055~~	~~0.055~~	~~0.055~~
$PM_{2.5}$ from South Street Tower Emergency Diesel Generator[4]	0.0012	3.8E-04	0.0027
$PM_{2.5}$ from 16th Street Tower Emergency Diesel Generator[4]	4.5E-04	0.0011	5.0E-04
$PM_{2.5}$ Concentration from GSW Arena Emergency Diesel Generators[4]	0.0018	0.0033	0.0022
2014 Background $PM_{2.5}$ Concentration[2]	8.5	8.6	8.4
Total $PM_{2.5}$ Concentration (Operational)	~~8.9~~ 8.8	~~9.0~~ 8.9	8.7
Cumulative Threshold[3]	10	10	10
Total $PM_{2.5}$ Concentration Exceeds Threshold? (Operational)	No	No	No

Notes:

1. The concentration associated with generators reflect Tier 4 engine assumptions.

~~1.~~ 2. 2014 background risk from the Citywide HRA database for all receptors.

~~2.~~ 3. Cumulative threshold is the threshold for creating an Air Pollutant Exposure Zone (APEZ), as defined by the San Francisco Planning Department, Environmental Planning.

~~3. Back-calculated assuming a cancer risk of 10 in a million for each of the three generators (total of 30 in a million). The cancer risk of 10 in a million is the maximum allowable Project cancer risk from toxic air contaminants in the BAAQMD, and exposure assumptions for a 70-year resident.~~

4. Generators were modeled using source parameters for standby generators published in SF-CRRP (BAAQMD 2012).

Abbreviations:

BAAQMD: Bay Area Air Quality Management District
HRA: Health Risk Assessment
µg: microgram
m³: cubic meter

References:

Bay Area Air Quality Management District (BAAQMD). 2012. The San Francisco Community Risk Reduction Plan: Technical Support Document. December.

Refined Table 6.1-7
Exposure Parameters and Cancer Risk Adjustment Factors
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Exposure Parameter	Units	Child Resident		Adult Resident		Hospital Child		Daycare Child	
		Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Daily Breathing Rate (DBR)[1]	[L/kg-day]	581	302	302	302	581	581	581	581
Exposure Time (ET)[2]	[hours/24 hours]	24	24	24	24	24	24	11	11
Exposure Frequency (EF)[3]	[days/year]	350	350	350	350	365	365	253	253
Exposure Duration (ED)[4]	[years]	2.0	70	2.0	70	1.0	1.0	0.67	5.9
Averaging Time (AT)	[days]	25,550	25,550	25,550	25,550	25,550	25,550	25,550	25,550
Intake Factor, Inhalation (IF_{inh})	[m^3/kg-day]	0.016	0.29	0.0083	0.29	0.0083	0.0083	0.0018	0.016
Cancer Risk Adjustment Factor[5]	[-]	10	1.7	1.0	1.0	10	10	10	5.2
Modeling Adjustment Factor (MAF)[6]	[-]	N/A	N/A	N/A	N/A	N/A	N/A	3.15	N/A

Notes:

1. Daily breathing rate reflects default breathing rate from BAAQMD 2010.

2. Exposure time reflects default exposure time from BAAQMD 2010.

3. Exposure frequency reflects default exposure frequency from BAAQMD 2010.

4. Assumes all construction-related emissions will be emitted within the first two years. Operation of the daycare center is not expected to take place until mid- to late-2017; since Project construction will be largely completed by that time, an exposure duration of 8 months was used as a conservative estimate. Operation is assumed to continue for 70 years. A hospital child is assumed to be present for one year during operation, and a daycare child assumed to present from age 6 weeks to 6 years old during operation.

5. Based on BAAQMD 2010.

6. Construction emissions are conservatively assumed to occur concurrently with the operation of the daycare center. As such, a modeling adjustment factor of (365/253)*(24/11) = 3.15 is applied for the daycare child receptor. Since operational emissions are assumed to occur throughout all hours of the day, a modeling adjustment factor is not needed.

Calculation:

IF_{inh} = DBR * ET * EF * ED * CF / AT

CF = 0.001 (m^3/L)

Abbreviations:

BAAQMD: Bay Area Air Quality Management District
L: liter
kg: kilogram
m^3: cubic meter
MAF: Modeling Adjustment Factor

References:

BAAQMD. 2010. BAAQMD Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. January.
http://baaqmd.gov/~/media/Files/Engineering/Air%20Toxics%20Programs/hrsa_guidelines.ashx?la=en

Refined Table 6.1-8
Screening Cancer Risk Results
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Scenario	Units	Dormitory Receptor		Hospital Child Receptor	Daycare Child Receptor
		Child Resident	Adult Resident		
Diesel PM Cancer Potency Factor (CPF)[1]	$[mg/kg\text{-}day]^{-1}$	1.1	1.1	1.1	1.1
Excess Cancer Risk from Uncontrolled Construction Emissions[2,3]	[in a million]	~~54~~ 55	~~2.8~~ 2.9	28	73
Excess Cancer Risk from Tier 4 Controlled Construction Emissions[2,3]	[in a million]	~~7.7~~ 8.6	~~0.40~~ 0.45	~~4.0~~ 4.1	~~10.4~~ 11
Excess Cancer Risk from Tier 2 + ARB NOx VDECS Controlled Construction Emissions[2,3]	[in a million]	~~9.2~~ 11	~~0.48~~ 0.55	~~4.8~~ 4.9	~~12.5~~ 13
Excess Cancer Risk from Operational Traffic Emissions[4]	[in a million]	7.2	7.2	7.2	7.2
~~Excess Cancer Risk from Emergency Diesel Generators~~[4]	~~[in a million]~~	~~30~~	~~30~~	~~30~~	~~30~~
Excess Cancer Risk from South Street Tower Emergency Diesel Generator[5]	[in a million]	0.085	0.050	0.0045	0.033
Excess Cancer Risk from 16th Street Tower Emergency Diesel Generator[5]	[in a million]	0.033	0.019	0.013	0.0059
Excess Cancer Risk from GSW Arena Emergency Diesel Generators[5]	[in a million]	0.12	0.072	0.038	0.025
2014 Background Risk[6]	[in a million]	26	26	44	20
Total Excess Cancer Risk (Uncontrolled Scenario)	[in a million]	~~117~~ 88	~~66~~ 36	~~109~~ 79	~~131~~ 101
Total Excess Cancer Risk (Tier 4 Controlled Scenario)	[in a million]	~~71~~ 42	~~64~~ 34	~~85~~ 55	~~68~~ 38
Total Excess Cancer Risk (Tier 2 + ARB NOx VDECS) Controlled Scenario)	[in a million]	~~72~~ 44	~~64~~ 34	~~86~~ 56	~~70~~ 40
Cumulative Threshold[7]	[in a million]	100	100	100	100
Total Risk Exceeds Threshold? (Uncontrolled Scenario)	-	~~Yes~~ No	No	~~Yes~~ No	Yes
Total Risk Exceeds Threshold? (Tier 4 Controlled Scenario)	-	No	No	No	No
Total Risk Exceeds Threshold? (Tier 2 + ARB NOx VDECS Controlled Scenario)	-	No	No	No	No

Notes:

1. From Cal/EPA 2013.

2. Represent health impacts for a residential receptor at the dormitory, hospital, or daycare.

3. The health risk associated with generators reflect Tier 4 engine assumptions, the MAF is not applied for the daycare receptor for emissions from the dewatering generators as they run 24 hours a day.

~~3.~~ 4. The screening values reflect a 70-year cancer risk with age sensitivity factors applied (BAAQMD 2012a).

~~4. A cancer risk of 10 in a million, the maximum allowable Project cancer risk from toxic air contaminants in the BAAQMD, is conservatively assumed.~~

5. Generators were modeled using source parameters for standby generators published in SF-CRRP (BAAQMD 2012b).

~~5.~~ 6. 2014 background risk from the Citywide HRA database for all receptors.

7. Cumulative threshold is the threshold for creating an Air Pollutant Exposure Zone (APEZ), as defined by the San Francisco Planning Department, Environmental Planning.

Calculation:

Cancer Risk = [AnnualConc] × [CF] × [IF_{inh}] × [CPF] x [CRAF] x [MAF]

CF = 0.001 (mg/µg)

Abbreviations:

BAAQMD: Bay Area Air Quality Management District
Cal/EPA: California Environmental Protection Agency
CRAF: Cancer Risk Adjustment Factor
HRA: Health Risk Assessment
IF_{inh}: Intake Factor, Inhalation
kg: kilogram
MAF: Modeling Adjustment Factor
mg: milligram
SF-CRRP: San Francisco Community Risk Reduction Plan
PM: Particulate Matter
µg: microgram

References:

Bay Area Air Quality Management District (BAAQMD). 2012a. Recommended Methods for Screening and Modeling Local Risks and Hazards. May. Available online at: http://baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/Risk%20Modeling%20Approach%20May%202012.ashx?la=en

BAAQMD. 2012b. The San Francisco Community Risk Reduction Plan: Technical Support Document. December.

Cal/EPA. 2013. OEHHA/ARB Consolidated Table of Approved Risk Assessment Health Values. August. Available online at: http://www.arb.ca.gov/toxics/healthval/contable.pdf

Data Request Instructions for Mission Bay Site

Table 1: Off-Road Construction Equipment List

Phase Name	Project Equipment at Site	Horsepower	Equipment Quantity	Usage Hours per Workday	Equipment Start Date (Month #)	Equipment End Date (Month #)	Workdays per Week
Demolition/Mass Excavation	Street Sweeper	285	2	7	1	10	5
Mass Excavation	Large Excavator	523	3	7	1	3	5
Mass Excavation	Scraper	500	3	7	1	3	5
Mass Excavation	Wheel Loader	211	3	7	1	3	5
Mass Excavation	Track Type Tractor Blde/Ripper	150	2	7	1	3	5
Rapid Impact Compaction	Track type tractor with hammer	150	3	7	1	3	5
Pile Installation	Drill Rig (for installation of Auger Cast piles)	1205	4	7	2	4	5
Pile Installation	Crawler Cranes	530	4	7	2	4	5
Pile Installation	Large Forklifts	93	2	7	2	4	5
Pile Installation	Bobcat or small excavators	71	4	7	2	4	5
Pile Installation	Cutting and chopping saws		4	7	2	4	5
Shoring	Drill Rig	150	2	7	2	4	5
Shoring	Support Crane	530	2	7	2	4	5
Shoring	Grout-mixing plant	20	2	7	2	4	5
Shoring	Small Excavator	71	2	7	2	4	5
Shoring	Cut off wall (CDSM) equipment	150	4	7	1	2	5
Building Construction (including arena)	Concrete Boom Pumps	480	2	7	2	13	5
Building Construction (including arena)	Bobcat	71	2	7	2	23	5
Building Construction (including arena)	Small Excavator	404	2	7	2	23	5
Building Construction (including arena)	Large Excavator	523	2	7	2	13	5
Building Construction (including arena)	Crawler Cranes	530	4	7	3	16	5
Building Construction (including arena)	Mobile Cranes	530	4	7	3	23	5
Building Construction (including arena)	Grandall-type Forklifts	93	8	7	3	24	5
Building Construction (including arena)	Cutting/chopping saws		15	7	3	24	5
Building Construction (including arena)	Tile cutting saws		10	7	8	24	5
Building Construction (including arena)	Drywall stud impact guns		25	7	8	20	5

Construction Equipment List

Refined Table 6.1-9

Phase ID	Phase	Project Equipment	OFFROAD Equipment	HP	OFFROAD HP Bin	Tier HP Bin	LF	Quantity	Total Hours	Calendar Year	Construction Year	Fuel
1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	285	500	300	0.4556	2	3,042	2015	1	Diesel
2	Mass Excavation	Pugmill Generator	Other Construction Equipment	335	500	600	0.4154	1	521	2015	1	Diesel
2	Mass Excavation	Dewatering Generator	Other Construction Equipment	40	50	50	0.4154	5	21,900	2015	1	Diesel
2	Mass Excavation	Dewatering Generator	Other Construction Equipment	66	120	75	0.4154	4	17,520	2015	1	Diesel
2	Mass Excavation	Large Excavator	Excavators	523	750	600	0.3819	3	1,369	2015	1	Diesel
2	Mass Excavation	Scraper	Scrapers	500	500	600	0.4824	3	1,369	2015	1	Diesel
2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	211	250	300	0.3685	3	1,369	2015	1	Diesel
2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	150	175	175	0.3685	2	913	2015	1	Diesel
~~3~~	~~Rapid Impact Compaction~~	~~Track type tractor with hammer~~	~~Tractors/Loaders/Backhoes~~	~~150~~	~~175~~	~~175~~	~~0.3685~~	~~3~~	~~1,369~~	~~2015~~	~~1~~	~~Diesel~~
4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,205	9,999	2,000	0.5025	4	1,825	2015	1	Diesel
4	Pile Installation	Crawler Cranes	Cranes	530	750	600	0.2881	4	1,825	2015	1	Diesel
4	Pile Installation	Large Forklifts	Forklifts	93	120	120	0.201	2	913	2015	1	Diesel
4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	71	120	75	0.3618	4	1,825	2015	1	Diesel
4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	0	50	11	0.4154	4	1,825	2015	1	Electric
5	Shoring	Drill Rig	Bore/Drill Rigs	150	175	175	0.5025	2	913	2015	1	Diesel
5	Shoring	Support Crane	Cranes	530	750	600	0.2881	2	913	2015	1	Diesel
5	Shoring	Grout-mixing plant	Other Material Handling Equipment	20	50	25	0.3953	2	913	2015	1	Diesel
5	Shoring	Small Excavator	Excavators	71	120	75	0.3819	2	913	2015	1	Diesel
5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	150	175	175	0.5025	4	1,217	2015	1	Diesel
6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	480	500	600	0.4154	2	3,346	2015	1	Diesel
6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	71	120	75	0.3618	2	3,346	2015	1	Diesel
6	Building Construction (including arena)	Small Excavator	Excavators	404	500	600	0.3819	2	3,346	2015	1	Diesel
6	Building Construction (including arena)	Large Excavator	Excavators	523	750	600	0.3819	2	3,346	2015	1	Diesel
6	Building Construction (including arena)	Crawler Cranes	Cranes	530	750	600	0.2881	4	6,083	2015	1	Diesel
6	Building Construction (including arena)	Mobile Cranes	Cranes	530	750	600	0.2881	4	6,083	2015	1	Diesel
6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	93	120	120	0.201	8	12,167	2015	1	Diesel
6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	0	50	11	0.4154	15	22,813	2015	1	Electric
6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	0	50	11	0.4154	10	7,604	2015	1	Electric
6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	0	50	11	0.4154	25	19,010	2015	1	Electric
6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	0	50	11	0.4154	4	6,083	2015	1	Electric
6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	0	50	11	0.4154	1	1,065	2015	1	Electric
6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	480	500	600	0.4154	2	304	2016	2	Diesel
6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	71	120	75	0.3618	2	3,346	2016	2	Diesel
6	Building Construction (including arena)	Small Excavator	Excavators	404	500	600	0.3819	2	3,346	2016	2	Diesel
6	Building Construction (including arena)	Large Excavator	Excavators	523	750	600	0.3819	2	304	2016	2	Diesel
6	Building Construction (including arena)	Crawler Cranes	Cranes	530	750	600	0.2881	4	2,433	2016	2	Diesel
6	Building Construction (including arena)	Mobile Cranes	Cranes	530	750	600	0.2881	4	6,692	2016	2	Diesel
6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	93	120	120	0.201	8	14,600	2016	2	Diesel
6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	0	50	11	0.4154	15	27,375	2016	2	Electric
6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	0	50	11	0.4154	10	18,250	2016	2	Electric
6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	0	50	11	0.4154	25	30,417	2016	2	Electric
6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	0	50	11	0.4154	4	7,300	2016	2	Electric
6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	0	50	11	0.4154	1	1,825	2016	2	Electric
7	Muni Stop Extension	Digger	Excavators	523	750	600	0.3819	1	288	2015	1	Diesel
7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	150	175	175	0.3685	2	576	2015	1	Diesel
7	Muni Stop Extension	Jackhammers	Other Construction Equipment	78	120	120	0.4154	1	288	2015	1	Diesel
7	Muni Stop Extension	Dump truck	Off-Highway Trucks	400	500	600	0.3819	1	288	2015	1	Diesel
7	Muni Stop Extension	Truck crane	Cranes	530	750	600	0.2881	1	288	2015	1	Diesel
7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	71	120	75	0.3618	1	288	2015	1	Diesel
7	Muni Stop Extension	Saw cutter	Other Construction Equipment	0	50	11	0.4154	2	576	2015	1	Electric

Refined Table 6.1-10

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	5,265	lb	Nox	OFFROAD	0
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	229	lb	PM	OFFROAD	0
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	406	lb	ROG	OFFROAD	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	42	lb	Nox	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	1.3	lb	PM	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	10	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	2,217	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	6.5	lb	PM	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	97	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	2,888	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	8.4	lb	PM	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	126	lb	ROG	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	2,093	lb	Nox	OFFROAD	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	68	lb	PM	OFFROAD	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	146	lb	ROG	OFFROAD	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	4,429	lb	Nox	OFFROAD	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	179	lb	PM	OFFROAD	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	344	lb	ROG	OFFROAD	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	1,122	lb	Nox	OFFROAD	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	36	lb	PM	OFFROAD	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	76	lb	ROG	OFFROAD	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	538	lb	Nox	OFFROAD	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	27	lb	PM	OFFROAD	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	47	lb	ROG	OFFROAD	0
1	3	Rapid Impact Compaction	Track type tractor with hammer	Tractors/Loaders/Backhoes	1,369	150	175	175	Diesel	807	lb	Nox	OFFROAD	0
1	3	Rapid Impact Compaction	Track type tractor with hammer	Tractors/Loaders/Backhoes	1,369	150	175	175	Diesel	41	lb	PM	OFFROAD	0
1	3	Rapid Impact Compaction	Track type tractor with hammer	Tractors/Loaders/Backhoes	1,369	150	175	175	Diesel	70	lb	ROG	OFFROAD	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	10,387	lb	Nox	OFFROAD	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	255	lb	PM	OFFROAD	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	434	lb	ROG	OFFROAD	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	2,649	lb	Nox	OFFROAD	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	93	lb	PM	OFFROAD	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	176	lb	ROG	OFFROAD	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	248	lb	Nox	OFFROAD	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	21	lb	PM	OFFROAD	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	29	lb	ROG	OFFROAD	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	725	lb	Nox	OFFROAD	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	63	lb	PM	OFFROAD	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	88	lb	ROG	OFFROAD	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	592	lb	Nox	OFFROAD	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	27	lb	PM	OFFROAD	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	46	lb	ROG	OFFROAD	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	1,324	lb	Nox	OFFROAD	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	47	lb	PM	OFFROAD	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	88	lb	ROG	OFFROAD	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	92	lb	Nox	OFFROAD	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	9.3	lb	PM	OFFROAD	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	28	lb	ROG	OFFROAD	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	274	lb	Nox	OFFROAD	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	20	lb	PM	OFFROAD	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	28	lb	ROG	OFFROAD	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	789	lb	Nox	OFFROAD	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	35	lb	PM	OFFROAD	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	61	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	6,494	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	239	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	477	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	1,329	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	115	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	162	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	3,658	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	119	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	264	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	5,117	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	166	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	357	lb	ROG	OFFROAD	0

Uncontrolled Offroad Equipment Activities and Emissions

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	8,830	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	311	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	586	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	8,830	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	311	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	586	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	3,310	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	278	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	385	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	547	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	20	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	41	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	1,247	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	107	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	152	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	3,203	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	103	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	243	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	450	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	15	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	32	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	3,534	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	125	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	239	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	9,718	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	344	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	658	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	3,744	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	313	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	435	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	OFFROAD	0

Uncontrolled Offroad Equipment Activities and Emissions

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	288	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	1.7	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	1.5	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	176	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	1.3	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	1.3	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	59	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	0.59	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	0.47	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	221	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	1.3	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	1.2	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	220	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	1.3	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	1.2	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	46	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	0.47	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	0.38	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	ROG	Tier 2	1

Refined Table 6.1-11

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	226	lb	Nox	Tier 4	0
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	7.0	lb	PM10	Tier 4	0
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	52	lb	ROG	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	42	lb	Nox	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	1.3	lb	PM10	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	10	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	2,217	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	6.5	lb	PM10	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	97	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	2,888	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	8.4	lb	PM10	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	126	lb	ROG	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	157	lb	Nox	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	4.8	lb	PM10	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	36	lb	ROG	Tier 4	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	189	lb	Nox	Tier 4	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	5.8	lb	PM10	Tier 4	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	44	lb	ROG	Tier 4	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	61	lb	Nox	Tier 4	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	1.9	lb	PM10	Tier 4	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	14	lb	ROG	Tier 4	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	29	lb	Nox	Tier 4	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	0.89	lb	PM10	Tier 4	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	6.7	lb	ROG	Tier 4	0
1	3	Rapid Impact Compaction	Track type tractor with hammer	Tractors/Loaders/Backhoes	1,369	150	175	175	Diesel	43	lb	Nox	Tier 4	0
1	3	Rapid Impact Compaction	Track type tractor with hammer	Tractors/Loaders/Backhoes	1,369	150	175	175	Diesel	1.3	lb	PM10	Tier 4	0
1	3	Rapid Impact Compaction	Track type tractor with hammer	Tractors/Loaders/Backhoes	1,369	150	175	175	Diesel	10	lb	ROG	Tier 4	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	5,457	lb	Nox	Tier 4	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	39	lb	PM10	Tier 4	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	146	lb	ROG	Tier 4	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	160	lb	Nox	Tier 4	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	4.9	lb	PM10	Tier 4	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	37	lb	ROG	Tier 4	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	10	lb	Nox	Tier 4	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	0.30	lb	PM10	Tier 4	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	2.3	lb	ROG	Tier 4	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	283	lb	Nox	Tier 4	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	0.83	lb	PM10	Tier 4	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	12	lb	ROG	Tier 4	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	39	lb	Nox	Tier 4	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	1.2	lb	PM10	Tier 4	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	9.1	lb	ROG	Tier 4	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	80	lb	Nox	Tier 4	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	2.5	lb	PM10	Tier 4	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	18	lb	ROG	Tier 4	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	85	lb	Nox	Tier 4	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	4.8	lb	PM10	Tier 4	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	4.8	lb	ROG	Tier 4	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	149	lb	Nox	Tier 4	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	0.44	lb	PM10	Tier 4	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	6.5	lb	ROG	Tier 4	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	53	lb	Nox	Tier 4	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	1.6	lb	PM10	Tier 4	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	12	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	382	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	12	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	88	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	519	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	1.5	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	23	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	296	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	9.1	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	68	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	383	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	12	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	88	lb	ROG	Tier 4	0

Controlled Offroad Equipment Activities and Emissions (Tier 4)

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	532	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	16	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	123	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	532	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	16	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	123	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	130	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	4.0	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	30	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	PM	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	PM	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	35	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	1.1	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	8.0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	519	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	1.5	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	23	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	296	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	9.1	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	68	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	35	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	1.1	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	8.0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	213	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	6.6	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	49	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	586	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	18	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	135	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	156	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	4.8	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	36	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	PM	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	33	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	1.0	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	7.6	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	18	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	0.56	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	4.2	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	5.3	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	0.16	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	1.2	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	25	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	0.78	lb	PM10	Tier 4	0

Controlled Offroad Equipment Activities and Emissions (Tier 4)

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	5.8	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	25	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	0.78	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	5.8	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	45	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	0.13	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	2.0	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	ROG	Tier 4	0

Controlled Offroad Equipment Activities and Emissions (Tier 2 + ARB NOx VDECS)

Refined Table 6.1-12

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	2,168	lb	Nox	Tier 2	1
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	11	lb	PM10	Tier 2	1
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	10	lb	ROG	Tier 2	1
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	42	lb	Nox	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	1.3	lb	PM10	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	10	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	2,217	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	6.5	lb	PM10	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	97	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	2,888	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	8.4	lb	PM10	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	126	lb	ROG	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	1,371	lb	Nox	Tier 2	1
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	8.0	lb	PM10	Tier 2	1
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	7.2	lb	ROG	Tier 2	1
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	1,655	lb	Nox	Tier 2	1
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	10	lb	PM10	Tier 2	1
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	8.7	lb	ROG	Tier 2	1
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	584	lb	Nox	Tier 2	1
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	3.1	lb	PM10	Tier 2	1
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	2.8	lb	ROG	Tier 2	1
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	278	lb	Nox	Tier 2	1
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	2.1	lb	PM10	Tier 2	1
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	2.1	lb	ROG	Tier 2	1
~~1~~	~~3~~	~~Rapid Impact Compaction~~	~~Track type tractor with hammer~~	~~Tractors/Loaders/Backhoes~~	~~1,369~~	~~150~~	~~175~~	~~175~~	~~Diesel~~	~~417~~	~~lb~~	~~Nox~~	~~Tier 2~~	~~1~~
~~1~~	~~3~~	~~Rapid Impact Compaction~~	~~Track type tractor with hammer~~	~~Tractors/Loaders/Backhoes~~	~~1,369~~	~~150~~	~~175~~	~~175~~	~~Diesel~~	~~3.2~~	~~lb~~	~~PM10~~	~~Tier 2~~	~~1~~
~~1~~	~~3~~	~~Rapid Impact Compaction~~	~~Track type tractor with hammer~~	~~Tractors/Loaders/Backhoes~~	~~1,369~~	~~150~~	~~175~~	~~175~~	~~Diesel~~	~~3.2~~	~~lb~~	~~ROG~~	~~Tier 2~~	~~1~~
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	5,540	lb	Nox	Tier 2	1
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	32	lb	PM10	Tier 2	1
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	29	lb	ROG	Tier 2	1
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	1,397	lb	Nox	Tier 2	1
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	8.1	lb	PM10	Tier 2	1
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	7.4	lb	ROG	Tier 2	1
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	107	lb	Nox	Tier 2	1
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	1.1	lb	PM10	Tier 2	1
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	0.86	lb	ROG	Tier 2	1
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	295	lb	Nox	Tier 2	1
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	3.0	lb	PM10	Tier 2	1
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	2.4	lb	ROG	Tier 2	1
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	379	lb	Nox	Tier 2	1
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	2.9	lb	PM10	Tier 2	1
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	2.9	lb	ROG	Tier 2	1
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	699	lb	Nox	Tier 2	1
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	4.1	lb	PM10	Tier 2	1
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	3.7	lb	ROG	Tier 2	1
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	51	lb	Nox	Tier 2	1
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	1.4	lb	PM10	Tier 2	1
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	0.48	lb	ROG	Tier 2	1
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	155	lb	Nox	Tier 2	1
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	1.6	lb	PM10	Tier 2	1
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	1.3	lb	ROG	Tier 2	1
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	506	lb	Nox	Tier 2	1
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	3.9	lb	PM10	Tier 2	1
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	3.8	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	3,345	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	19	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	18	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	540	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	5.5	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	4.4	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	2,588	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	15	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	14	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	3,350	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	19	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	18	lb	ROG	Tier 2	1

Controlled Offroad Equipment Activities and Emissions (Tier 2 + ARB NOx VDECS)

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	4,657	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	27	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	25	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	4,657	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	27	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	25	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	1,429	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	14	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	12	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	PM	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	PM	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	304	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	1.8	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	1.6	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	540	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	5.5	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	4.4	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	2,588	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	15	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	14	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	305	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	1.8	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	1.6	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	1,863	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	11	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	10	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	5,122	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	30	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	27	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	1,715	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	17	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	14	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	PM	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	Tier 2	1

Controlled Offroad Equipment Activities and Emissions (Tier 2 + ARB NOx VDECS)

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	7	Muni Stop Extension	Digger	Excavators	0,288	523	750	600	Diesel	288	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Digger	Excavators	0,288	523	750	600	Diesel	1.7	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Digger	Excavators	0,288	523	750	600	Diesel	1.5	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	0,576	150	175	175	Diesel	176	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	0,576	150	175	175	Diesel	1.3	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	0,576	150	175	175	Diesel	1.3	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	0,288	78	120	120	Diesel	59	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	0,288	78	120	120	Diesel	0.59	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	0,288	78	120	120	Diesel	0.47	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	0,288	400	500	600	Diesel	221	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	0,288	400	500	600	Diesel	1.3	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	0,288	400	500	600	Diesel	1.2	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	0,288	530	750	600	Diesel	220	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	0,288	530	750	600	Diesel	1.3	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	0,288	530	750	600	Diesel	1.2	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	0,288	71	120	75	Diesel	46	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	0,288	71	120	75	Diesel	0.47	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	0,288	71	120	75	Diesel	0.38	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	0,576	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	0,576	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	0,576	0	50	11	Electric	0	lb	ROG	Tier 2	1

Table 6.1-13
Project Construction Trip Estimates

Phase	Duration [months]	Average Number of Daily Construction Trucks[1]	Average Number of Daily Construction Workers[1]	Number of Work Days	Total One-Way Trips		
					Hauling Trips	Vendor Trips	Worker Trips
Entire Site							
Demolition (Entire Site)	1	8	10	22	352	-	440
Excavation and Shoring (Entire Site)	3	300	25	66	39,600	-	3,300
Arena							
Foundation & Below Grade Construction (Piles & Concrete)	6	20	100	131	-	5,240	26,200
Base Building	16	25	200	348	-	17,400	139,200
Exterior Finishing	10	25	50	218	-	10,900	21,800
Interior Finishing	18.5	30	150	402	-	24,120	120,600
Garage/Podium							
Foundation & Below Grade Construction (Piles & Concrete)	6	20	50	131	-	5,240	13,100
Base Building	9	20	50	196	-	7,840	19,600
NW Tower							
Base Building	8	15	40	174	-	5,220	13,920
Exterior Finishing	5	2	10	109	-	436	2,180
Interior Finishing	12	10	100	261	-	5,220	52,200
SW Tower							
Base Building	8	15	40	174	-	5,220	13,920
Exterior Finishing	5	2	10	109	-	436	2,180
Interior Finishing	12	10	100	261	-	5,220	52,200
Entire Site							
Street Improvements	5	10	40	109	-	2,180	8,720
Muni Extension							
Demolition	0	0.0	0	0	0	-	-
Construction	3	8	21	24	-	384	1008
Total Construction Trips					39,952	~~94,672~~ 95,056	~~489,560~~ 490,568

Notes:

1. Proposed number of construction trucks and workers provided by Project Sponsor in a table titled "Summary of Construction Phases and Duration, and Daily Construction Trucks and Workers by Phase," dated 11/25/2014.

Onroad Equipment Activities, Emission Factors and Emissions

Refined Table 6.1-14

Site	Year	Trip Type[1]	Vehicle Type[1]	Fuel	% of Fleet[1]	Total One-way Trips	One-way Trip Length	Running Exhaust and Running Losses Emission Factor (g/mile)				
								ROG Exhaust	*ROG Running Loss*	*NOx Exhaust*	*PM_{10} Exhaust*	*$PM_{2.5}$ Exhaust*
Mission Bay	2015	Worker	LDA	GAS	50%	~~489,560~~ 490,568	12.4	0.039	0.067	0.12	0.0023	0.0021
	2015	Worker	LDT1	GAS	25%	~~489,560~~ 490,568	12.4	0.079	0.22	0.27	0.0043	0.0040
	2015	Worker	LDT2	GAS	25%	~~489,560~~ 490,568	12.4	0.041	0.10	0.21	0.0022	0.0020
	2015	Vendor	T6	DSL	50%	~~94,672~~ 95,056	7.3	0.22	0	4.6	0.12	0.11
	2015	Vendor	T7	DSL	50%	~~94,672~~ 95,056	7.3	0.29	0	7.4	0.12	0.11
	2015	Hauling	T7	DSL	100%	39,952	20	0.29	0	7.4	0.12	0.11

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

Onroad Equipment Activities, Emission Factors and Emissions

Refined Table 6.1-15

								Running Exhaust and Running Losses Emissions (lb)				
Site	**Year**	**Trip Type[1]**	**Vehicle Type[1]**	**Fuel**	**% of Fleet[1]**	**Total One-way Trips**	**One-way Trip Length**	*ROG Exhaust*	*ROG Running Loss*	*NOx Exhaust*	*PM_{10} Exhaust*	*$PM_{2.5}$ Exhaust*
Mission Bay	2015	Worker	LDA	GAS	50%	~~489,560~~ 490,568	12.4	263	~~446~~ 447	~~797~~ 799	15	~~14.04~~ 14.07
	2015	Worker	LDT1	GAS	25%	~~489,560~~ 490,568	12.4	264	~~740~~ 742	~~888~~ 890	15	~~13.38~~ 13.41
	2015	Worker	LDT2	GAS	25%	~~489,560~~ 490,568	12.4	137	~~350~~ 351	~~692~~ 693	7.4	~~6.83~~ 6.84
	2015	Vendor	T6	DSL	50%	~~94,672~~ 95,056	7.3	~~169~~ 170	0	~~3,525~~ 3,539	93	~~85.41~~ 85.75
	2015	Vendor	T7	DSL	50%	~~94,672~~ 95,056	7.3	~~221~~ 222	0	~~5,609~~ 5,631	~~89~~ 89	~~81.86~~ 82.19
	2015	Hauling	T7	DSL	100%	39,952	20	512	0	12,969	206	189.28

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

Onroad Equipment Activities, Emission Factors and Emissions

Refined Table 6.1-16

								Idling Emission Factor (g/hr-vehicle)				Idling Exhaust Emissions (lb) [5 min per one-way trip for mass emissions]			
Site	**Year**	**Trip Type[1]**	**Vehicle Type[1]**	**Fuel**	**% of Fleet[1]**	**Total One-way Trips**	**One-way Trip Length**	*ROG*	*NOx*	*PM_{10}*	*$PM_{2.5}$*	*ROG*	*NOx*	*PM_{10}*	*$PM_{2.5}$*
Mission Bay	2015	Worker	LDA	GAS	50%	~~489,560~~ 490,568	12.4	0	0	0	0	0	0	0	0.00
	2015	Worker	LDT1	GAS	25%	~~489,560~~ 490,568	12.4	0	0	0	0	0	0	0	0.00
	2015	Worker	LDT2	GAS	25%	~~489,560~~ 490,568	12.4	0	0	0	0	0	0	0	0.00
	2015	Vendor	T6	DSL	50%	~~94,672~~ 95,056	7.3	2.0	80	0.36	0.33	18	~~694~~ 696	3.1	~~2.85~~ 2.86
	2015	Vendor	T7	DSL	50%	~~94,672~~ 95,056	7.3	6.4	66	0.31	0.28	56	~~576~~ 578	2.7	~~2.44~~ 2.45
	2015	Hauling	T7	DSL	100%	39,952	20	6.4	66	0.31	0.28	47	486	2.2	2.06

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

Onroad Equipment Activities, Emission Factors and Emissions

Refined Table 6.1-17

								Starting Exhaust Emission Factor (g/one-way trip)				Starting Exhaust Emissions (lb) [Once per one-way trip for mass emissions]			
Site	Year	Trip Type[1]	Vehicle Type[1]	Fuel	% of Fleet[1]	Total One-way Trips	One-way Trip Length	*ROG*	*NOx*	*PM_{10}*	*$PM_{2.5}$*	*ROG*	*NOx*	*PM_{10}*	*$PM_{2.5}$*
Mission Bay	2015	Worker	LDA	GAS	50%	~~489,560~~ 490,568	12.4	0.22	0.18	0.0030	0.0027	118	95	1.6	~~1.46~~ 1.47
	2015	Worker	LDT1	GAS	25%	~~489,560~~ 490,568	12.4	0.43	0.31	0.0046	0.0042	115	~~82~~ 83	1.2	1.14
	2015	Worker	LDT2	GAS	25%	~~489,560~~ 490,568	12.4	0.28	0.34	0.0027	0.0025	~~74~~ 75	92	~~0.73~~ 0.74	0.68
	2015	Vendor	T6	DSL	50%	~~94,672~~ 95,056	7.3	0	0	0	0	0	0	0	0.00
	2015	Vendor	T7	DSL	50%	~~94,672~~ 95,056	7.3	0	0	0	0	0	0	0	0.00
	2015	Hauling	T7	DSL	100%	39,952	20	0	0	0	0	0	0	0	0.00

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

Onroad Equipment Activities, Emission Factors and Emissions

Refined Table 6.1-18

								Evaporative ROG Emission Factor (g/one-way trip)			Evaporative ROG Emissions (lb)		
Site	**Year**	**Trip Type[1]**	**Vehicle Type[1]**	**Fuel**	**% of Fleet[1]**	**Total One-way Trips**	**One-way Trip Length**	*Diurnal*	*Hot-Soak*	*Resting Loss*	*Diurnal*	*Hot-Soak*	*Resting Loss*
Mission Bay	2015	Worker	LDA	GAS	50%	~~489,560~~ 490,568	12.4	0.046	0.15	0.041	25	82	22
	2015	Worker	LDT1	GAS	25%	~~489,560~~ 490,568	12.4	0.10	0.28	0.083	28	77	22
	2015	Worker	LDT2	GAS	25%	~~489,560~~ 490,568	12.4	0.050	0.16	0.047	~~13~~ 14	43	13
	2015	Vendor	T6	DSL	50%	~~94,672~~ 95,056	7.3	0	0	0	0	0	0
	2015	Vendor	T7	DSL	50%	~~94,672~~ 95,056	7.3	0	0	0	0	0	0
	2015	Hauling	T7	DSL	100%	39,952	20	0	0	0	0	0	0

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

Construction Area Emissions Estimates

Table 6.1-19

Venue	Floor Area	Building Surface Area[1]	Architectural Coatings: Reapplication Rate	Architectural Coatings: Indoor Paint VOC EF[2]	Architectural Coatings: Outdoor Paint VOC EF[2]	Architectural Coatings: Architectural Coating VOC emissions[3]
	[ft^2]	[ft^2]		[g/L]	[g/L]	[lb/yr]
Event Center	750,000	1,500,000	100%	100	150	7,823
GSW Office Space	25,000	50,000				261
Office Space	580,000	1,160,000				6,050
Retail Space	125,000	250,000				1,304
Parking and Loading	475,000	950,000				4,955

Notes:

1. Consistent with CalEEMod, residential building surface area is assumed to be 2.7 times the floor area, and non-residential 2 times the floor area.
2. Based on BAAQMD paint VOC regulations, 100 g/L for flat paints, generally used indoors, and 150 g/L for all other architectural coatings. Building area is assumed to be 75% indoors and 25% outdoors, consistent with CalEEMod.
3. Uses CalEEMod assumptions of 1 gallon of paint covers 180 square feet.

Area Sources	Total Emissions [ton/yr]				
	ROG	CO	NO_x	PM_{10}	$PM_{2.5}$
Architectural Coatings	10.20	--	--	--	--
Total Project Emissions:	10.20	0.00	0.00	0.00	0.00

Mobile Source CAP Emissions Estimates

Table 6.1-20
Project CAPs Emission Factors

Emission Factor[1]	Units	Pollutant				
		ROG	CO	NO_x	PM_{10}	$PM_{2.5}$
Running Exhaust	[g/mile]	0.068	1.5	0.45	0.0066	0.0060
Idling Exhaust	[g/trip]	0.013	0.1	0.09	0.0003	0.0003
Starting Exhaust	[g/trip]	0.279	3.5	0.33	0.0030	0.0028
PM Brake Wear	[g/mile]	-	-	-	0.0420	0.0180
PM Tire Wear	[g/mile]	-	-	-	0.0088	0.0022
ROG Running Loss	[g/mile]	0.079	-	-	-	-
ROG Diurnal	[g/trip]	0.052	-	-	-	-
ROG Hot-Soak	[g/trip]	0.148	-	-	-	-
ROG Resting Loss	[g/trip]	0.044	-	-	-	-

Notes:
1. From EMFAC2011, calendar year 2017, San Francisco Bay Area. Emission factors are weighted by VMT for all vehicle categories.

Mobile Source CAP Emissions Estimates

Table 6.1-21

Project CAPs Emission Calculations

Trip Type	Scenario	Daily One-way Vehicle Trips[1]			Days Per Year[2]	Weighted Trip Length [mile][3]	Emissions				
		Arena	Retail	Office			ROG	CO	NO_x	PM_{10}	$PM_{2.5}$
							[ton/yr]				
Mission Bay, Weekend Trips	Basketball Event Days	8,715	3,106	509	30	20.1	1.4	14	3.9	0.47	0.22
	Concert Event Days	8,715	3,106	509	55	20.1	2.6	26	7.1	0.86	0.40
	No Event Days	55	5,313	509	19	7.8	0.21	1.9	0.49	0.055	0.026
Mission Bay, Weekday Trips	Basketball Event Days	8,589	2,560	2,542	30	18.7	1.5	15	4.0	0.49	0.22
	Concert Event Days	8,589	2,560	2,542	45	18.7	2.2	22	6.1	0.73	0.34
	Convention Event Days	3,921	2,560	2,542	61	15.4	1.7	16	4.5	0.54	0.25
	No Event Days	55	4,393	2,542	125	7.9	1.6	15	3.9	0.44	0.20
						Total Emissions:	**11**	**110**	**30**	**3.6**	**1.6**

Notes:

1. Daily vehicle trips provided by Adavant Consulting in a final memorandum titled "Travel, Parking, and Loading Demand Estimates for the Proposed Event Center & Mixed-Use Development at Mission Bay Blocks 29-32 - Case No. 2014.1441E". Office use includes GSW offices.

2. The maximum number of home games (60) in a season was conservatively assumed. Furthermore, it is assumed that half of the games will take place on weekends. Vehicle generation associated with all concert and family show events is approximated by concert trips, while the other 61 events are assumed to be convention events on weekdays.

3. Trip length for each scenario is weighted by the number of trips in each land use category. Arena vehicle trips are assumed to have a trip length of 25 miles/trip based on season ticket holder addresses. Season ticket holders account for approximately 60% seating at Warrior games. Vehicle trips from retail and office space are assumed to have a trip length of 11.98 miles/trip, based on 2006 average commute trip length in the Bay Area (MTC 2008).

Mobile Source CAP Emissions Estimates

Table 6.1-22

Road Dust Calculations

Total Annual VMT

Trip Type	Scenario	VMT [mile/yr]
Mission Bay, Weekend Trips	Basketball Event Days	7,418,424
	Concert Event Days	13,600,444
	No Event Days	870,239
Mission Bay, Weekday Trips	Basketball Event Days	7,688,333
	Concert Event Days	11,532,500
	Convention Event Days	8,457,295
	No Event Days	6,891,904
	Total VMT	**56,459,139**

Pollutants	Emissions Factor [lb/VMT]	Emissions [ton/yr]
Fugitive PM_{10}	0.00063	17.84
Fugitive $PM_{2.5}$	0.00016	4.38

Road Dust Equation[1]

E = k*(sL)^0.91 * (W)^1.02 * (1-P/4N)

where:

E = annual average emission factor in the same units as k	
k = particle size multiplier for particle size range and units of interest	
PM_{10} (lb/VMT)	0.0022
$PM_{2.5}$ (lb/VMT)	0.00054
sL = road surface silt loading (grams per square meter) (g/m^2)	0.1
W = average weight (tons) of all the vehicles traveling the road	2.4
P = number of “wet” days with at least 0.01 in of precipitation during the averaging period	64
N number of days in the averaging period	365

Notes:

1. Road dust equation and parameters are based on CalEEMod defaults for the San Francisco Bay Area Air Basin.

References

California Air Resources Board (ARB). 2011. EMission FACtor Model (EMFAC2011). Available online at www.arb.ca.gov/msei/modeling.htm

Metropolitan Transportation Commission (MTC). 2008. Travel Forecasts Data Summary: Transportation 2035 Plan for Available online at http://www.mtc.ca.gov/planning/2035_plan/Supplementary/T2035-Travel_Forecast_Data_Summary.pdf

Table 6.1-23
Mobile Source CAPs Emission Reduction

Oracle Arena and GSW Oakland HQ Vehicle Trips Calculation

Employee Commute/ Non-Commute Trips

Scenario	Total Employees[1]	Total Driving Employees[2]	% SOV[3]	% Carpool[3]	Carpool Density [people/ vehicle][4]	Trips/ Roundtrip	Total Vehicle Trips per Day	Average operating days per year[5]	Total Vehicle Trips per Year
Oracle Arena Operations Employees	71	55	86%	14%	2	2	103	260	26,859
GSW Headquarters Employees	150	128	94%	6%	2	2	248	260	64,350

Notes:

1. Oracle Arena Operations employees assumed to be the same as the estimated number of employees at the proposed event center. Number of existing GSW employees at the Oakland headquarters is based on the Project Notice of Preparation dated 11/19/2014.
2. A 78.1% driving rate was assumed for the Oracle Arena employees according to the most recent Bay Area Census data (http://www.bayareacensus.ca.gov/bayarea.htm). GSW employees who drive based on a 85% driving rate according to Ben Draa, Senior Financial Analyst, GSW.
3. Oracle Arena employees SOV and carpool rates from Bay Area Census data. GSW Headquarters SOV and carpool rates from Ben Draa, Senior Financial Analyst,
4. A carpool density of two people per vehicle is assumed to be conservative.
5. Assumes 5 days per week for 52 weeks per year.

Spectator Trips

Scenario	Total Spectators Per Event[1]	Total Driving Spectators[2]	% SOV[3]	% Carpool[3]	Carpool Density [people/ vehicle][3]	Trips/ Roundtrip	Total Vehicle Trips per Event	Event Days per Year[4]	Total Vehicle Trips per Year
Oracle Arena Game Spectators	18,250	16,250	20%	80%	3	2	15,167	47	712,833
Oracle Arena Non-game Event Spectators	9,125	9,125	20%	80%	3	2	8,517	42	357,700

Notes:

1. Average spectator count and transit riders from Ben Draa, Senior Financial Analyst, GSW.
2. Ben Draa, Senior Financial Analyst, GSW, estimated that 2,000 of the total spectators take public transit or taxis per event.
3. The carpool assumptions are conservative in that 20% of the driving spectators would drive alone, while the remaining 80% would carpool at a density of 3 people per vehicle.
4. Number of GSW games is based on the 2013-2014 season and number of non-game events is based on four-year averages (2010-2013).

Vendor and Event Staff Trips

Scenario	Total Event Staff Per Event[1]	Total Driving Staff[1]	% SOV[2]	% Carpool[2]	Carpool Density [people/ vehicle][3]	Trips/ Roundtrip	Total Vehicle Trips per Event	Event Days per Year[4]	Total Vehicle Trips per Year
Oracle Arena Game Event Staff	1,013	791	86%	14%	2	2	1,474	47	69,274
Oracle Arena Non-game Event Staff	645	504	86%	14%	2	2	939	42	39,419

Notes:

1. A 78.1% driving rate was assumed for the vendor and event staff according to the most recent Bay Area Census data (http://www.bayareacensus.ca.gov/bayarea.htm). GSW employees who drive based on a 85% driving rate according to Ben Draa, Senior Financial Analyst, GSW.
2. SOV and carpool rates from Bay Area Census data.
3. A carpool density of two people per vehicle is assumed to be conservative.
4. Number of GSW games is based on the 2013-2014 season and number of non-game events is based on four-year averages (2010-2013).

Table 6.1-24
Mobile Source CAPs Emission Reduction

Oracle Arena and GSW HQ Emission Reduction Calculations

Trip Type		Total Vehicle Trips per Year	Trip Reduction per Year[9]	Trip Length [mile]	Total VMT [mile/year]	VMT Reduction [mile/year][9]
Employee Commute Trips[1]	Oracle Arena operations employees	26,859	0	9.5	255,163	0
	GSW Headquarters	64,350	64,350	9.5	611,325	611,325
Employee Non-Commute Trips[2]	Oracle Arena operations employees	26,859	0	3	80,578	0
	GSW Headquarters	64,350	64,350	3	193,050	193,050
Spectator Trips[3]	Oracle Arena game spectators	712,833	712,833	25	17,963,400	17,963,400
	Oracle Arena non-game event spectators	357,700	0	25	9,014,040	0
Vendor and Event Staff Trips[1,4]	Oracle Arena game vendors and event staff	69,274	69,274	9.5	658,103	658,103
	Oracle Arena non-game event vendors and event staff	39,419	0	9.5	374,479	0
Opposing Team Bus trips[5,6]	Oracle Arena Opposing Team Bus trips	132	132	17.5	2,310	2,310
Delivery Trips[7,8]	GSW Headquarters	4,160	4,160	7.3	30,368	30,368
Total Oracle Arena VMT [miles/year]					**28,348,073**	**18,623,813**
Total GSW Office VMT [miles/year]					**834,743**	**834,743**
Total VMT [miles/year]					**29,182,816**	**19,458,556**

Emission Factor[11]	Units	Pollutant	
		ROG	NO_x
Running Exhaust	[g/mile]	0.068	0.45
Idling Exhaust	[g/trip]	0.013	0.09
Starting Exhaust	[g/trip]	0.279	0.33
ROG Running Loss	[g/mile]	0.079	-
ROG Diurnal	[g/trip]	0.052	-
ROG Hot-Soak	[g/trip]	0.148	-
ROG Resting Loss	[g/trip]	0.044	-

Table 6.1-25
Mobile Source CAPs Emission Reduction

Trip Type		Emission Reduction [ton/year]			
		ROG	NO_x	PM_{10}	$PM_{2.5}$
Employee Commute Trips	Oracle Arena operations employees	0	0	0	0
	GSW Headquarters	0.14	0.34	0.039	0.018
Employee Non-Commute Trips	Oracle Arena operations employees	0	0	0	0
	GSW Headquarters	0.069	0.13	0.012	0.0058
Spectator Trips	Oracle Arena game spectators	3.3	9.3	1.1	0.52
	Oracle Arena non-game event spectators	0	0	0	0
Vendor and Event Staff Trips	Oracle Arena game vendors and event staff	0.15	0.36	0.042	0.019
	Oracle Arena non-game event vendors and event staff	0	0	0	0
Opposing Team Bus trips	Oracle Arena Opposing Team Bus trips	4.5E-04	0.0012	1.5E-04	6.7E-05
Delivery Trips	GSW Headquarters	0.0074	0.017	0.0019	8.9E-04
Total		**3.7**	**10**	**1.2**	**0.57**

Notes:
1. CalEEMod Default Trip Length for Commercial-Worker trips in the San Francisco Bay Area Air Basin.
2. Non-commute trips are assumed to have a trip length of 3 miles.
3. Trip length is an estimation based on season ticket holder addresses. Season ticket holders account for approximately 60% of seating at Warrior games.
4. Annual vehicle trips based on number of vendors at each event and total number of event days per year.
5. Annual vehicle trips based on 1.5 bus trips per game, 2 trips per round trip and 44 events per year. Count of opposing team bus trips from Ben Draa, Senior Financial Analyst, GSW. Event days per year includes 3 preseason games and 41 regular-season games.
6. Trip length is the driving distance from Union Square, San Francisco, where the Opposing Team is assumed to stay, to Oracle Arena.
7 Annual vehicle trips based on a daily delivery count of 8 from Ben Draa, Senior Financial Analyst, GSW. Assume 5 days per week for 52 weeks per year.
8. CalEEMod Default Trip Length for Commercial-Nonwork trips in the San Francisco Bay Area Air Basin.
9. Represents reduction in regional VMT-related emissions due to relocation of Warriors games from Oakland to San Francisco only.
10. From EMFAC2011, calendar year 2017, San Francisco Bay Area. Emission factors are weighted by VMT for all vehicle categories.

Table 6.1-26
Mobile Source CAPs Emission Reduction

Reduction in Road Dust Emissions

Road Dust Equation[1]
E = k*(sL)^0.91 * (W)^1.02 * (1-P/4N)

where:
E = annual average emission factor in the same units as k
k = particle size multiplier for particle size range and units of interest

PM_{10} (lb/VMT)	0.0022
$PM_{2.5}$ (lb/VMT)	0.00054
sL = road surface silt loading (grams per square meter) (g/m^2)	0.1
W = average weight (tons) of all the vehicles traveling the road	2.4
P = number of "wet" days with at least 0.01 in of precipitation during theaveraging period	64
N number of days in the averaging period	365

Pollutants	Emissions Factor [lb/VMT]	VMT Reduction [mile/yr]	Emission Reduction [ton/yr]
Fugitive PM_{10}	0.00063	19,458,556	6.1
Fugitive $PM_{2.5}$	0.00016		1.5

Notes:
1. Road dust equation and parameters are based on CalEEMod defaults for the San Francisco Bay Area Air Basin.

Generator Emissions Estimates

Project Emission Calculations **Table 6.1-27**

Location	Size		Fuel Type	Operation[1] (hrs/yr)	Emission Factors[2,3]					Emissions			
					NMHC	ROG	CO	NOx	PM	ROG	CO	NOx	PM
	[kW]	[hp]			[g/bhp-hr]					[ton/yr]			
Arena Standby Emergency	1,500	2,012	diesel	50	0.14	0.15	2.6	0.50	0.020	0.017	0.29	0.055	0.0022
Arena Standby Emergency	1,500	2,012	diesel	50	0.14	0.15	2.6	0.50	0.020	0.017	0.29	0.055	0.0022
Office Tower 1	750	1006	diesel	50	0.14	0.15	2.6	0.50	0.020	0.0083	0.14	0.028	0.0011
Office Tower 2	750	1006	diesel	50	0.14	0.15	2.6	0.50	0.020	0.0083	0.14	0.028	0.0011
Marketplace	500	671	diesel	50	0.14	0.15	2.2	0.30	0.015	0.0055	0.081	0.011	0.0006
									Total Emissions:	0.055	0.95	0.18	0.0072

Notes:

1. Operation is conservatively assumed to be 50 hours per year, the maximum allowable by the Bay Area Air Quality Management District.
2. Criterial Air Pollutants emission factors based on Tier 4 standards from the ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards (ARB 2013). Emission factors for PM_{10} and $PM_{2.5}$ are conservatively based on the PM emission standard.
3. The emission factors for ROG were calculated from the NMHC emission factors using conversion factors for diesel engines (USEPA 1997) and assuming that VOC and ROG are equivalent (ARB 2009).

References:

U.S. Environmental Protection Agency (USEPA). 1997. *Conversion Factors for Hydrocarbon Emission Components.* November.
Available online at: http://www.epa.gov/oms/models/nonrdmdl/nr-002.pdf.

California Air Resources Board (ARB). 2013. ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards.
Available online at: http://www.arb.ca.gov/msprog/ordiesel/documents/Off-Road_Diesel_Stds.xls.

ARB. 2009. *Definitions of VOC and ROG.* January.
Available online at: http://www.arb.ca.gov/ei/speciate/voc_rog_dfn_1_09.pdf

Boiler Emissions Estimates

Project Emission Calculations

Table 6.1-28

Quantity[1]	Fuel Type	Size Per Boiler[1]	Higher Heating Value[2]	Fuel Consumption[3]	Operation[4] (hrs/yr)	Emission Factors[5,6,7]						Emissions			
						CO	NOx	CO	NOx	ROG	PM	CO	NOx	ROG	PM
		Btu/hr	Btu/scf	scf/hr		ppmv (dry at 3% O_2)		lb/MMBtu		lb/10^6 scf		[ton/yr]			
4	Natural Gas	4,000,000	1,020	3,922	8,760	400	30	0.30	0.037	5.5	7.6	21	2.6	0.38	0.52

Notes:
1. Quantity and Size based on Project Sponsor estimate and is consistent with the total estimated heating load.
2. Higher heating value is the average natural gas heating value in AP-42 Section 1.4.
3. Fuel consumption calculated from size and higher heating value.
4. The boiler is assumed to operate for every hour of the year.
5. CO and NOx emission factors in ppm from BAAQMD Regulation 9 Rule 7.
6. CO and NOx emission factors converted from ppm to lb/MMBtu using the F-Factor method described in USEPA Method 19 for natural gas fuel (USEPA 2001).
7. ROG and PM emission factors from AP-42 Section 1.4 Table 1.4-2.

References:

BAAQMD. 2011. Regulation 9 Rule 7. Inorganic Gaseous Pollutants Nitrogen oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters.

USEPA. 1995. AP 42, Volume I, Fifth Edition. §1.4. Natural Gas Combustion. Available online at: http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s04.pdf

USEPA. 2001. Preferred and Alternative Methods for Estimating Air Emissions from Boilers. January. Available online at: http://www.epa.gov/ttnchie1/eiip/techreport/volume02/ii02.pdf.

Area Source Emissions Adjustment

Table 6.1-29

Default Consumer Product Emission Factor[1]	2.1E-05	lb/ROG/sqft/day
Updated Consumer Product Emission Factor[2]	1.5E-05	lb/ROG/sqft/day
Default Consumer Products Emissions	7.6	tons/year
Updated Consumer Product Emissions	5.4	tons/year
Reduction in Consumer Product Emissions	2.2	tons/year
Default Area Source Emissions	8.7	tons/year
Updated Area Source Emissions	6.4	tons/year

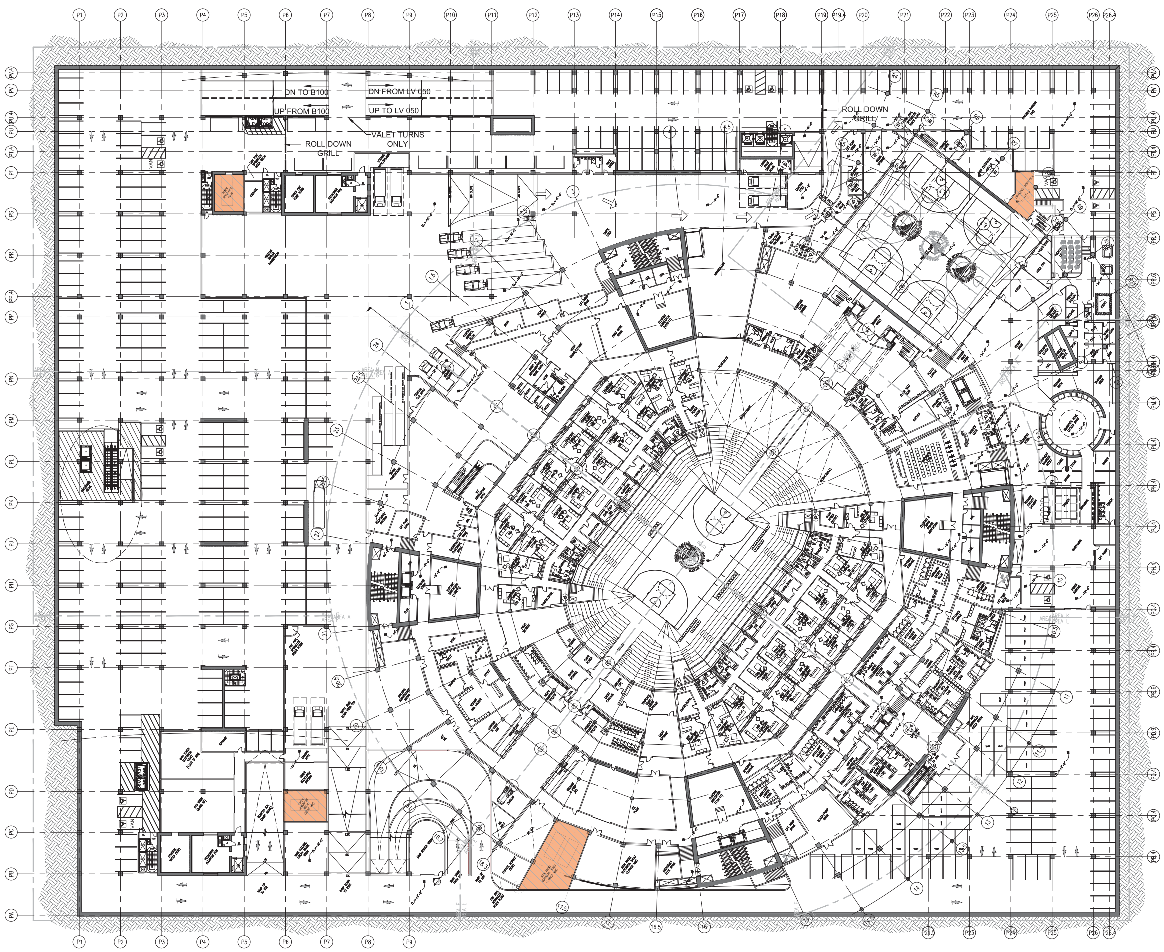
Notes:

1. Default value from the California Emissions Estimator Model (CalEEMod®).

2. San Francisco-specific area source emission factor developed by San Francisco Environmental Planning (SFEP) for ROG from consumer products.

KEY

EMERGENCY GENERATOR ROOM



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DESIGN ARCHITECT
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SBE ARCHITECT - ARENA INTERIORS / MARKET HALL
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PFAU LONG ARCHITECTURE
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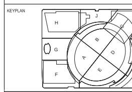
KEYPLAN



NO.	DATE	ISSUE

CAD FILENAME

DRAWING TITLE

SITE PLAN
LEVEL 000
EVENT LEVEL &
SUBGRADE PARKING

0' 20' 40' 80' 1/32" = 1' @ Arch E

01

KHA PROJECT NO. 13032

DRAWING NUMBER E1.0000

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APPENDIX AQ

Air Quality Supporting Information:
a¦bL±!wL!b¢ TABLES

Muni Variant Table 6.1-2
Construction Particulate Matter Emissions
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Emissions	Units	Uncontrolled Scenario	Controlled Tier 4 Scenario	Controlled Tier 2 + ARB NOx VDECS Scenario
Project construction $PM_{2.5}$ emissions[1]	[lb/project]	4,078	592	705
Project construction DPM emissions[1]	[lb/project]	4,073	586	699
Dewatering generator $PM_{2.5}$ emissions[2]	[lb/project]	15	15	15
Dewatering generator DPM emissions[2]	[lb/project]	15	15	15
Muni platform construction $PM_{2.5}$ emissions[3]	[lb/project]	12	7.1	12
Muni platform construction DPM emissions[3]	[lb/project]	12	7.1	12
Construction duration	[years]	2	2	2
Annual Project DPM emissions	[lb/year]	2,036	293	349
Annual dewatering generator DPM emissions	[lb/year]	7.4	7.4	7.4
Annual muni platform DPM emissions	[lb/year]	6.2	3.6	6.2
Average Project $PM_{2.5}$ emissions	[g/s]	0.029	0.004	0.005
Average Project DPM emissions	[g/s]	0.029	0.004	0.005
Average dewatering generator $PM_{2.5}$ emissions	[g/s]	1.1E-04	1.1E-04	1.1E-04
Average dewatering generator DPM emissions	[g/s]	1.1E-04	1.1E-04	1.1E-04
Average muni platform $PM_{2.5}$ emissions	[g/s]	9.0E-05	5.1E-05	9.0E-05
Average muni platform DPM emissions	[g/s]	9.0E-05	5.1E-05	9.0E-05

Notes:

1. Includes emissions from off-road equiment and on-road sources. Emissions in the controlled scenario reflect the use of Tier 4 or Tier 2 + ARB NOx VDECS off-road equipment. The pug mill generator (with Tier 4 engine) is included in each scenario.

2. Includes emissions from nine small generators that will operate 24 hours/day during the first six months of construction. The Project Sponsor has committed to Tier 4 engines for all generators used during construction, so those emissions are presented for all scenarios.

3. Includes emissions from 20 weekends of construction for the Muni Variant, or 8 additional weekends as compared to the Muni Platform extension evaluated in the Project.

Abbreviations:
DPM: Diesel particulate matter
lb: pound
g: gram
m^2: square meter
s: second

Muni Variant Table 6.1-5
AERMOD Construction Screening Inputs and Outputs
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Parameter	**Inputs and Outputs**						
Source	Construction			Dewatering Generators[1]	Muni Platform		
Source Type	Area				Area		
Emission Rate (g/s-m^2)	2.19869E-05				3.32E-04		
Release Height (m)	5				5		
Area (m^2)	45481.57185				3,015		
Receptor Height (m)	1.8				1.8		
Urban/Rural (U/R)	U				U		
Meteorological Station	Mission Bay 2008				Mission Bay 2008		
Dispersion Factor (μg/m^3 per g/s)							
Annual Average Dispersion Factor at Dormitory Receptor	10.41			14.7	126		
Annual Average Dispersion Factor at Hospital Receptor	10.36			12.7	13.3		
Annual Average Dispersion Factor at Child Daycare Receptor	40.7			58.5	143		
Emission Rate (g/s)	**Uncontrolled**	**Tier 4**	**Tier 2 + ARB NOx VDECS Controlled**	**Tier 4**	**Uncontrolled**	**Tier 4**	**Tier 2 + ARB NOx VDECS Controlled**
$PM_{2.5}$ Emission Rate	0.029	0.0043	0.0051	1.1E-04	9.0E-05	5.1E-05	9.0E-05
Diesel PM Emission Rate	0.029	0.0042	0.0050	1.1E-04	9.0E-05	5.1E-05	9.0E-05
Concentration (μg/m^3)	**Uncontrolled**	**Tier 4**	**Tier 2 + ARB NOx VDECS Controlled**	**Tier 4**	**Uncontrolled**	**Tier 4**	**Tier 2 + ARB NOx VDECS Controlled**
Annual Maximum $PM_{2.5}$ Conc at Dormitory Receptor	0.31	0.044	0.053	0.0016	0.011	0.0065	0.011
Annual Maximum $PM_{2.5}$ Conc at Hospital Receptor	0.30	0.044	0.053	0.0014	0.0012	6.8E-04	0.0012
Annual Maximum $PM_{2.5}$ Conc at Child Daycare Receptor	1.2	0.17	0.21	0.0063	0.013	0.0073	0.013
Annual Maximum DPM Conc at Dormitory Receptor	0.30	0.044	0.052	0.0016	0.011	0.0065	0.011
Annual Maximum DPM Conc at Hospital Receptor	0.30	0.044	0.052	0.0014	0.0012	6.8E-04	0.0012
Annual Maximum DPM Conc at Child Daycare Receptor	1.2	0.17	0.20	0.0063	0.013	0.0073	0.013

Notes:
1. The Project Sponsor has committed to Tier 4 engines for all generators used during construction, the dispersion factors differ due to 24 hour use of the generators.

Abbreviations:
g: gram
m: meter
m^2: square meter
m^3: cubic meter
PM: particulate matter
s: second
μg: microgram

Muni Variant Table 6.1-6
Screening $PM_{2.5}$ Concentration Results
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Scenario	Concentration [μg/m^3]		
	Dormitory Receptor	Hospital Receptor	Daycare Receptor
Construction			
$PM_{2.5}$ Concentration from Uncontrolled Construction Emissions[1]	0.32	0.31	1.2
$PM_{2.5}$ Concentration from Tier 4 Controlled Construction Emissions[1]	0.052	0.046	0.19
$PM_{2.5}$ Concentration from Tier 2 + ARB NOx VDECS Mitigated Construction Emissions[1]	0.066	0.055	0.23
2014 Background $PM_{2.5}$ Concentration[2]	8.5	8.6	8.4
Total $PM_{2.5}$ Concentration (Construction, Uncontrolled scenario)	8.8	8.9	9.6
Total $PM_{2.5}$ Concentration (Construction, Tier 4 Controlled scenario)	8.5	8.7	8.5
Total $PM_{2.5}$ Concentration (Construction, Tier 2 + ARB NOx VDECS Controlled scenario)	8.6	8.7	8.6
Cumulative Threshold[3]	10	10	10
Total $PM_{2.5}$ Concentration Exceeds Threshold? (Uncontrolled scenario)	No	No	No
Total $PM_{2.5}$ Concentration Exceeds Threshold? (Tier 4 Controlled scenario)	No	No	No
Total $PM_{2.5}$ Concentration Exceeds Threshold? (Tier 2 + ARB NOx VDECS Mitigated scenario)	No	No	No
Operational			
$PM_{2.5}$ Concentration from Operational Traffic	0.32	0.32	0.32
$PM_{2.5}$ from South Street Tower Emergency Diesel Generator[4]	0.0012	3.8E-04	0.0027
$PM_{2.5}$ from 16th Street Tower Emergency Diesel Generator[4]	4.5E-04	0.0011	5.0E-04
$PM_{2.5}$ Concentration from GSW Arena Emergency Diesel Generators[4]	0.0018	0.0033	0.0022
2014 Background $PM_{2.5}$ Concentration[2]	8.5	8.6	8.4
Total $PM_{2.5}$ Concentration (Operational)	8.8	8.9	8.7
Cumulative Threshold[3]	10	10	10
Total $PM_{2.5}$ Concentration Exceeds Threshold? (Operational)	No	No	No

Notes:
1. The concentration associated with generators reflect Tier 4 engine assumptions.
2. 2014 background risk from the Citywide HRA database for all receptors.
3. Cumulative threshold is the threshold for creating an Air Pollutant Exposure Zone (APEZ), as defined by the San Francisco Planning Department, Environmental Planning.
4. Generators were modeled using source parameters for standby generators published in SF-CRRP (BAAQMD 2012).

Abbreviations:
BAAQMD: Bay Area Air Quality Management District
HRA: Health Risk Assessment
m^3: cubic meter
SF-CRRP: San Francisco Community Risk Reduction Plan
μg: microgram

References:
Bay Area Air Quality Management District (BAAQMD). 2012. The San Francisco Community Risk Reduction Plan: Technical Support Document. December.

Muni Variant Table 6.1-7
Exposure Parameters and Cancer Risk Adjustment Factors
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Exposure Parameter	Units	Child Resident		Adult Resident		Hospital Child		Daycare Child	
		Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Daily Breathing Rate (DBR)[1]	[L/kg-day]	581	302	302	302	581	581	581	581
Exposure Time (ET)[2]	[hours/24 hours]	24	24	24	24	24	24	11	11
Exposure Frequency (EF)[3]	[days/year]	350	350	350	350	365	365	253	253
Exposure Duration (ED)[4]	[years]	2.0	70	2.0	70	1.0	1.0	0.67	5.9
Averaging Time (AT)	[days]	25,550	25,550	25,550	25,550	25,550	25,550	25,550	25,550
Intake Factor, Inhalation (IF_{inh})	[m^3/kg-day]	0.016	0.29	0.0083	0.29	0.0083	0.0083	0.0018	0.016
Cancer Risk Adjustment Factor[5]	[-]	10	1.7	1.0	1.0	10	10	10	5.2
Modeling Adjustment Factor (MAF)[6]	[-]	N/A	N/A	N/A	N/A	N/A	N/A	3.15	N/A

Notes:

1. Daily breathing rate reflects default breathing rate from BAAQMD 2010.

2. Exposure time reflects default exposure time from BAAQMD 2010.

3. Exposure frequency reflects default exposure frequency from BAAQMD 2010.

4. Assumes all construction-related emissions will be emitted within the first two years. Operation of the daycare center is not expected to take place until mid- to late-2017; since Project construction will be largely completed by that time, an exposure duration of 8 months was used as a conservative estimate. Operation is assumed to continue for 70 years. A hospital child is assumed to be present for one year during operation, and a daycare child assumed to present from age 6 weeks to 6 years old during operation.

5. Based on BAAQMD 2010.

6. Construction emissions are conservatively assumed to occur concurrently with the operation of the daycare center. As such, a modeling adjustment factor of (365/253)*(24/11) = 3.15 is applied for the daycare child receptor. Since operational emissions are assumed to occur throughout all hours of the day, a modeling adjustment factor is not needed.

Calculation:

IF_{inh} = DBR * ET * EF * ED * CF / AT

CF = 0.001 (m^3/L)

Abbreviations:

BAAQMD: Bay Area Air Quality Management District
L: liter
kg: kilogram
m^3: cubic meter
MAF: Modeling Adjustment Factor

References:

BAAQMD. 2010. BAAQMD Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. January.
http://baaqmd.gov/~/media/Files/Engineering/Air%20Toxics%20Programs/hrsa_guidelines.ashx?la=en

Muni Variant Table 6.1-8
Screening Cancer Risk Results
GSW Mission Bay Multi-Purpose Event Center & Ancillary Development
San Francisco, California

Scenario	Units	Dormitory Receptor		Hospital Child Receptor	Daycare Child Receptor
		Child Resident	Adult Resident		
Diesel PM Cancer Potency Factor (CPF)[1]	$[mg/kg\text{-}day]^{-1}$	1.1	1.1	1.1	1.1
Excess Cancer Risk from Uncontrolled Construction Emissions[2,3]	[in a million]	56	2.9	28	73
Excess Cancer Risk from Tier 4 Controlled Construction Emissions[2,3]	[in a million]	9.1	0.47	4.2	11
Excess Cancer Risk from Tier 2 + ARB NOx VDECS Controlled Construction Emissions[2,3]	[in a million]	11	0.59	5.0	13
Excess Cancer Risk from Operational Traffic Emissions[4]	[in a million]	7.2	7.2	7.2	7.2
Excess Cancer Risk from South Street Tower Emergency Diesel Generator[5]	[in a million]	0.085	0.050	0.0045	0.033
Excess Cancer Risk from 16th Street Tower Emergency Diesel Generator[5]	[in a million]	0.033	0.019	0.013	0.0059
Excess Cancer Risk from GSW Arena Emergency Diesel Generators[5]	[in a million]	0.12	0.072	0.038	0.025
2014 Background Risk[6]	[in a million]	26	26	44	20
Total Excess Cancer Risk (Uncontrolled Scenario)	[in a million]	89	36	79	101
Total Excess Cancer Risk (Tier 4 Controlled Scenario)	[in a million]	42	34	56	38
Total Excess Cancer Risk (Tier 2 + ARB NOx VDECS) Controlled Scenario)	[in a million]	45	34	56	41
Cumulative Threshold[7]	[in a million]	100	100	100	100
Total Risk Exceeds Threshold? (Uncontrolled Scenario)	-	No	No	No	Yes
Total Risk Exceeds Threshold? (Tier 4 Controlled Scenario)	-	No	No	No	No
Total Risk Exceeds Threshold? (Tier 2 + ARB NOx VDECS Controlled Scenario)	-	No	No	No	No

Notes:
1. From Cal/EPA 2013.
2. Represent health impacts for a residential receptor at the dormitory, hospital, or daycare.
3. The health risk associated with generators reflect Tier 4 engine assumptions, the MAF is not applied for the daycare receptor for emissions from the dewatering generators as they run 24 hours a day.
4. The screening values reflect a 70-year cancer risk with age sensitivity factors applied (BAAQMD 2012a).
5. Generators were modeled using source parameters for standby generators published in SF-CRRP (BAAQMD 2012b).
6. 2014 background risk from the Citywide HRA database for all receptors.
7. Cumulative threshold is the threshold for creating an Air Pollutant Exposure Zone (APEZ), as defined by the San Francisco Planning Department, Environmental Planning.

Calculation:
Cancer Risk = [AnnualConc] × [CF] × [IF_{inh}] × [CPF] x [CRAF] x [MAF]
CF = 0.001 (mg/µg)

Abbreviations:
BAAQMD: Bay Area Air Quality Management District
Cal/EPA: California Environmental Protection Agency
CRAF: Cancer Risk Adjustment Factor
HRA: Health Risk Assessment
IF_{inh}: Intake Factor, Inhalation
kg: kilogram
MAF: Modeling Adjustment Factor
mg: milligram
PM: Particulate Matter
SF-CRRP: San Francisco Community Risk Reduction Plan
µg: microgram

References:

Bay Area Air Quality Management District (BAAQMD). 2012a. Recommended Methods for Screening and Modeling Local Risks and Hazards. May. Available online at: http://baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/Risk%20Modeling%20Approach%20May%202012.ashx?la=en

BAAQMD. 2012b. The San Francisco Community Risk Reduction Plan: Technical Support Document. December.

Cal/EPA. 2013. OEHHA/ARB Consolidated Table of Approved Risk Assessment Health Values. August. Available online at: http://www.arb.ca.gov/toxics/healthval/contable.pdf

Construction Equipment List

Muni Variant Table 6.1-9

Phase ID	Phase	Project Equipment	OFFROAD Equipment	HP	OFFROAD HP Bin	Tier HP Bin	LF	Quantity	Total Hours	Calendar Year	Construction Year	Fuel
1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	285	500	300	0.4556	2	3,042	2015	1	Diesel
2	Mass Excavation	Pugmill Generator	Other Construction Equipment	335	500	600	0.4154	1	521	2015	1	Diesel
2	Mass Excavation	Dewatering Generator	Other Construction Equipment	40	50	50	0.4154	5	21,900	2015	1	Diesel
2	Mass Excavation	Dewatering Generator	Other Construction Equipment	66	120	75	0.4154	4	17,520	2015	1	Diesel
2	Mass Excavation	Large Excavator	Excavators	523	750	600	0.3819	3	1,369	2015	1	Diesel
2	Mass Excavation	Scraper	Scrapers	500	500	600	0.4824	3	1,369	2015	1	Diesel
2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	211	250	300	0.3685	3	1,369	2015	1	Diesel
2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	150	175	175	0.3685	2	913	2015	1	Diesel
4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,205	9,999	2,000	0.5025	4	1,825	2015	1	Diesel
4	Pile Installation	Crawler Cranes	Cranes	530	750	600	0.2881	4	1,825	2015	1	Diesel
4	Pile Installation	Large Forklifts	Forklifts	93	120	120	0.201	2	913	2015	1	Diesel
4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	71	120	75	0.3618	4	1,825	2015	1	Diesel
4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	0	50	11	0.4154	4	1,825	2015	1	Electric
5	Shoring	Drill Rig	Bore/Drill Rigs	150	175	175	0.5025	2	913	2015	1	Diesel
5	Shoring	Support Crane	Cranes	530	750	600	0.2881	2	913	2015	1	Diesel
5	Shoring	Grout-mixing plant	Other Material Handling Equipment	20	50	25	0.3953	2	913	2015	1	Diesel
5	Shoring	Small Excavator	Excavators	71	120	75	0.3819	2	913	2015	1	Diesel
5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	150	175	175	0.5025	4	1,217	2015	1	Diesel
6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	480	500	600	0.4154	2	3,346	2015	1	Diesel
6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	71	120	75	0.3618	2	3,346	2015	1	Diesel
6	Building Construction (including arena)	Small Excavator	Excavators	404	500	600	0.3819	2	3,346	2015	1	Diesel
6	Building Construction (including arena)	Large Excavator	Excavators	523	750	600	0.3819	2	3,346	2015	1	Diesel
6	Building Construction (including arena)	Crawler Cranes	Cranes	530	750	600	0.2881	4	6,083	2015	1	Diesel
6	Building Construction (including arena)	Mobile Cranes	Cranes	530	750	600	0.2881	4	6,083	2015	1	Diesel
6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	93	120	120	0.201	8	12,167	2015	1	Diesel
6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	0	50	11	0.4154	15	22,813	2015	1	Electric
6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	0	50	11	0.4154	10	7,604	2015	1	Electric
6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	0	50	11	0.4154	25	19,010	2015	1	Electric
6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	0	50	11	0.4154	4	6,083	2015	1	Electric
6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	0	50	11	0.4154	1	1,065	2015	1	Electric
6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	480	500	600	0.4154	2	304	2016	2	Diesel
6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	71	120	75	0.3618	2	3,346	2016	2	Diesel
6	Building Construction (including arena)	Small Excavator	Excavators	404	500	600	0.3819	2	3,346	2016	2	Diesel
6	Building Construction (including arena)	Large Excavator	Excavators	523	750	600	0.3819	2	304	2016	2	Diesel
6	Building Construction (including arena)	Crawler Cranes	Cranes	530	750	600	0.2881	4	2,433	2016	2	Diesel
6	Building Construction (including arena)	Mobile Cranes	Cranes	530	750	600	0.2881	4	6,692	2016	2	Diesel
6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	93	120	120	0.201	8	14,600	2016	2	Diesel
6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	0	50	11	0.4154	15	27,375	2016	2	Electric
6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	0	50	11	0.4154	10	18,250	2016	2	Electric
6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	0	50	11	0.4154	25	30,417	2016	2	Electric
6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	0	50	11	0.4154	4	7,300	2016	2	Electric
6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	0	50	11	0.4154	1	1,825	2016	2	Electric

Construction Equipment List

Phase ID	Phase	Project Equipment	OFFROAD Equipment	HP	OFFROAD HP Bin	Tier HP Bin	LF	Quantity	Total Hours	Calendar Year	Construction Year	Fuel
7	Muni Stop Extension	Digger	Excavators	523	750	600	0.3819	1	288	2015	1	Diesel
7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	150	175	175	0.3685	2	576	2015	1	Diesel
7	Muni Stop Extension	Jackhammers	Other Construction Equipment	78	120	120	0.4154	1	288	2015	1	Diesel
7	Muni Stop Extension	Dump truck	Off-Highway Trucks	400	500	600	0.3819	1	288	2015	1	Diesel
7	Muni Stop Extension	Truck crane	Cranes	530	750	600	0.2881	1	288	2015	1	Diesel
7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	71	120	75	0.3618	1	288	2015	1	Diesel
7	Muni Stop Extension	Saw cutter	Other Construction Equipment	0	50	11	0.4154	2	576	2015	1	Electric
7	Muni Stop (Variant)	Digger	Excavators	523	750	600	0.3819	1	192	2015	1	Diesel
7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	150	175	175	0.3685	2	384	2015	1	Diesel
7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	78	120	120	0.4154	1	192	2015	1	Diesel
7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	400	500	600	0.3819	1	192	2015	1	Diesel
7	Muni Stop (Variant)	Truck crane	Cranes	530	750	600	0.2881	1	192	2015	1	Diesel
7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	71	120	75	0.3618	1	192	2015	1	Diesel
7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	0	50	11	0.4154	2	384	2015	1	Electric

Uncontrolled Offroad Equipment Activities and Emissions

Muni Variant Table 6.1-10

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	5,265	lb	Nox	OFFROAD	0
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	229	lb	PM	OFFROAD	0
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	406	lb	ROG	OFFROAD	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	42	lb	Nox	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	1.3	lb	PM	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	10	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	2,217	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	6.5	lb	PM	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	97	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	2,888	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	8.4	lb	PM	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	126	lb	ROG	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	2,093	lb	Nox	OFFROAD	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	68	lb	PM	OFFROAD	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	146	lb	ROG	OFFROAD	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	4,429	lb	Nox	OFFROAD	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	179	lb	PM	OFFROAD	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	344	lb	ROG	OFFROAD	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	1,122	lb	Nox	OFFROAD	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	36	lb	PM	OFFROAD	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	76	lb	ROG	OFFROAD	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	538	lb	Nox	OFFROAD	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	27	lb	PM	OFFROAD	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	47	lb	ROG	OFFROAD	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	10,387	lb	Nox	OFFROAD	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	255	lb	PM	OFFROAD	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	434	lb	ROG	OFFROAD	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	2,649	lb	Nox	OFFROAD	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	93	lb	PM	OFFROAD	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	176	lb	ROG	OFFROAD	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	248	lb	Nox	OFFROAD	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	21	lb	PM	OFFROAD	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	29	lb	ROG	OFFROAD	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	725	lb	Nox	OFFROAD	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	63	lb	PM	OFFROAD	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	88	lb	ROG	OFFROAD	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	592	lb	Nox	OFFROAD	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	27	lb	PM	OFFROAD	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	46	lb	ROG	OFFROAD	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	1,324	lb	Nox	OFFROAD	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	47	lb	PM	OFFROAD	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	88	lb	ROG	OFFROAD	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	92	lb	Nox	OFFROAD	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	9.3	lb	PM	OFFROAD	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	28	lb	ROG	OFFROAD	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	274	lb	Nox	OFFROAD	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	20	lb	PM	OFFROAD	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	28	lb	ROG	OFFROAD	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	789	lb	Nox	OFFROAD	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	35	lb	PM	OFFROAD	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	61	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	6,494	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	239	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	477	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	1,329	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	115	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	162	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	3,658	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	119	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	264	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	5,117	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	166	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	357	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	8,830	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	311	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	586	lb	ROG	OFFROAD	0

Uncontrolled Offroad Equipment Activities and Emissions

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	8,830	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	311	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	586	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	3,310	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	278	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	385	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	Nox	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	PM	OFFROAD	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	547	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	20	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	41	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	1,247	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	107	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	152	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	3,203	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	103	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	243	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	450	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	15	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	32	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	3,534	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	125	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	239	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	9,718	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	344	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	658	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	3,744	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	313	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	435	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	ROG	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM	OFFROAD	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	OFFROAD	0
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	288	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	1.7	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	1.5	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	176	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	1.3	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	1.3	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	59	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	0.59	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	0.47	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	221	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	1.3	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	1.2	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	220	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	1.3	lb	PM	Tier 2	1

Uncontrolled Offroad Equipment Activities and Emissions

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	1.2	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	46	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	0.47	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	0.38	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	PM	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Digger	Excavators	192	523	750	600	Diesel	192	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Digger	Excavators	192	523	750	600	Diesel	1.1	lb	PM	Tier 2	1
1	7	Muni Stop (Variant)	Digger	Excavators	192	523	750	600	Diesel	1.0	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	384	150	175	175	Diesel	117	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	384	150	175	175	Diesel	0.90	lb	PM	Tier 2	1
1	7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	384	150	175	175	Diesel	0.89	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	192	78	120	120	Diesel	39	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	192	78	120	120	Diesel	0.39	lb	PM	Tier 2	1
1	7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	192	78	120	120	Diesel	0.32	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	192	400	500	600	Diesel	147	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	192	400	500	600	Diesel	0.85	lb	PM	Tier 2	1
1	7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	192	400	500	600	Diesel	0.78	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Truck crane	Cranes	192	530	750	600	Diesel	147	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Truck crane	Cranes	192	530	750	600	Diesel	0.85	lb	PM	Tier 2	1
1	7	Muni Stop (Variant)	Truck crane	Cranes	192	530	750	600	Diesel	0.78	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	192	71	120	75	Diesel	31	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	192	71	120	75	Diesel	0.31	lb	PM	Tier 2	1
1	7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	192	71	120	75	Diesel	0.25	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	384	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	384	0	50	11	Electric	0	lb	PM	Tier 2	1
1	7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	384	0	50	11	Electric	0	lb	ROG	Tier 2	1

Muni Variant Table 6.1-11

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	226	lb	Nox	Tier 4	0
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	7.0	lb	PM10	Tier 4	0
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	52	lb	ROG	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	42	lb	Nox	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	1.3	lb	PM10	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	10	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	2,217	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	6.5	lb	PM10	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	97	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	2,888	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	8.4	lb	PM10	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	126	lb	ROG	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	157	lb	Nox	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	4.8	lb	PM10	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	36	lb	ROG	Tier 4	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	189	lb	Nox	Tier 4	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	5.8	lb	PM10	Tier 4	0
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	44	lb	ROG	Tier 4	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	61	lb	Nox	Tier 4	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	1.9	lb	PM10	Tier 4	0
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	14	lb	ROG	Tier 4	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	29	lb	Nox	Tier 4	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	0.89	lb	PM10	Tier 4	0
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	6.7	lb	ROG	Tier 4	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	5,457	lb	Nox	Tier 4	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	39	lb	PM10	Tier 4	0
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	146	lb	ROG	Tier 4	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	160	lb	Nox	Tier 4	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	4.9	lb	PM10	Tier 4	0
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	37	lb	ROG	Tier 4	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	10	lb	Nox	Tier 4	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	0.30	lb	PM10	Tier 4	0
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	2.3	lb	ROG	Tier 4	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	283	lb	Nox	Tier 4	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	0.83	lb	PM10	Tier 4	0
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	12	lb	ROG	Tier 4	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	39	lb	Nox	Tier 4	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	1.2	lb	PM10	Tier 4	0
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	9.1	lb	ROG	Tier 4	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	80	lb	Nox	Tier 4	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	2.5	lb	PM10	Tier 4	0
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	18	lb	ROG	Tier 4	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	85	lb	Nox	Tier 4	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	4.8	lb	PM10	Tier 4	0
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	4.8	lb	ROG	Tier 4	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	149	lb	Nox	Tier 4	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	0.44	lb	PM10	Tier 4	0
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	6.5	lb	ROG	Tier 4	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	53	lb	Nox	Tier 4	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	1.6	lb	PM10	Tier 4	0
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	12	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	382	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	12	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	88	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	519	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	1.5	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	23	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	296	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	9.1	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	68	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	383	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	12	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	88	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	532	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	16	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	123	lb	ROG	Tier 4	0

Controlled Offroad Equipment Activities and Emissions (Tier 4)

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	532	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	16	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	123	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	130	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	4.0	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	30	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	PM	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	PM	Tier 4	0
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	35	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	1.1	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	8.0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	519	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	1.5	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	23	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	296	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	9.1	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	68	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	35	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	1.1	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	8.0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	213	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	6.6	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	49	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	586	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	18	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	135	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	156	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	4.8	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	36	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	PM10	Tier 4	0
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	PM	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	ROG	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM	Tier 4	0
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	33	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	1.0	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	7.6	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	18	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	0.56	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	4.2	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	5.3	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	0.16	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	1.2	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	25	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	0.78	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	5.8	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	25	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	0.78	lb	PM10	Tier 4	0

Controlled Offroad Equipment Activities and Emissions (Tier 4)

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	5.8	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	45	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	0.13	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	2.0	lb	ROG	Tier 4	0
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	ROG	Tier 4	0
1	7	Muni Stop (Variant)	Digger	Excavators	192	523	750	600	Diesel	22	lb	Nox	Tier 4	0
1	7	Muni Stop (Variant)	Digger	Excavators	192	523	750	600	Diesel	0.68	lb	PM10	Tier 4	0
1	7	Muni Stop (Variant)	Digger	Excavators	192	523	750	600	Diesel	5.1	lb	ROG	Tier 4	0
1	7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	384	150	175	175	Diesel	12	lb	Nox	Tier 4	0
1	7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	384	150	175	175	Diesel	0.37	lb	PM10	Tier 4	0
1	7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	384	150	175	175	Diesel	2.8	lb	ROG	Tier 4	0
1	7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	192	78	120	120	Diesel	3.6	lb	Nox	Tier 4	0
1	7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	192	78	120	120	Diesel	0.11	lb	PM10	Tier 4	0
1	7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	192	78	120	120	Diesel	0.82	lb	ROG	Tier 4	0
1	7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	192	400	500	600	Diesel	17	lb	Nox	Tier 4	0
1	7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	192	400	500	600	Diesel	0.52	lb	PM10	Tier 4	0
1	7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	192	400	500	600	Diesel	3.9	lb	ROG	Tier 4	0
1	7	Muni Stop (Variant)	Truck crane	Cranes	192	530	750	600	Diesel	17	lb	Nox	Tier 4	0
1	7	Muni Stop (Variant)	Truck crane	Cranes	192	530	750	600	Diesel	0.52	lb	PM10	Tier 4	0
1	7	Muni Stop (Variant)	Truck crane	Cranes	192	530	750	600	Diesel	3.9	lb	ROG	Tier 4	0
1	7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	192	71	120	75	Diesel	30	lb	Nox	Tier 4	0
1	7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	192	71	120	75	Diesel	0.087	lb	PM10	Tier 4	0
1	7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	192	71	120	75	Diesel	1.3	lb	ROG	Tier 4	0
1	7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	384	0	50	11	Electric	0	lb	Nox	Tier 4	0
1	7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	384	0	50	11	Electric	0	lb	PM10	Tier 4	0
1	7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	384	0	50	11	Electric	0	lb	ROG	Tier 4	0

Controlled Offroad Equipment Activities and Emissions (Tier 2 + ARB NOx VDECS)

Muni Variant Table Table 6.1-12

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	2,168	lb	Nox	Tier 2	1
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	11	lb	PM10	Tier 2	1
1	1	Demolition/Mass Excavation	Street Sweeper	Sweepers/Scrubbers	3,042	285	500	300	Diesel	10	lb	ROG	Tier 2	1
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	42	lb	Nox	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	1.3	lb	PM10	Tier 4	0
1	2	Mass Excavation	Pugmill Generator	Other Construction Equipment	521	335	500	600	Diesel	10	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	2,217	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	6.5	lb	PM10	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	21,900	40	50	50	Diesel	97	lb	ROG	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	2,888	lb	Nox	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	8.4	lb	PM10	Tier 4	0
1	2	Mass Excavation	Dewatering Generator	Other Construction Equipment	17,520	66	120	75	Diesel	126	lb	ROG	Tier 4	0
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	1,371	lb	Nox	Tier 2	1
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	8.0	lb	PM10	Tier 2	1
1	2	Mass Excavation	Large Excavator	Excavators	1,369	523	750	600	Diesel	7.2	lb	ROG	Tier 2	1
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	1,655	lb	Nox	Tier 2	1
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	10	lb	PM10	Tier 2	1
1	2	Mass Excavation	Scraper	Scrapers	1,369	500	500	600	Diesel	8.7	lb	ROG	Tier 2	1
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	584	lb	Nox	Tier 2	1
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	3.1	lb	PM10	Tier 2	1
1	2	Mass Excavation	Wheel Loader	Tractors/Loaders/Backhoes	1,369	211	250	300	Diesel	2.8	lb	ROG	Tier 2	1
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	278	lb	Nox	Tier 2	1
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	2.1	lb	PM10	Tier 2	1
1	2	Mass Excavation	Track Type Tractor Blde/Ripper	Tractors/Loaders/Backhoes	913	150	175	175	Diesel	2.1	lb	ROG	Tier 2	1
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	5,540	lb	Nox	Tier 2	1
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	32	lb	PM10	Tier 2	1
1	4	Pile Installation	Drill Rig (for installation of Auger Cast piles)	Bore/Drill Rigs	1,825	1,205	9,999	2,000	Diesel	29	lb	ROG	Tier 2	1
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	1,397	lb	Nox	Tier 2	1
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	8.1	lb	PM10	Tier 2	1
1	4	Pile Installation	Crawler Cranes	Cranes	1,825	530	750	600	Diesel	7.4	lb	ROG	Tier 2	1
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	107	lb	Nox	Tier 2	1
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	1.1	lb	PM10	Tier 2	1
1	4	Pile Installation	Large Forklifts	Forklifts	913	93	120	120	Diesel	0.86	lb	ROG	Tier 2	1
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	295	lb	Nox	Tier 2	1
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	3.0	lb	PM10	Tier 2	1
1	4	Pile Installation	Bobcat or small excavators	Rubber Tired Loaders	1,825	71	120	75	Diesel	2.4	lb	ROG	Tier 2	1
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	4	Pile Installation	Cutting and chopping saws	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	379	lb	Nox	Tier 2	1
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	2.9	lb	PM10	Tier 2	1
1	5	Shoring	Drill Rig	Bore/Drill Rigs	913	150	175	175	Diesel	2.9	lb	ROG	Tier 2	1
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	699	lb	Nox	Tier 2	1
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	4.1	lb	PM10	Tier 2	1
1	5	Shoring	Support Crane	Cranes	913	530	750	600	Diesel	3.7	lb	ROG	Tier 2	1
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	51	lb	Nox	Tier 2	1
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	1.4	lb	PM10	Tier 2	1
1	5	Shoring	Grout-mixing plant	Other Material Handling Equipment	913	20	50	25	Diesel	0.48	lb	ROG	Tier 2	1
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	155	lb	Nox	Tier 2	1
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	1.6	lb	PM10	Tier 2	1
1	5	Shoring	Small Excavator	Excavators	913	71	120	75	Diesel	1.3	lb	ROG	Tier 2	1
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	506	lb	Nox	Tier 2	1
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	3.9	lb	PM10	Tier 2	1
1	5	Shoring	Cut off wall (CDSM) equipment	Bore/Drill Rigs	1,217	150	175	175	Diesel	3.8	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	3,345	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	19	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	3,346	480	500	600	Diesel	18	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	540	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	5.5	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	4.4	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	2,588	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	15	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	14	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	3,350	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	19	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Large Excavator	Excavators	3,346	523	750	600	Diesel	18	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	4,657	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	27	lb	PM10	Tier 2	1

Controlled Offroad Equipment Activities and Emissions (Tier 2 + ARB NOx VDECS)

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	6	Building Construction (including arena)	Crawler Cranes	Cranes	6,083	530	750	600	Diesel	25	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	4,657	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	27	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,083	530	750	600	Diesel	25	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	1,429	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	14	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	12,167	93	120	120	Diesel	12	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	22,813	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	7,604	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	19,010	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	PM	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	6,083	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	PM	Tier 2	1
1	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,065	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	304	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	1.8	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Concrete Boom Pumps	Other Construction Equipment	304	480	500	600	Diesel	1.6	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	540	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	5.5	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Bobcat	Rubber Tired Loaders	3,346	71	120	75	Diesel	4.4	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	2,588	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	15	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Small Excavator	Excavators	3,346	404	500	600	Diesel	14	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	305	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	1.8	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Large Excavator	Excavators	304	523	750	600	Diesel	1.6	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	1,863	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	11	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Crawler Cranes	Cranes	2,433	530	750	600	Diesel	10	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	5,122	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	30	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Mobile Cranes	Cranes	6,692	530	750	600	Diesel	27	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	1,715	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	17	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Grandall-type Forklifts	Forklifts	14,600	93	120	120	Diesel	14	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Cutting/chopping saws	Other Construction Equipment	27,375	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Tile cutting saws	Other Construction Equipment	18,250	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	PM10	Tier 2	1
2	6	Building Construction (including arena)	Drywall stud impact guns	Other Construction Equipment	30,417	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	PM	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	7,300	0	50	11	Electric	0	lb	ROG	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	Nox	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	PM	Tier 2	1
2	6	Building Construction (including arena)	Tower Cranes	Other Construction Equipment	1,825	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	288	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	1.7	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Digger	Excavators	288	523	750	600	Diesel	1.5	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	176	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	1.3	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Backhoe	Tractors/Loaders/Backhoes	576	150	175	175	Diesel	1.3	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	59	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	0.59	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Jackhammers	Other Construction Equipment	288	78	120	120	Diesel	0.47	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	221	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	1.3	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Dump truck	Off-Highway Trucks	288	400	500	600	Diesel	1.2	lb	ROG	Tier 2	1

Controlled Offroad Equipment Activities and Emissions (Tier 2 + ARB NOx VDECS)

Construction Year	Phase ID	Phase	Project Equipment	OFFROAD Equipment	Total Hours	HP	OFFROAD HP Bin	Tier HP Bin	Fuel	Emissions	Units	Pollutant	Engine Tier	DPF
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	220	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	1.3	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Truck crane	Cranes	288	530	750	600	Diesel	1.2	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	46	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	0.47	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Bobcat	Rubber Tired Loaders	288	71	120	75	Diesel	0.38	lb	ROG	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	7	Muni Stop Extension	Saw cutter	Other Construction Equipment	576	0	50	11	Electric	0	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Digger	Excavators	192	523	750	600	Diesel	192	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Digger	Excavators	192	523	750	600	Diesel	1.1	lb	PM10	Tier 2	1
1	7	Muni Stop (Variant)	Digger	Excavators	192	523	750	600	Diesel	1.0	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	384	150	175	175	Diesel	117	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	384	150	175	175	Diesel	0.90	lb	PM10	Tier 2	1
1	7	Muni Stop (Variant)	Backhoe	Tractors/Loaders/Backhoes	384	150	175	175	Diesel	0.89	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	192	78	120	120	Diesel	39	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	192	78	120	120	Diesel	0.39	lb	PM10	Tier 2	1
1	7	Muni Stop (Variant)	Jackhammers	Other Construction Equipment	192	78	120	120	Diesel	0.32	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	192	400	500	600	Diesel	147	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	192	400	500	600	Diesel	0.85	lb	PM10	Tier 2	1
1	7	Muni Stop (Variant)	Dump truck	Off-Highway Trucks	192	400	500	600	Diesel	0.78	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Truck crane	Cranes	192	530	750	600	Diesel	147	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Truck crane	Cranes	192	530	750	600	Diesel	0.85	lb	PM10	Tier 2	1
1	7	Muni Stop (Variant)	Truck crane	Cranes	192	530	750	600	Diesel	0.78	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	192	71	120	75	Diesel	31	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	192	71	120	75	Diesel	0.31	lb	PM10	Tier 2	1
1	7	Muni Stop (Variant)	Bobcat	Rubber Tired Loaders	192	71	120	75	Diesel	0.25	lb	ROG	Tier 2	1
1	7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	384	0	50	11	Electric	0	lb	Nox	Tier 2	1
1	7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	384	0	50	11	Electric	0	lb	PM10	Tier 2	1
1	7	Muni Stop (Variant)	Saw cutter	Other Construction Equipment	384	0	50	11	Electric	0	lb	ROG	Tier 2	1

Muni Variant Table 6.1-13
Project Construction Trip Estimates

Phase	Duration [months]	Average Number of Daily Construction Trucks[1]	Average Number of Daily Construction Workers[1]	Number of Work Days	Total One-Way Trips		
					Hauling Trips	Vendor Trips	Worker Trips
Entire Site							
Demolition (Entire Site)	1	8	10	22	352	-	440
Excavation and Shoring (Entire Site)	3	300	25	66	39,600	-	3,300
Arena							
Foundation & Below Grade Construction (Piles & Concrete)	6	20	100	131	-	5,240	26,200
Base Building	16	25	200	348	-	17,400	139,200
Exterior Finishing	10	25	50	218	-	10,900	21,800
Interior Finishing	18.5	30	150	402	-	24,120	120,600
Garage/Podium							
Foundation & Below Grade Construction (Piles & Concrete)	6	20	50	131	-	5,240	13,100
Base Building	9	20	50	196	-	7,840	19,600
NW Tower							
Base Building	8	15	40	174	-	5,220	13,920
Exterior Finishing	5	2	10	109	-	436	2,180
Interior Finishing	12	10	100	261	-	5,220	52,200
SW Tower							
Base Building	8	15	40	174	-	5,220	13,920
Exterior Finishing	5	2	10	109	-	436	2,180
Interior Finishing	12	10	100	261	-	5,220	52,200
Entire Site							
Street Improvements	5	10	40	109	-	2,180	8,720
Muni Stop (Variant)							
Demolition	0.5	2.9	0	4	23	-	-
Construction	4.5	8	21	40	-	640	1680
				Total Construction Trips	39,975	95,312	491,240

Notes:

1. Proposed number of construction trucks and workers provided by Project Sponsor in a table titled "Summary of Construction Phases and Duration, and Daily Construction Trucks and Workers by Phase," dated 11/25/2014.

Onroad Equipment Activities, Emission Factors and Emissions

Muni Variant Table 6.1-14

								Running Exhaust and Running Losses Emission Factor (g/mile)				
Site	**Year**	**Trip Type[1]**	**Vehicle Type[1]**	**Fuel**	**% of Fleet[1]**	**Total One-way Trips**	**One-way Trip Length**	*ROG Exhaust*	*ROG Running Loss*	*NOx Exhaust*	*PM_{10} Exhaust*	*$PM_{2.5}$ Exhaust*
Mission Bay	2015	Worker	LDA	GAS	50%	491,240	12.4	0.039	0.067	0.12	0.0023	0.0021
	2015	Worker	LDT1	GAS	25%	491,240	12.4	0.079	0.22	0.27	0.0043	0.0040
	2015	Worker	LDT2	GAS	25%	491,240	12.4	0.041	0.10	0.21	0.0022	0.0020
	2015	Vendor	T6	DSL	50%	95,312	7.3	0.22	0	4.6	0.12	0.11
	2015	Vendor	T7	DSL	50%	95,312	7.3	0.29	0	7.4	0.12	0.11
	2015	Hauling	T7	DSL	100%	39,975	20	0.29	0	7.4	0.12	0.11

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

Muni Variant Table 6.1-15

Site	Year	Trip Type[1]	Vehicle Type[1]	Fuel	% of Fleet[1]	Total One-way Trips	One-way Trip Length	Running Exhaust and Running Losses Emissions (lb)				
								ROG Exhaust	*ROG Running Loss*	*NOx Exhaust*	*PM_{10} Exhaust*	*$PM_{2.5}$ Exhaust*
Mission Bay	2015	Worker	LDA	GAS	50%	491,240	12.4	264	448	800	15	14.09
	2015	Worker	LDT1	GAS	25%	491,240	12.4	265	743	891	15	13.42
	2015	Worker	LDT2	GAS	25%	491,240	12.4	137	351	694	7.4	6.85
	2015	Vendor	T6	DSL	50%	95,312	7.3	170	0	3,549	93	85.98
	2015	Vendor	T7	DSL	50%	95,312	7.3	223	0	5,647	90	82.41
	2015	Hauling	T7	DSL	100%	39,975	20	512	0	12,977	206	189.39

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

Onroad Equipment Activities, Emission Factors and Emissions

Muni Variant Table 6.1-16

Site	Year	Trip Type[1]	Vehicle Type[1]	Fuel	% of Fleet[1]	Total One-way Trips	One-way Trip Length	Idling Emission Factor (g/hr-vehicle)				Idling Exhaust Emissions (lb) [5 min per one-way trip for mass emissions]			
								ROG	*NOx*	PM_{10}	$PM_{2.5}$	*ROG*	*NOx*	PM_{10}	$PM_{2.5}$
Mission Bay	2015	Worker	LDA	GAS	50%	491,240	12.4	0	0	0	0	0	0	0	0
	2015	Worker	LDT1	GAS	25%	491,240	12.4	0	0	0	0	0	0	0	0
	2015	Worker	LDT2	GAS	25%	491,240	12.4	0	0	0	0	0	0	0	0
	2015	Vendor	T6	DSL	50%	95,312	7.3	2.0	80	0.36	0.33	18	698	3.1	2.87
	2015	Vendor	T7	DSL	50%	95,312	7.3	6.4	66	0.31	0.28	56	580	2.7	2.46
	2015	Hauling	T7	DSL	100%	39,975	20	6.4	66	0.31	0.28	47	486	2.2	2.06

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

Onroad Equipment Activities, Emission Factors and Emissions

Muni Variant Table 6.1-17

Site	Year	Trip Type[1]	Vehicle Type[1]	Fuel	% of Fleet[1]	Total One-way Trips	One-way Trip Length	Starting Exhaust Emission Factor (g/one-way trip)				Starting Exhaust Emissions (lb) [Once per one-way trip for mass emissions]			
								ROG	*NOx*	*PM_{10}*	*$PM_{2.5}$*	*ROG*	*NOx*	*PM_{10}*	*$PM_{2.5}$*
Mission Bay	2015	Worker	LDA	GAS	50%	491,240	12.4	0.22	0.18	0.0030	0.0027	118	95	1.6	1.47
	2015	Worker	LDT1	GAS	25%	491,240	12.4	0.43	0.31	0.0046	0.0042	115	83	1.2	1.14
	2015	Worker	LDT2	GAS	25%	491,240	12.4	0.28	0.34	0.0027	0.0025	75	92	0.74	0.68
	2015	Vendor	T6	DSL	50%	95,312	7.3	0	0	0	0	0	0	0	0.00
	2015	Vendor	T7	DSL	50%	95,312	7.3	0	0	0	0	0	0	0	0.00
	2015	Hauling	T7	DSL	100%	39,975	20	0	0	0	0	0	0	0	0.00

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

Muni Variant Table 6.1-18

								Evaporative ROG Emission Factor (g/one-way trip)			Evaporative ROG Emissions (lb)		
Site	**Year**	**Trip Type[1]**	**Vehicle Type[1]**	**Fuel**	**% of Fleet[1]**	**Total One-way Trips**	**One-way Trip Length**	*Diurnal*	*Hot-Soak*	*Resting Loss*	*Diurnal*	*Hot-Soak*	*Resting Loss*
Mission Bay	2015	Worker	LDA	GAS	50%	491,240	12.4	0.046	0.15	0.041	25	82	22
	2015	Worker	LDT1	GAS	25%	491,240	12.4	0.10	0.28	0.083	28	77	22
	2015	Worker	LDT2	GAS	25%	491,240	12.4	0.050	0.16	0.047	14	43	13
	2015	Vendor	T6	DSL	50%	95,312	7.3	0	0	0	0	0	0
	2015	Vendor	T7	DSL	50%	95,312	7.3	0	0	0	0	0	0
	2015	Hauling	T7	DSL	100%	39,975	20	0	0	0	0	0	0

Notes:

1. CalEEMod default vehicle mix of light-duty auto (LDA), light-duty truck type 1 (LDT1), and light-duty truck type 2 (LDT2) for worker trips, mix of medium heavy-duty vehicles (MHDT) and heavy heavy-duty trucks (HHDT) for vendor trips, and all HHDT for hauling trips.

APPENDIX TR2

Supplemental Transportation Supporting Information

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Existing 2015 (No Project) with SF Giants Game at AT&T Park - Weekday Late Evening

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

10/21/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↑↑	↰	↱
Volume (vph)	597	80	2	920	99	20
Ideal Flow (vphpl)	1400	1400	1000	1000	1400	1400
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2224			1620	1134	1000
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	2224			1546	1134	1000
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	711	95	2	1095	118	24
RTOR Reduction (vph)	10	0	0	0	0	16
Lane Group Flow (vph)	796	0	0	1097	118	8
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1255			872	377	332
v/s Ratio Prot	0.36				c0.10	
v/s Ratio Perm				c0.71		0.01
v/c Ratio	0.63			1.26	0.31	0.02
Uniform Delay, d1	16.3			23.9	27.3	24.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	2.5			125.4	0.5	0.0
Delay (s)	18.7			149.4	27.8	24.7
Level of Service	B			F	C	C
Approach Delay (s)	18.7			149.4	27.3	
Approach LOS	B			F	C	

Intersection Summary			
HCM 2000 Control Delay	89.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations		↰↑↑↑↱			↰↑	↑↱			↰↰↰	↱
Volume (vph)	19	302	53	13	179	395	159	85	209	116
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.98			1.00	0.97			0.98	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			0.99	0.85
Flt Protected		1.00			1.00	1.00			0.96	1.00
Satd. Flow (prot)		5746			2872	2470			4028	1122
Flt Permitted		1.00			0.90	1.00			0.96	1.00
Satd. Flow (perm)		5746			2600	2470			4028	1122
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	22	355	62	15	211	465	187	100	246	136
RTOR Reduction (vph)	0	39	0	0	0	53	0	0	0	0
Lane Group Flow (vph)	0	400	0	0	226	599	0	0	370	112
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		21.4			22.6	22.6			13.5	13.5
Effective Green, g (s)		23.4			25.6	25.6			16.5	16.5
Actuated g/C Ratio		0.31			0.34	0.34			0.22	0.22
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1792			887	843			886	246
v/s Ratio Prot						c0.24			0.09	c0.10
v/s Ratio Perm		0.07			0.09					
v/c Ratio		0.22			0.25	0.71			0.42	0.46
Uniform Delay, d1		19.1			17.8	21.5			25.1	25.4
Progression Factor		1.00			0.79	1.00			1.00	1.00
Incremental Delay, d2		0.1			0.1	2.8			0.3	1.3
Delay (s)		19.1			14.2	24.3			25.4	26.7
Level of Service		B			B	C			C	C
Approach Delay (s)		19.1			14.2	24.3			25.7	
Approach LOS		B			B	C			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Existing (2015) plus Basketball Game with no SF Giants Game at AT&T Park - Weekday Evening

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	244	319	59	47	105	6	39	74	53	8	29	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.98	
Flpb, ped/bikes		0.99		0.99	1.00			0.99	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.90	
Flt Protected		0.98		0.95	1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1459		1696	1780			1760	1489		1343	
Flt Permitted		0.82		0.40	1.00			0.84	1.00		0.98	
Satd. Flow (perm)		1218		722	1780			1507	1489		1321	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	268	351	65	52	115	7	43	81	58	9	32	105
RTOR Reduction (vph)	0	3							47	0	84	0
Lane Group Flow (vph)	0	681	0	52	120	0	0	124	11	0	62	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6							
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		52.3		52.3	52.3			18.7	18.7		18.7	
Effective Green, g (s)		52.3		52.3	52.3			18.7	18.7		18.7	
Actuated g/C Ratio		0.55		0.55	0.55			0.20	0.20		0.20	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		669		396	977			296	292		259	
v/s Ratio Prot					0.07							
v/s Ratio Perm		c0.56		0.07				c0.08	0.01		0.05	
v/c Ratio		1.02		0.13	0.12			0.42	0.04		0.24	
Uniform Delay, d1		21.5		10.4	10.4			33.5	31.0		32.2	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		39.5		0.2	0.1			1.0	0.1		0.5	
Delay (s)		60.9		10.6	10.4			34.5	31.0		32.7	
Level of Service		E		B	B			C	C		C	
Approach Delay (s)		60.9			10.5			33.4			32.7	
Approach LOS		E			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	45.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	95.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	308	555	48	18	210	11	35	588	44	25	362	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1669	3371		1698	3388		1260	2487		1260	2373	
Flt Permitted	0.60	1.00		0.24	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1049	3371		427	3388		1260	2487		1260	2373	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	342	617	53	20	233	12	39	653	49	28	402	190
RTOR Reduction (vph)	0	6	0	0	4	0	0	5	0	0	56	0
Lane Group Flow (vph)	342	664	0	20	241	0	39	697	0	28	536	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	311	1001		126	1006		212	992		187	899	
v/s Ratio Prot		0.20			0.07		0.03	c0.28		0.02	c0.23	
v/s Ratio Perm	c0.33			0.05								
v/c Ratio	1.10	0.66		0.16	0.24		0.18	0.70		0.15	0.60	
Uniform Delay, d1	35.1	30.8		25.9	26.6		35.6	25.1		37.0	24.9	
Progression Factor	1.00	1.00		1.00	1.00		0.84	0.73		1.50	0.63	
Incremental Delay, d2	80.5	3.5		2.7	0.6		1.2	2.7		1.4	2.4	
Delay (s)	115.6	34.2		28.6	27.2		31.2	21.0		56.8	18.1	
Level of Service	F	C		C	C		C	C		E	B	
Approach Delay (s)		61.7			27.3			21.6			19.8	
Approach LOS		E			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Existing (2015) plus Basketball Game with SF Giants Game at AT&T Park - Weekday Evening

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd. 10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	264	537	27	35	141	7	35	100	69	5	48	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.98	
Flpb, ped/bikes		0.99		0.99	1.00			1.00	1.00		1.00	
Frt		1.00		1.00	0.99			1.00	0.85		0.91	
Flt Protected		0.98		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1484		1699	1784			1770	1486		1362	
Flt Permitted		0.84		0.34	1.00			0.86	1.00		0.99	
Satd. Flow (perm)		1260		610	1784			1549	1486		1351	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	272	554	28	36	145	7	36	103	71	5	49	97
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	58	0	62	0
Lane Group Flow (vph)	0	853	0	36	151	0	0	139	13	0	89	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		62.2		62.2	62.2			19.6	19.6		19.6	
Effective Green, g (s)		62.2		62.2	62.2			19.6	19.6		19.6	
Actuated g/C Ratio		0.59		0.59	0.59			0.19	0.19		0.19	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		740		358	1047			286	275		250	
v/s Ratio Prot					0.08							
v/s Ratio Perm		c0.68		0.06				c0.09	0.01		0.07	
v/c Ratio		1.15		0.10	0.14			0.49	0.05		0.36	
Uniform Delay, d1		21.9		9.6	9.8			38.6	35.5		37.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		83.9		0.1	0.1			1.3	0.1		0.9	
Delay (s)		105.7		9.7	9.9			39.9	35.5		38.5	
Level of Service		F		A	A			D	D		D	
Approach Delay (s)		105.7			9.9			38.5			38.5	
Approach LOS		F			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	75.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	105.9	Sum of lost time (s)	14.0
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St. 4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	286	782	46	22	202	45	58	585	20	26	344	202
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1300	1300	1300	1300	1300	1300
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1495	3030		1523	2951		1170	2325		1170	2183	
Flt Permitted	0.58	1.00		0.13	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	907	3030		216	2951		1170	2325		1170	2183	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	308	841	49	24	217	48	62	629	22	28	370	217
RTOR Reduction (vph)	0	4	0	0	19	0	0	2	0	0	85	0
Lane Group Flow (vph)	308	886	0	24	246	0	62	649	0	28	502	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	269	899		64	876		197	927		174	827	
v/s Ratio Prot		0.29			0.08		0.05	c0.28		0.02	c0.23	
v/s Ratio Perm	c0.34			0.11								
v/c Ratio	1.14	0.99		0.38	0.28		0.31	0.70		0.16	0.61	
Uniform Delay, d1	35.1	34.9		27.8	27.0		36.5	25.1		37.1	25.0	
Progression Factor	1.00	1.00		1.00	1.00		0.83	0.74		1.40	0.68	
Incremental Delay, d2	99.8	26.7		16.0	0.8		2.7	2.9		1.8	3.0	
Delay (s)	134.9	61.6		43.8	27.8		33.0	21.3		53.8	20.0	
Level of Service	F	E		D	C		C	C		D	B	
Approach Delay (s)		80.5			29.1			22.3			21.5	
Approach LOS		F			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	47.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Existing (2015) plus Basketball Game with no SF Giants Game at AT&T Park - Weekday Late Evening

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	25	19	341	47	1	5	17	9	0	11	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	0.98		0.97	
Flpb, ped/bikes		0.99		0.98	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	1.00			1.00	0.85		0.87	
Flt Protected		0.97		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1422		1677	1795			1779	1494		1294	
Flt Permitted		0.80		0.69	1.00			0.75	1.00		1.00	
Satd. Flow (perm)		1168		1210	1795			1350	1494		1294	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	99	32	24	437	60	1	6	22	12	0	14	364
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	9	0	287	0
Lane Group Flow (vph)	0	149	0	437	60	0	0	28	3	0	91	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm		NA	
Protected Phases		2			6							
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		32.6		32.6	32.6			15.4	15.4		15.4	
Effective Green, g (s)		32.6		32.6	32.6			15.4	15.4		15.4	
Actuated g/C Ratio		0.45		0.45	0.45			0.21	0.21		0.21	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		525		544	808			287	317		275	
v/s Ratio Prot					0.03						c0.07	
v/s Ratio Perm		0.13		c0.36				0.02	0.00			
v/c Ratio		0.28		0.80	0.07			0.10	0.01		0.33	
Uniform Delay, d1		12.5		17.1	11.3			22.9	22.5		24.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3		8.4	0.0			0.1	0.0		0.7	
Delay (s)		12.8		25.5	11.4			23.1	22.5		24.9	
Level of Service		B		C	B			C	C		C	
Approach Delay (s)		12.8			23.8			22.9			24.9	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	72.4	Sum of lost time (s)	14.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	80	25	23	299	14	82	72	6	34	133	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.98	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.99		1.00	0.99		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1680	3272		1679	3391		1260	2485		1260	2301	
Flt Permitted	0.49	1.00		0.67	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	866	3272		1188	3391		1260	2485		1260	2301	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	42	96	30	28	360	17	99	87	7	41	160	148
RTOR Reduction (vph)	0	20	0	0	4	0	0	4	0	0	96	0
Lane Group Flow (vph)	42	106	0	28	373	0	99	90	0	41	212	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		12.9	35.9		8.9	31.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		12.9	35.9		8.9	31.9	
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.14	0.40		0.10	0.35	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	285	1079		392	1119		180	991		124	815	
v/s Ratio Prot		0.03			c0.11		c0.08	0.04		0.03	c0.09	
v/s Ratio Perm	0.05			0.02								
v/c Ratio	0.15	0.10		0.07	0.33		0.55	0.09		0.33	0.26	
Uniform Delay, d1	21.2	20.9		20.7	22.7		35.9	16.9		37.8	20.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.0		0.1	0.2		3.6	0.2		1.6	0.2	
Delay (s)	21.5	20.9		20.8	22.9		39.5	17.1		39.3	20.8	
Level of Service	C	C		C	C		D	B		D	C	
Approach Delay (s)		21.1			22.7			28.5			23.0	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Existing (2015) plus Basketball Game with SF Giants Game at AT&T Park - Weekday Late Evening

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

10/21/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	597	80	2	941	99	20
Ideal Flow (vphpl)	1400	1400	1000	1000	1400	1400
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2224			1620	1134	1000
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	2224			1546	1134	1000
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	711	95	2	1120	118	24
RTOR Reduction (vph)	10	0	0	0	0	16
Lane Group Flow (vph)	796	0	0	1122	118	8
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1255			872	377	332
v/s Ratio Prot	0.36				c0.10	
v/s Ratio Perm				c0.73		0.01
v/c Ratio	0.63			1.29	0.31	0.02
Uniform Delay, d1	16.3			23.9	27.3	24.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	2.5			137.7	2.2	0.1
Delay (s)	18.7			161.6	29.5	24.8
Level of Service	B			F	C	C
Approach Delay (s)	18.7			161.6	28.7	
Approach LOS	B			F	C	

Intersection Summary			
HCM 2000 Control Delay	96.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	97.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	19	302	53	13	179	395	159	98	235	116
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.98			1.00	0.97			0.99	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			0.99	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5745			2872	2470			4071	1122
Flt Permitted		1.00			0.90	1.00			0.95	1.00
Satd. Flow (perm)		5745			2600	2470			4071	1122
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	22	355	62	15	211	465	187	115	276	136
RTOR Reduction (vph)	0	40	0	0	0	50	0	0	0	0
Lane Group Flow (vph)	0	399	0	0	226	602	0	0	406	121
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		20.8			22.4	22.4			14.3	14.3
Effective Green, g (s)		22.8			25.4	25.4			17.3	17.3
Actuated g/C Ratio		0.30			0.34	0.34			0.23	0.23
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1746			880	836			939	258
v/s Ratio Prot						c0.24			0.10	c0.11
v/s Ratio Perm		0.07			0.09					
v/c Ratio		0.23			0.26	0.72			0.43	0.47
Uniform Delay, d1		19.5			18.0	21.7			24.7	24.9
Progression Factor		1.00			0.72	1.00			1.00	1.00
Incremental Delay, d2		0.1			0.1	3.1			0.3	1.3
Delay (s)		19.6			12.9	24.8			25.0	26.2
Level of Service		B			B	C			C	C
Approach Delay (s)		19.6			12.9	24.8			25.3	
Approach LOS		B			B	C			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Existing (2015) plus Basketball Game with SF Giants Game at AT&T Park - Weekday Late Evening

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	36	10	602	154	12	5	17	13	2	10	307
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.97	
Flpb, ped/bikes		0.99		0.97	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.87	
Flt Protected		0.97		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1441		1667	1775			1779	1489		1288	
Flt Permitted		0.73		0.68	1.00			0.77	1.00		1.00	
Satd. Flow (perm)		1083		1188	1775			1390	1489		1287	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	97	46	13	772	197	15	6	22	17	3	13	394
RTOR Reduction (vph)	0	3	0	0	2	0	0	0	14	0	326	0
Lane Group Flow (vph)	0	153	0	772	210	0	0	28	3	0	84	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		52.6		52.6	52.6			15.9	15.9		15.9	
Effective Green, g (s)		52.6		52.6	52.6			15.9	15.9		15.9	
Actuated g/C Ratio		0.57		0.57	0.57			0.17	0.17		0.17	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		614		674	1007			238	255		220	
v/s Ratio Prot					0.12							
v/s Ratio Perm		0.14		c0.65				0.02	0.00		c0.06	
v/c Ratio		0.25		1.15	0.21			0.12	0.01		0.38	
Uniform Delay, d1		10.1		20.1	9.8			32.5	31.9		34.0	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.2		82.2	0.1			0.2	0.0		1.1	
Delay (s)		10.3		102.2	9.9			32.7	31.9		35.1	
Level of Service		B		F	A			C	C		D	
Approach Delay (s)		10.3			82.3			32.4			35.1	
Approach LOS		B			F			C			D	

Intersection Summary			
HCM 2000 Control Delay	61.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	92.7	Sum of lost time (s)	14.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	78	23	31	428	7	100	105	9	34	134	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.99	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.99		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1686	3275		1676	3411		1260	2482		1260	2221	
Flt Permitted	0.34	1.00		0.67	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	609	3275		1190	3411		1260	2482		1260	2221	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	45	94	28	37	516	8	120	127	11	41	161	307
RTOR Reduction (vph)	0	20	0	0	1	0	0	7	0	0	130	0
Lane Group Flow (vph)	45	102	0	37	523	0	120	131	0	41	338	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	180	972		353	1013		212	990		187	841	
v/s Ratio Prot		0.03			c0.15		c0.10	0.05		0.03	c0.15	
v/s Ratio Perm	0.07			0.03								
v/c Ratio	0.25	0.11		0.10	0.52		0.57	0.13		0.22	0.40	
Uniform Delay, d1	26.7	25.5		25.5	29.2		38.2	19.1		37.4	22.7	
Progression Factor	1.00	1.00		1.00	1.00		0.84	0.76		1.00	1.00	
Incremental Delay, d2	3.3	0.2		0.6	1.9		6.9	0.2		2.7	1.4	
Delay (s)	30.0	25.7		26.1	31.1		38.8	14.7		40.1	24.2	
Level of Service	C	C		C	C		D	B		D	C	
Approach Delay (s)		26.9			30.7			25.9			25.5	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Supplemental Materials to Appendix TR-X
Off-site Surface Parking Lots

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Intersection Level of Service Analysis Calculations

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INTERSECTION LOS ANALYSIS CALCULATIONS

EXISTING 2015 (NO PROJECT)
NO SF GIANTS GAME AT AT&T PARK
WEEKDAY PM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	889	733	12	137	907	36	53	1043	272	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3057		2987	3023			5478	941			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3057		2987	3023			5478	941			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	916	756	12	141	935	37	55	1075	280	0	0	0
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	190	0	0	0
Lane Group Flow (vph)	916	767	0	141	971	0	0	1130	90	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	40.9		13.2	37.4			35.5	35.5			
Effective Green, g (s)	18.2	40.9		13.2	37.4			35.5	35.5			
Actuated g/C Ratio	0.17	0.37		0.12	0.34			0.32	0.32			
Clearance Time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1136		358	1027			1767	303			
v/s Ratio Prot	c0.20	0.25		0.05	c0.32							
v/s Ratio Perm								0.21	0.10			
v/c Ratio	1.24	0.67		0.39	0.95			0.64	0.30			
Uniform Delay, d1	45.9	29.0		44.7	35.3			31.8	27.9			
Progression Factor	1.37	1.61		1.53	1.02			0.89	2.83			
Incremental Delay, d2	114.1	2.1		0.2	6.6			0.7	0.5			
Delay (s)	177.1	48.8		68.8	42.7			29.1	79.5			
Level of Service	F	D		E	D			C	E			
Approach Delay (s)		118.6			46.0			39.1			0.0	
Approach LOS		F			D			D			A	

Intersection Summary			
HCM 2000 Control Delay	72.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	151	1521	25	24	917	19	5	69	79	34	268	304
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.64	1.00	0.83	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00	0.68	1.00	1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.95	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4385		1296	2553			1585	858	1044	2330	581
Flt Permitted	0.95	1.00		0.95	1.00			0.97	1.00	0.71	1.00	1.00
Satd. Flow (perm)	1540	4385		1296	2553			1543	858	778	2330	581
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	154	1552	26	24	936	19	5	70	81	35	273	310
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	53	0	47	116
Lane Group Flow (vph)	154	1577	0	24	954	0	0	75	28	35	356	64
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.4	45.9		6.0	35.9			38.2	38.2	39.2	39.2	39.2
Effective Green, g (s)	14.4	45.9		6.0	35.9			38.2	38.2	39.2	39.2	39.2
Actuated g/C Ratio	0.13	0.42		0.05	0.33			0.35	0.35	0.36	0.36	0.36
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	201	1829		70	833			535	297	277	830	207
v/s Ratio Prot	0.10	c0.36		0.02	c0.37						c0.15	
v/s Ratio Perm								0.05	0.03	0.04		0.11
v/c Ratio	0.77	0.86		0.34	1.14			0.14	0.09	0.13	0.43	0.31
Uniform Delay, d1	46.2	29.2		50.1	37.0			24.6	24.2	23.9	26.9	25.6
Progression Factor	0.58	1.17		0.88	0.91			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.6	0.5		1.1	71.0			0.1	0.1	0.2	0.4	0.9
Delay (s)	28.4	34.8		45.4	104.7			24.8	24.4	24.1	27.3	26.5
Level of Service	C	C		D	F			C	C	C	C	C
Approach Delay (s)		34.2			103.2			24.6			26.8	
Approach LOS		C			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	51.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	115.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1689	138	0	1226	86	8
Ideal Flow (vphpl)	1850	1850	1850	1850	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2957			2998	1540	1357
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	2957			2998	1540	1357
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1759	144	0	1277	90	8
RTOR Reduction (vph)	6	0	0	0	0	5
Lane Group Flow (vph)	1897	0	0	1277	90	3
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1669			1692	512	451
v/s Ratio Prot	c0.64			0.43	c0.06	
v/s Ratio Perm						0.00
v/c Ratio	1.14			0.75	0.18	0.01
Uniform Delay, d1	23.9			18.2	26.0	24.5
Progression Factor	1.00			0.53	1.00	1.00
Incremental Delay, d2	69.5			1.0	0.7	0.0
Delay (s)	93.5			10.7	26.8	24.6
Level of Service	F			B	C	C
Approach Delay (s)	93.5			10.7	26.6	
Approach LOS	F			B	C	

Intersection Summary			
HCM 2000 Control Delay	59.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	98.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	272	1171	161	52	302	537	219	193	722	265
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		2.0			2.0	2.0			2.0	2.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	0.87
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5749			2857	2464			4086	978
Flt Permitted		0.99			0.66	1.00			0.95	1.00
Satd. Flow (perm)		5749			1899	2464			4086	978
Peak-hour factor, PHF	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93
Adj. Flow (vph)	296	1259	173	56	325	577	235	210	776	285
RTOR Reduction (vph)	0	22	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	0	1706	0	0	381	808	0	0	1015	256
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Perm
Protected Phases		6			4	4		7	7	
Permitted Phases	6			4						7
Actuated Green, G (s)		27.0			25.0	25.0			24.0	24.0
Effective Green, g (s)		29.0			28.0	28.0			27.0	27.0
Actuated g/C Ratio		0.32			0.31	0.31			0.30	0.30
Clearance Time (s)		4.0			5.0	5.0			5.0	5.0
Lane Grp Cap (vph)		1852			590	766			1225	293
v/s Ratio Prot						c0.33			0.25	
v/s Ratio Perm		0.30			0.20					c0.26
v/c Ratio		0.92			0.65	1.05			0.83	0.87
Uniform Delay, d1		29.4			26.7	31.0			29.3	29.9
Progression Factor		1.48			0.06	1.00			1.00	1.00
Incremental Delay, d2		6.6			0.5	47.9			6.5	28.4
Delay (s)		50.1			2.1	78.9			35.9	58.2
Level of Service		D			A	E			D	E
Approach Delay (s)		50.1			2.1	78.9			40.4	
Approach LOS		D			A	E			D	

Intersection Summary			
HCM 2000 Control Delay	48.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	16	472	568	45	338	362	24	255	129	618
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.84		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.92		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	0.99
Satd. Flow (prot)		1313	1914		2130		1163		1327	2541
Flt Permitted		0.95	1.00		1.00		1.00		0.15	0.63
Satd. Flow (perm)		1313	1914		2130		1163		207	1616
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	17	508	611	48	363	389	26	274	139	665
RTOR Reduction (vph)	0	0	8	0	0	0	17	0	0	0
Lane Group Flow (vph)	0	464	712	0	755	0	6	0	306	772
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	5	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		22.5	22.5		23.0		23.0		42.0	42.0
Effective Green, g (s)		22.5	25.0		24.5		23.0		43.5	43.5
Actuated g/C Ratio		0.25	0.28		0.27		0.26		0.48	0.48
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		328	531		579		297		305	950
v/s Ratio Prot		0.35	c0.37		c0.35				c0.18	0.15
v/s Ratio Perm							0.01		0.30	0.24
v/c Ratio		1.41	1.34		1.42dr		0.02		1.00	0.81
Uniform Delay, d1		33.8	32.5		32.8		25.1		31.1	19.8
Progression Factor		1.00	1.00		1.00		1.00		1.10	1.16
Incremental Delay, d2		203.7	165.8		149.0		0.1		28.0	2.2
Delay (s)		237.5	198.3		181.8		25.2		62.3	25.1
Level of Service		F	F		F		C		E	C
Approach Delay (s)			213.6		177.1					35.7
Approach LOS			F		F					D

Intersection Summary			
HCM 2000 Control Delay	141.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	101.9%	ICU Level of Service	G
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	15	66	19	10	67	20	898	18	12	161	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	1.00		1.00	0.99	
Flt Protected		0.97	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1569	1353		1426		1272	2531		1540	3037	
Flt Permitted		0.87	1.00		0.95		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1405	1353		1373		1272	2531		1540	3037	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	16	69	20	11	71	21	945	19	13	169	14
RTOR Reduction (vph)	0	0	47	0	48	0	0	1	0	0	6	0
Lane Group Flow (vph)	0	34	22	0	54	0	21	963	0	13	177	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.1	32.1		32.1		14.8	37.5		14.5	37.5	
Effective Green, g (s)		32.1	32.1		32.1		14.8	37.5		14.5	37.5	
Actuated g/C Ratio		0.32	0.32		0.32		0.15	0.38		0.14	0.38	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Grp Cap (vph)		451	434		440		188	949		223	1138	
v/s Ratio Prot							0.02	c0.38		0.01	c0.06	
v/s Ratio Perm		0.02	0.02		c0.04							
v/c Ratio		0.08	0.05		0.12		0.11	1.01		0.06	0.16	
Uniform Delay, d1		23.6	23.4		24.0		36.9	31.2		36.9	20.7	
Progression Factor		1.00	1.00		1.00		1.63	0.50		1.00	1.00	
Incremental Delay, d2		0.3	0.2		0.6		0.8	27.9		0.5	0.3	
Delay (s)		23.9	23.7		24.6		61.1	43.7		37.4	21.0	
Level of Service		C	C		C		E	D		D	C	
Approach Delay (s)		23.8			24.6			44.0			22.1	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	38.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑	↱	↰	↑↱		↰	↑↱	
Volume (vph)	19	12	10	3	10	30	7	84	6	80	114	14
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes		0.99			1.00	1.00	0.84	1.00		1.00	1.00	
Frt		0.96			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2553			1434	1227	1155	1432		1377	1393	
Flt Permitted		0.95			1.00	1.00	0.80	1.00		0.95	1.00	
Satd. Flow (perm)		2493			1449	1227	973	1432		1377	1393	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	20	13	11	3	11	32	8	90	6	86	123	15
RTOR Reduction (vph)	0	10	0	0	0	17	0	4	0	0	5	0
Lane Group Flow (vph)	0	34	0	0	14	15	8	92	0	86	133	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		2.3			2.3	18.6	5.0	5.0		16.3	26.3	
Effective Green, g (s)		2.3			2.3	18.6	5.0	5.0		16.3	26.3	
Actuated g/C Ratio		0.06			0.06	0.48	0.13	0.13		0.42	0.68	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		148			86	750	126	185		581	949	
v/s Ratio Prot						0.01		c0.06		0.06	c0.10	
v/s Ratio Perm		c0.01			0.01	0.00	0.01					
v/c Ratio		0.23			0.16	0.02	0.06	0.50		0.15	0.14	
Uniform Delay, d1		17.3			17.2	5.2	14.7	15.6		6.9	2.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			0.9	0.0	0.2	2.1		0.1	0.1	
Delay (s)		18.1			18.1	5.2	15.0	17.7		7.0	2.2	
Level of Service		B			B	A	B	B		A	A	
Approach Delay (s)		18.1			9.2			17.5			4.1	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	38.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱↱	↑↑	↱	↰	↑
Volume (vph)	34	208	743	29	71	219
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1743	1535	848	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1743	1535	848	1134	1194
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	226	808	32	77	238
RTOR Reduction (vph)	0	202	0	5	0	0
Lane Group Flow (vph)	37	24	808	27	77	238
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	8.6	8.6	47.5	42.5	9.1	61.6
Effective Green, g (s)	8.6	8.6	47.5	42.5	9.1	61.6
Actuated g/C Ratio	0.11	0.11	0.59	0.53	0.11	0.77
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	121	186	909	502	128	917
v/s Ratio Prot	c0.03		c0.53	0.01	c0.07	0.20
v/s Ratio Perm		0.01		0.02		
v/c Ratio	0.31	0.13	0.89	0.05	0.60	0.26
Uniform Delay, d1	33.0	32.4	14.1	9.1	33.8	2.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.3	10.6	0.0	7.7	0.2
Delay (s)	34.5	32.7	24.6	9.2	41.6	2.8
Level of Service	C	C	C	A	D	A
Approach Delay (s)	33.0		24.1			12.3
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	19	43	13	164	149	41
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	21	48	14	182	166	46
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	408	206	261			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	408	206	261			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	94	99			
cM capacity (veh/h)	522	741	1251			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	21	48	75	121	110	101
Volume Left	21	0	14	0	0	0
Volume Right	0	48	0	0	0	46
cSH	522	741	1251	1700	1700	1700
Volume to Capacity	0.04	0.06	0.01	0.07	0.06	0.06
Queue Length 95th (ft)	3	5	1	0	0	0
Control Delay (s)	12.2	10.2	1.6	0.0	0.0	0.0
Lane LOS	B	B	A			
Approach Delay (s)	10.8		0.6		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	32.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	189	71	860	17	2	487
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00		1.00	1.00
Flpb, ped/bikes	0.93	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1584	1466	3408		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1584	1466	3408		1711	3421
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	210	79	956	19	2	541
RTOR Reduction (vph)	0	56	1	0	0	0
Lane Group Flow (vph)	210	23	974	0	2	541
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	54.0		2.0	61.1
Effective Green, g (s)	28.7	28.7	54.0		2.0	61.1
Actuated g/C Ratio	0.29	0.29	0.54		0.02	0.61
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	454	420	1840		34	2090
v/s Ratio Prot			c0.29		0.00	c0.16
v/s Ratio Perm	c0.13	0.02				
v/c Ratio	0.46	0.05	0.53		0.06	0.26
Uniform Delay, d1	29.3	25.8	14.8		48.1	9.0
Progression Factor	1.00	1.00	2.21		1.19	0.78
Incremental Delay, d2	0.7	0.1	0.8		0.7	0.1
Delay (s)	30.1	25.9	33.5		58.0	7.1
Level of Service	C	C	C		E	A
Approach Delay (s)	28.9		33.5			7.3
Approach LOS	C		C			A

Intersection Summary			
HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	177	192	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	208	226	0
Pedestrians	25			1	1	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	356	139	251			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	356	139	251			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	604	866	1287			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	69	139	151	75
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1287	1700	1700	1700
Volume to Capacity	0.00	0.00	0.08	0.09	0.04
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.0	0.0		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	20.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	8	67	49	28	130	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	9	77	56	32	149	5
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	499					
pX, platoon unblocked						
vC, conflicting volume			136		293	148
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			136		293	148
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		76	99
cM capacity (veh/h)			1393		620	832

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	86	89	154
Volume Left	0	56	149
Volume Right	77	0	5
cSH	1700	1393	625
Volume to Capacity	0.05	0.04	0.25
Queue Length 95th (ft)	0	3	24
Control Delay (s)	0.0	5.0	12.6
Lane LOS		A	B
Approach Delay (s)	0.0	5.0	12.6
Approach LOS			B

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	31.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	134	52	266	3	108	47	264	696	5	18	472	186
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1257	1365	1126	1282	1365	1099	2515	2590		1296	2464	
Flt Permitted	0.68	1.00	1.00	0.72	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	901	1365	1126	971	1365	1099	2515	2590		1296	2464	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	147	57	292	3	119	52	290	765	5	20	519	204
RTOR Reduction (vph)	0	0	191	0	0	34	0	1	0	0	42	0
Lane Group Flow (vph)	147	57	101	3	119	18	290	769	0	20	681	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	310	470	388	334	470	379	352	979		155	882	
v/s Ratio Prot		0.04			0.09		0.12	c0.30		0.02	c0.28	
v/s Ratio Perm	c0.16		0.09	0.00		0.02						
v/c Ratio	0.47	0.12	0.26	0.01	0.25	0.05	0.82	0.79		0.13	0.77	
Uniform Delay, d1	25.6	22.4	23.6	21.5	23.5	21.8	41.8	27.5		39.3	28.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.65	0.76		1.02	1.00	
Incremental Delay, d2	5.1	0.5	1.6	0.0	1.3	0.2	9.8	3.0		1.7	6.3	
Delay (s)	30.8	22.9	25.2	21.6	24.8	22.0	37.1	23.9		41.9	34.8	
Level of Service	C	C	C	C	C	C	D	C		D	C	
Approach Delay (s)		26.6			23.9			27.5			35.0	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	29.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	377	8	6	522	30	33	25	34	41	3	105
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.85	1.00	0.98		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.91		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1411	1621	1706	1238	1621	1527		1491	1355	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.68	1.00		0.72	1.00	
Satd. Flow (perm)	1621	1706	1411	1621	1706	1238	1163	1527		1123	1355	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	97	410	9	7	567	33	36	27	37	45	3	114
RTOR Reduction (vph)	0	0	4	0	0	18	0	28	0	0	85	0
Lane Group Flow (vph)	97	410	5	7	567	15	36	36	0	45	32	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)			10			10			10			10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.9	47.6	47.6	2.7	39.4	39.4	21.9	21.9		21.9	21.9	
Effective Green, g (s)	10.9	47.6	47.6	2.7	39.4	39.4	21.9	21.9		21.9	21.9	
Actuated g/C Ratio	0.12	0.55	0.55	0.03	0.45	0.45	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	202	931	770	50	770	559	292	383		282	340	
v/s Ratio Prot	c0.06	0.24		0.00	c0.33			0.02			0.02	
v/s Ratio Perm			0.00			0.01	0.03			c0.04		
v/c Ratio	0.48	0.44	0.01	0.14	0.74	0.03	0.12	0.09		0.16	0.09	
Uniform Delay, d1	35.5	11.8	9.0	41.1	19.6	13.3	25.2	25.0		25.5	25.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	1.5	0.0	1.3	3.7	0.0	0.2	0.1		0.3	0.1	
Delay (s)	37.3	13.3	9.0	42.4	23.3	13.3	25.4	25.2		25.7	25.2	
Level of Service	D	B	A	D	C	B	C	C		C	C	
Approach Delay (s)		17.8			23.0			25.3			25.3	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	87.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	118	301	14	21	561	78	49	134	61	112	54	146
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1050	1540	2934			2978	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.64	1.00			0.69	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1050	1041	2934			2120	1072
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	123	314	15	22	584	81	51	140	64	117	56	152
RTOR Reduction (vph)	0	0	5	0	0	22	0	54	0	0	0	130
Lane Group Flow (vph)	123	314	10	22	584	59	51	150	0	0	173	22
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	7.0	56.8	56.8	2.7	51.5	51.5	13.3	13.3			12.3	12.3
Effective Green, g (s)	7.0	56.8	56.8	2.7	51.5	51.5	13.3	13.3			12.3	12.3
Actuated g/C Ratio	0.08	0.66	0.66	0.03	0.60	0.60	0.16	0.16			0.14	0.14
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	99	804	912	48	729	630	161	454			303	153
v/s Ratio Prot	c0.10	0.26		0.01	c0.48			0.05				
v/s Ratio Perm			0.01			0.06	0.05				c0.08	0.02
v/c Ratio	1.24	0.39	0.01	0.46	0.80	0.09	0.32	0.33			0.57	0.14
Uniform Delay, d1	39.4	6.6	4.9	40.8	13.2	7.3	32.2	32.3			34.3	32.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	169.2	1.4	0.0	6.8	6.3	0.1	1.1	0.4			2.6	0.4
Delay (s)	208.6	8.0	5.0	47.6	19.5	7.3	33.3	32.7			36.9	32.6
Level of Service	F	A	A	D	B	A	C	C			D	C
Approach Delay (s)		62.5			19.0			32.8			34.9	
Approach LOS		E			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	35.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	85.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	328	70	33	396	327	61	249	30	75	138	43
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.91	1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1337	925		1335	1126	867	1070	957	923	1070	1069	
Flt Permitted	0.14	1.00		0.32	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	193	925		444	1126	867	1070	957	923	1070	1069	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	50	349	74	35	421	348	65	265	32	80	147	46
RTOR Reduction (vph)	0	9	0	0	0	184	0	0	23	0	14	0
Lane Group Flow (vph)	50	414	0	35	421	164	65	265	9	80	179	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	34.1	34.1		34.1	34.1	41.1	13.1	25.1	25.1	7.0	19.0	
Effective Green, g (s)	34.1	34.1		34.1	34.1	41.1	13.1	25.1	25.1	7.0	19.0	
Actuated g/C Ratio	0.39	0.39		0.39	0.39	0.46	0.15	0.28	0.28	0.08	0.21	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	104	356		194	433	451	158	271	261	84	229	
v/s Ratio Prot	0.01	c0.45		0.00	c0.37	0.03	0.06	c0.28		0.07	c0.17	
v/s Ratio Perm	0.17			0.06		0.16			0.01			
v/c Ratio	0.48	1.16		0.18	0.97	0.36	0.41	0.98	0.03	0.95	0.78	
Uniform Delay, d1	20.5	27.2		25.0	26.7	15.3	34.2	31.4	22.9	40.6	32.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.5	100.2		0.4	35.8	0.5	1.7	48.0	0.1	81.8	15.8	
Delay (s)	23.9	127.4		25.5	62.6	15.8	35.9	79.4	23.0	122.4	48.5	
Level of Service	C	F		C	E	B	D	E	C	F	D	
Approach Delay (s)		116.5			40.7			66.6			70.2	
Approach LOS		F			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	68.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	88.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	19	74	39	45	162	2	31	116	78	11	51	51
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	21	82	43	50	180	2	34	129	87	12	57	57

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	147	50	182	163	87	126
Volume Left (vph)	21	50	0	34	0	12
Volume Right (vph)	43	0	2	0	87	57
Hadj (s)	-0.11	0.53	0.03	0.14	-0.67	-0.22
Departure Headway (s)	5.8	6.3	5.8	5.9	5.1	5.8
Degree Utilization, x	0.24	0.09	0.29	0.27	0.12	0.20
Capacity (veh/h)	579	539	589	578	661	580
Control Delay (s)	10.6	8.7	9.9	9.9	7.6	10.2
Approach Delay (s)	10.6	9.7		9.1		10.2
Approach LOS	B	A		A		B

Intersection Summary			
Delay	9.7		
Level of Service	A		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	146	81	51	19	202	23	40	796	35	16	426	299
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.98		1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1668	3177		1676	3353		1260	2500		1260	2331	
Flt Permitted	0.60	1.00		0.66	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1059	3177		1170	3353		1260	2500		1260	2331	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	155	86	54	20	215	24	43	847	37	17	453	318
RTOR Reduction (vph)	0	35	0	0	8	0	0	3	0	0	127	0
Lane Group Flow (vph)	155	105	0	20	231	0	43	881	0	17	644	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Effective Green, g (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.12	0.35		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	367	1102		405	1163		149	872		187	883	
v/s Ratio Prot		0.03			0.07		0.03	c0.35		0.01	c0.28	
v/s Ratio Perm	c0.15			0.02								
v/c Ratio	0.42	0.10		0.05	0.20		0.29	1.01		0.09	0.73	
Uniform Delay, d1	25.0	22.0		21.7	22.9		40.2	32.5		36.7	26.6	
Progression Factor	1.00	1.00		1.00	1.00		0.91	0.79		1.55	0.71	
Incremental Delay, d2	3.5	0.2		0.2	0.4		3.6	28.7		0.7	3.8	
Delay (s)	28.5	22.2		21.9	23.3		40.0	54.6		57.5	22.8	
Level of Service	C	C		C	C		D	D		E	C	
Approach Delay (s)		25.5			23.2			53.9			23.6	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	36.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	107.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	232	38	4	553	2	38	0	12	13	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			0.97		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3349		1711	3420			1678		1711	1531	
Flt Permitted	0.38	1.00		0.57	1.00			0.84		0.72	1.00	
Satd. Flow (perm)	677	3349		1031	3420			1467		1300	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	252	41	4	601	2	41	0	13	14	0	14
RTOR Reduction (vph)	0	22	0	0	1	0	0	20	0	0	8	0
Lane Group Flow (vph)	7	271	0	4	602	0	0	34	0	14	6	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.0	24.0		24.0	24.0			26.0		26.0	26.0	
Effective Green, g (s)	24.0	24.0		24.0	24.0			26.0		26.0	26.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40			0.43		0.43	0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	270	1339		412	1368			635		563	663	
v/s Ratio Prot		0.08			c0.18						0.00	
v/s Ratio Perm	0.01			0.00				c0.02		0.01		
v/c Ratio	0.03	0.20		0.01	0.44			0.05		0.02	0.01	
Uniform Delay, d1	10.9	11.8		10.8	13.1			9.9		9.7	9.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.3		0.0	1.0			0.2		0.1	0.0	
Delay (s)	11.1	12.1		10.9	14.1			10.0		9.8	9.7	
Level of Service	B	B		B	B			B		A	A	
Approach Delay (s)		12.1			14.1			10.0			9.8	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	86	0	0	705	6	382	112	194	0	0	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				3.5
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Frt		1.00			1.00		1.00	0.90				0.85
Flt Protected		1.00			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3416			5125		1711	3096				2694
Flt Permitted		0.95			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3248			5125		1711	3096				2694
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	3	88	0	0	719	6	390	114	198	0	0	130
RTOR Reduction (vph)	0	0	0	0	1	0	0	103	0	0	0	121
Lane Group Flow (vph)	0	91	0	0	724	0	390	209	0	0	0	9
Confl. Peds. (#/hr)												20
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		47.5			36.5		53.0	53.0				7.5
Effective Green, g (s)		47.5			36.5		53.0	53.0				7.5
Actuated g/C Ratio		0.43			0.33		0.48	0.48				0.07
Clearance Time (s)		4.5			4.5		5.0	5.0				3.5
Lane Grp Cap (vph)		1414			1700		824	1491				183
v/s Ratio Prot		c0.00			c0.14		c0.23	0.07				0.00
v/s Ratio Perm		0.02										
v/c Ratio		0.06			0.43		0.47	0.14				0.05
Uniform Delay, d1		18.3			28.6		19.1	15.8				47.9
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.8		1.9	0.2				0.5
Delay (s)		18.4			29.4		21.1	16.0				48.4
Level of Service		B			C		C	B				D
Approach Delay (s)		18.4			29.4			18.8			48.4	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

21: I-280 SB On-Ramp & Mariposa St.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	89	566	665	549	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.89	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1502	1426	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1502	1426	3319	1801		
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	92	584	686	566	0	0
RTOR Reduction (vph)	44	44	0	0	0	0
Lane Group Flow (vph)	299	289	686	566	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	40.0	40.0	20.0	70.0		
Effective Green, g (s)	40.0	40.0	20.0	70.0		
Actuated g/C Ratio	0.57	0.57	0.29	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	858	814	948	1801		
v/s Ratio Prot	0.20		c0.21	0.31		
v/s Ratio Perm		c0.20				
v/c Ratio	0.35	0.35	0.72	0.31		
Uniform Delay, d1	8.0	8.1	22.5	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.2	0.3	2.8	0.1		
Delay (s)	8.3	8.3	25.3	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	8.3			13.9	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

22: Third St. & Cesar Chavez

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	193	135	181	7	204	13	176	549	16	17	532	160
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.93		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.98	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1188	1945		1139	1257		1215	2412		1215	2287	
Flt Permitted	0.36	1.00		0.55	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	454	1945		662	1257		1215	2412		1215	2287	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	201	141	189	7	212	14	183	572	17	18	554	167
RTOR Reduction (vph)	0	125	0	0	2	0	0	2	0	0	29	0
Lane Group Flow (vph)	201	205	0	7	224	0	183	587	0	18	692	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	33.8	33.8		21.9	21.9		17.3	45.6		4.3	32.6	
Effective Green, g (s)	33.8	33.8		21.9	21.9		17.3	45.6		4.3	32.6	
Actuated g/C Ratio	0.34	0.34		0.22	0.22		0.17	0.46		0.04	0.33	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	201	657		144	275		210	1099		52	745	
v/s Ratio Prot	c0.07	0.11			0.18		c0.15	0.24		0.01	c0.30	
v/s Ratio Perm	c0.27			0.01								
v/c Ratio	1.00	0.31		0.05	0.81		0.87	0.53		0.35	0.93	
Uniform Delay, d1	33.2	24.5		30.8	37.1		40.3	19.6		46.5	32.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.03	0.84	
Incremental Delay, d2	63.5	0.3		0.1	16.6		30.2	1.9		3.1	16.2	
Delay (s)	96.7	24.8		31.0	53.7		70.5	21.4		50.8	43.6	
Level of Service	F	C		C	D		E	C		D	D	
Approach Delay (s)		52.0			53.0			33.1			43.8	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	43.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania Street & I-280 SB On-Ramp
9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	270	650	480	532
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	293	707	522	578
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			515			
pX, platoon unblocked						
vC, conflicting volume	1915	147			293	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1915	147			293	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			59	
cM capacity (veh/h)	35	874			1265	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	147	147	707	522	578
Volume Left	0	0	0	522	0
Volume Right	0	0	707	0	0
cSH	1700	1700	1700	1265	1700
Volume to Capacity	0.09	0.09	0.42	0.41	0.34
Queue Length 95th (ft)	0	0	0	52	0
Control Delay (s)	0.0	0.0	0.0	9.8	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.7	
Approach LOS					

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp
9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	168	129	0	151	112
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	183	140	0	164	122
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	140				232	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	140				232	140
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				78	86
cM capacity (veh/h)	1441				736	882

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	91	91	140	286
Volume Left	0	0	0	164
Volume Right	0	0	0	122
cSH	1700	1700	1700	792
Volume to Capacity	0.05	0.05	0.08	0.36
Queue Length 95th (ft)	0	0	0	41
Control Delay (s)	0.0	0.0	0.0	12.1
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.1
Approach LOS				B

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp
9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	54	265	129	58	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	59	288	140	63	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	203				402	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	203				402	140
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				100	100
cM capacity (veh/h)	1366				552	882

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	155	192	140	63	0
Volume Left	59	0	0	0	0
Volume Right	0	0	0	63	0
cSH	1366	1700	1700	1700	1700
Volume to Capacity	0.04	0.11	0.08	0.04	0.00
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	3.2	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.4		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	24.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	18	44	21	41	27	37	629	21	20	547	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.93			0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1485			1537		1540	3064		1540	3056	
Flt Permitted		0.87			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1300			1372		1540	3064		1540	3056	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	20	48	23	45	29	40	684	23	22	595	32
RTOR Reduction (vph)	0	43	0	0	20	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	46	0	0	77	0	40	706	0	22	625	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		9.6			9.6		5.1	70.6		4.6	70.1	
Effective Green, g (s)		9.6			9.6		5.1	70.6		4.6	70.1	
Actuated g/C Ratio		0.10			0.10		0.05	0.71		0.05	0.70	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		124			131		78	2163		70	2142	
v/s Ratio Prot							c0.03	c0.23		0.01	c0.20	
v/s Ratio Perm		0.04			c0.06							
v/c Ratio		0.37			0.59		0.51	0.33		0.31	0.29	
Uniform Delay, d1		42.4			43.3		46.2	5.6		46.2	5.6	
Progression Factor		1.00			1.00		1.27	0.70		1.30	1.84	
Incremental Delay, d2		1.8			6.6		1.5	0.3		0.8	0.3	
Delay (s)		44.2			49.9		60.2	4.2		60.8	10.6	
Level of Service		D			D		E	A		E	B	
Approach Delay (s)		44.2			49.9			7.2			12.3	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	466	49	253	0	0	329
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	507	53	275	0	0	358

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	253	253	53	138	138	358
Volume Left (vph)	253	253	0	0	0	0
Volume Right (vph)	0	0	53	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.9	6.9	3.2	6.7	6.7	6.3
Degree Utilization, x	0.49	0.49	0.05	0.26	0.26	0.62
Capacity (veh/h)	505	506	1121	511	511	560
Control Delay (s)	15.1	15.1	5.2	10.8	10.8	19.0
Approach Delay (s)	14.1			10.8		19.0
Approach LOS	B			B		C

Intersection Summary			
Delay	14.8		
Level of Service	B		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	43	143	0	0	273	94	29	270	20	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	155	0	0	297	102	32	293	22	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	202	399	178	168
Volume Left (vph)	47	0	32	0
Volume Right (vph)	0	102	0	22
Hadj (s)	0.08	-0.12	0.12	-0.06
Departure Headway (s)	5.5	5.1	6.2	6.0
Degree Utilization, x	0.31	0.56	0.31	0.28
Capacity (veh/h)	614	686	552	567
Control Delay (s)	11.0	14.3	10.7	10.1
Approach Delay (s)	11.0	14.3	10.4	
Approach LOS	B	B	B	

Intersection Summary			
Delay	12.2		
Level of Service	B		
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	19	63	11	56	8	60	699	1	0	655	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.92			0.99		1.00	1.00			0.98	
Flpb, ped/bikes		0.98			0.99		1.00	1.00			1.00	
Frt		0.92			0.99		1.00	1.00			0.99	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1162			1546		1540	2267			2217	
Flt Permitted		0.94			0.94		0.95	1.00			1.00	
Satd. Flow (perm)		1103			1470		1540	2267			2217	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	19	20	66	12	59	8	63	736	1	0	689	37
RTOR Reduction (vph)	0	59	0	0	5	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	74	0	63	737	0	0	725	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		10.9			10.9		8.3	78.8			65.4	
Effective Green, g (s)		10.9			10.9		8.3	78.8			65.4	
Actuated g/C Ratio		0.11			0.11		0.08	0.79			0.65	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		120			160		127	1786			1449	
v/s Ratio Prot							0.04	c0.33			c0.33	
v/s Ratio Perm		0.04			c0.05							
v/c Ratio		0.38			0.46		0.50	0.41			0.50	
Uniform Delay, d1		41.4			41.8		43.8	3.3			8.9	
Progression Factor		1.00			1.00		0.78	0.38			1.44	
Incremental Delay, d2		2.1			2.1		2.4	0.6			1.1	
Delay (s)		43.5			43.9		36.8	1.8			13.8	
Level of Service		D			D		D	A			B	
Approach Delay (s)		43.5			43.9			4.6			13.8	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	352	437	0	0	214	394	239	174	339	60	0	479
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.84	1.00	1.00	0.86	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1008	1540	1621	1188	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1008	1540	1621	1188	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	371	460	0	0	225	415	252	183	357	63	0	504
RTOR Reduction (vph)	0	0	0	0	0	270	0	0	209	0	0	403
Lane Group Flow (vph)	371	460	0	0	225	145	252	183	148	63	0	101
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	18.1	41.2			18.1	18.1	19.0	19.0	19.0	11.5		11.5
Effective Green, g (s)	18.1	41.2			18.1	18.1	19.0	19.0	19.0	11.5		11.5
Actuated g/C Ratio	0.21	0.47			0.21	0.21	0.22	0.22	0.22	0.13		0.13
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	317	1446			635	208	333	351	257	201		158
v/s Ratio Prot	c0.24	0.15			0.07		c0.16	0.11		0.04		c0.08
v/s Ratio Perm						c0.14			0.12			
v/c Ratio	1.17	0.32			0.35	0.70	0.76	0.52	0.58	0.31		0.64
Uniform Delay, d1	34.8	14.5			29.8	32.3	32.2	30.3	30.7	34.5		36.1
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	105.1	0.6			1.5	17.7	9.4	1.4	3.1	0.9		8.2
Delay (s)	139.9	15.1			31.3	50.0	41.6	31.7	33.8	35.4		44.3
Level of Service	F	B			C	D	D	C	C	D		D
Approach Delay (s)		70.8			43.4			35.8			43.3	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	49.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	87.7	Sum of lost time (s)	21.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	55	117	5	58	23	132	99	2	8	104	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.96		1.00	1.00		1.00	0.94	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3128			1731		1711	1796		1711	1701	
Flt Permitted		0.86			0.99		0.64	1.00		0.69	1.00	
Satd. Flow (perm)		2738			1710		1160	1796		1235	1701	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	60	127	5	63	25	143	108	2	9	113	66
RTOR Reduction (vph)	0	74	0	0	15	0	0	1	0	0	39	0
Lane Group Flow (vph)	0	188	0	0	78	0	143	109	0	9	141	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Effective Green, g (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Actuated g/C Ratio		0.42			0.42		0.42	0.42		0.42	0.42	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		1140			712		483	748		514	708	
v/s Ratio Prot								0.06			0.08	
v/s Ratio Perm		c0.07			0.05		c0.12			0.01		
v/c Ratio		0.16			0.11		0.30	0.15		0.02	0.20	
Uniform Delay, d1		8.8			8.6		9.3	8.7		8.2	8.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.3		1.6	0.4		0.1	0.6	
Delay (s)		9.1			8.9		10.9	9.1		8.3	9.5	
Level of Service		A			A		B	A		A	A	
Approach Delay (s)		9.1			8.9			10.1			9.5	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

EXISTING 2015 (NO PROJECT)
WITH SF GIANTS GAME AT AT&T PARK
WEEKDAY PM PEAK

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	783	704	102	290	632	48	12	683	145	0	0	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Lane Util. Factor	0.94	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.93		1.00	0.96			1.00	0.47			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.98		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	3656	2370		2515	2469			4649	547			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	3656	2370		2515	2469			4649	547			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	807	726	105	299	652	49	12	704	149	0	0	0
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	114	0	0	0
Lane Group Flow (vph)	807	821	0	299	701	0	0	716	35	0	0	0
Confl. Peds. (#/hr)			1700			1700	1700		1700			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	20.8	43.9		19.6	44.2			26.1	26.1			
Effective Green, g (s)	20.8	43.9		19.6	44.2			26.1	26.1			
Actuated g/C Ratio	0.19	0.40		0.18	0.40			0.24	0.24			
Clearance Time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	691	945		448	992			1103	129			
v/s Ratio Prot	c0.22	c0.35		0.12	c0.28							
v/s Ratio Perm								0.15	0.06			
v/c Ratio	1.17	0.87		0.67	0.71			0.65	0.27			
Uniform Delay, d1	44.6	30.4		42.2	27.5			37.8	34.2			
Progression Factor	1.21	1.39		1.51	1.20			0.83	2.32			
Incremental Delay, d2	81.2	4.0		1.1	0.7			1.2	1.0			
Delay (s)	135.1	46.3		64.7	33.7			32.5	80.4			
Level of Service	F	D		E	C			C	F			
Approach Delay (s)		90.1			43.0			40.8			0.0	
Approach LOS		F			D			D			A	

Intersection Summary			
HCM 2000 Control Delay	64.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	1358	33	34	586	24	7	131	109	122	409	452
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	*0.80		1.00	*0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.64	1.00	0.84	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00	0.71	1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.95	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1296	3234		1296	2516			1601	858	1088	2349	581
Flt Permitted	0.95	1.00		0.95	1.00			0.96	1.00	0.67	1.00	1.00
Satd. Flow (perm)	1296	3234		1296	2516			1548	858	764	2349	581
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	131	1386	34	35	598	24	7	134	111	124	417	461
RTOR Reduction (vph)	0	2	0	0	3	0	0	0	72	0	43	175
Lane Group Flow (vph)	131	1418	0	35	619	0	0	141	39	124	563	97
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Effective Green, g (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Actuated g/C Ratio	0.13	0.39		0.08	0.33			0.35	0.35	0.36	0.36	0.36
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	169	1264		104	821			537	297	272	837	207
v/s Ratio Prot	0.10	c0.44		0.03	c0.25						c0.24	
v/s Ratio Perm								0.09	0.04	0.16		0.17
v/c Ratio	0.78	1.12		0.34	0.75			0.26	0.13	0.46	0.67	0.47
Uniform Delay, d1	46.2	33.5		47.8	33.1			25.8	24.5	27.2	30.0	27.3
Progression Factor	0.63	0.91		0.97	0.94			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	56.0		1.3	2.8			0.3	0.2	1.2	2.1	1.7
Delay (s)	31.2	86.5		47.6	33.9			26.0	24.7	28.4	32.1	29.0
Level of Service	C	F		D	C			C	C	C	C	C
Approach Delay (s)		81.8			34.6			25.5			30.8	
Approach LOS		F			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	54.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	134.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1494	151	3	1042	77	25
Ideal Flow (vphpl)	1700	1700	1400	1400	1700	1700
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2709			2269	1377	1214
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	2709			2157	1377	1214
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1556	157	3	1085	80	26
RTOR Reduction (vph)	7	0	0	0	0	14
Lane Group Flow (vph)	1706	0	0	1088	80	12
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1529			1217	458	403
v/s Ratio Prot	c0.63				c0.06	
v/s Ratio Perm				0.50		0.01
v/c Ratio	1.12			0.89	0.17	0.03
Uniform Delay, d1	23.9			21.1	26.0	24.7
Progression Factor	1.00			0.82	1.00	1.00
Incremental Delay, d2	61.7			7.4	0.8	0.1
Delay (s)	85.6			24.7	26.8	24.9
Level of Service	F			C	C	C
Approach Delay (s)	85.6			24.7	26.3	
Approach LOS	F			C	C	

Intersection Summary			
HCM 2000 Control Delay	60.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	88	794	99	22	227	661	205	256	755	261
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		2.0			2.0	2.0			2.0	2.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.97			0.99	0.87
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			1.00	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5795			2871	2501			4091	978
Flt Permitted		1.00			0.74	1.00			0.95	1.00
Satd. Flow (perm)		5795			2124	2501			4091	978
Peak-hour factor, PHF	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93
Adj. Flow (vph)	96	854	106	24	244	711	220	278	812	281
RTOR Reduction (vph)	0	22	0	0	0	7	0	0	0	0
Lane Group Flow (vph)	0	1034	0	0	268	924	0	0	1118	253
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Perm
Protected Phases		6			4	4		7	7	
Permitted Phases	6			4						7
Actuated Green, G (s)		27.0			25.0	25.0			24.0	24.0
Effective Green, g (s)		29.0			28.0	28.0			27.0	27.0
Actuated g/C Ratio		0.32			0.31	0.31			0.30	0.30
Clearance Time (s)		4.0			5.0	5.0			5.0	5.0
Lane Grp Cap (vph)		1867			660	778			1227	293
v/s Ratio Prot						c0.37			c0.27	
v/s Ratio Perm		0.18			0.13					0.26
v/c Ratio		0.55			0.41	1.19			0.91	0.86
Uniform Delay, d1		25.2			24.4	31.0			30.3	29.8
Progression Factor		1.66			0.15	1.00			1.00	1.00
Incremental Delay, d2		0.6			0.2	97.2			11.7	27.0
Delay (s)		42.3			3.9	128.2			42.0	56.8
Level of Service		D			A	F			D	E
Approach Delay (s)		42.3			3.9	128.2			44.7	
Approach LOS		D			A	F			D	

Intersection Summary			
HCM 2000 Control Delay	62.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	28	387	683	63	221	322	64	211	145	649
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.81		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.91		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1313	1910		2041		1163		1327	2548
Flt Permitted		0.95	1.00		1.00		1.00		0.23	0.84
Satd. Flow (perm)		1313	1910		2041		1163		326	2161
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	30	416	734	68	238	346	69	227	156	698
RTOR Reduction (vph)	0	0	9	0	1	0	46	0	0	0
Lane Group Flow (vph)	0	404	835	0	590	0	16	0	319	762
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	5	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		22.5	22.5		23.0		23.0		42.0	42.0
Effective Green, g (s)		22.5	25.0		24.5		23.0		43.5	43.5
Actuated g/C Ratio		0.25	0.28		0.27		0.26		0.48	0.48
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		328	530		555		297		341	1115
v/s Ratio Prot		0.31	c0.44		c0.29				c0.17	0.13
v/s Ratio Perm							0.01		0.28	0.20
v/c Ratio		1.23	1.57		1.32dr		0.05		0.94	0.68
Uniform Delay, d1		33.8	32.5		32.8		25.3		27.6	17.9
Progression Factor		1.00	1.00		1.00		1.00		1.05	1.14
Incremental Delay, d2		128.0	267.6		56.2		0.3		5.7	0.3
Delay (s)		161.8	300.1		89.0		25.6		34.8	20.7
Level of Service		F	F		F		C		C	C
Approach Delay (s)			255.3		82.9					24.9
Approach LOS			F		F					C

Intersection Summary			
HCM 2000 Control Delay	134.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	99.3%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	58	72	1	1	3	23	804	56	135	160	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.92		1.00	0.99		1.00	0.98	
Flt Protected		0.98	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1584	1353		1450		1272	2499		1540	2993	
Flt Permitted		0.91	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1473	1353		1431		1272	2499		1540	2993	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	34	61	76	1	1	3	24	846	59	142	168	31
RTOR Reduction (vph)	0	0	52	0	2	0	0	5	0	0	15	0
Lane Group Flow (vph)	0	95	24	0	3	0	24	900	0	142	184	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4	4		8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		32.1	32.1		32.1		14.8	38.5		13.5	37.5	
Effective Green, g (s)		32.1	32.1		32.1		14.8	38.5		13.5	37.5	
Actuated g/C Ratio		0.32	0.32		0.32		0.15	0.38		0.14	0.38	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Grp Cap (vph)		472	434		459		188	962		207	1122	
v/s Ratio Prot							0.02	c0.36		c0.09	0.06	
v/s Ratio Perm		c0.06	0.02		0.00							
v/c Ratio		0.20	0.06		0.01		0.13	0.94		0.69	0.16	
Uniform Delay, d1		24.6	23.5		23.1		37.0	29.6		41.2	20.8	
Progression Factor		1.00	1.00		1.00		1.57	0.38		1.00	1.00	
Incremental Delay, d2		1.0	0.2		0.0		1.1	14.0		17.0	0.3	
Delay (s)		25.6	23.7		23.1		59.0	25.2		58.2	21.1	
Level of Service		C	C		C		E	C		E	C	
Approach Delay (s)		24.8			23.1			26.1			36.6	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰	↱	↰	↱		↰	↱	
Volume (vph)	33	16	23	2	7	44	44	255	16	130	128	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.99	1.00	1.00		1.00	0.96	
Flpb, ped/bikes		0.99			1.00	1.00	0.82	1.00		1.00	1.00	
Frt		0.95			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2811			1604	1363	1265	1603		1540	1518	
Flt Permitted		0.90			0.91	1.00	0.65	1.00		0.95	1.00	
Satd. Flow (perm)		2596			1473	1363	869	1603		1540	1518	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	35	17	25	2	8	47	47	274	17	140	138	27
RTOR Reduction (vph)	0	23	0	0	0	31	0	3	0	0	7	0
Lane Group Flow (vph)	0	54	0	0	10	16	47	288	0	140	158	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		3.8			3.8	14.7	14.6	14.6		10.9	30.5	
Effective Green, g (s)		3.8			3.8	14.7	14.6	14.6		10.9	30.5	
Actuated g/C Ratio		0.09			0.09	0.33	0.33	0.33		0.25	0.69	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		222			126	606	286	528		378	1045	
v/s Ratio Prot						0.01		c0.18		c0.09	0.10	
v/s Ratio Perm		c0.02			0.01	0.01	0.05					
v/c Ratio		0.24			0.08	0.03	0.16	0.55		0.37	0.15	
Uniform Delay, d1		18.9			18.6	10.0	10.5	12.1		13.9	2.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			0.3	0.0	0.3	1.2		0.6	0.1	
Delay (s)		19.5			18.9	10.0	10.8	13.3		14.5	2.5	
Level of Service		B			B	A	B	B		B	A	
Approach Delay (s)		19.5			11.6			13.0			8.0	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	44.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.
4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱↱	↑↑	↱	↰	↑
Volume (vph)	47	249	895	37	85	214
Ideal Flow (vphpl)	1900	1900	1400	1400	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1540	2365	1791	990	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1540	2365	1791	990	1134	1194
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	271	973	40	92	233
RTOR Reduction (vph)	0	242	0	6	0	0
Lane Group Flow (vph)	51	29	973	34	92	233
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	8.6	8.6	47.6	42.6	10.1	62.7
Effective Green, g (s)	8.6	8.6	47.6	42.6	10.1	62.7
Actuated g/C Ratio	0.11	0.11	0.59	0.52	0.12	0.77
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	162	250	1048	579	140	920
v/s Ratio Prot	c0.03		c0.54	0.01	c0.08	0.20
v/s Ratio Perm		0.01		0.02		
v/c Ratio	0.31	0.11	0.93	0.06	0.66	0.25
Uniform Delay, d1	33.6	32.9	15.3	9.5	33.9	2.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	0.2	13.6	0.0	10.6	0.1
Delay (s)	34.7	33.1	29.0	9.5	44.6	2.8
Level of Service	C	C	C	A	D	A
Approach Delay (s)	33.4		28.2			14.6
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	26.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	81.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	22	37	16	224	159	47
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	26	44	19	264	187	55
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	484	221	292			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	484	221	292			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	94	98			
cM capacity (veh/h)	466	724	1218			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	26	44	107	176	125	118
Volume Left	26	0	19	0	0	0
Volume Right	0	44	0	0	0	55
cSH	466	724	1218	1700	1700	1700
Volume to Capacity	0.06	0.06	0.02	0.10	0.07	0.07
Queue Length 95th (ft)	4	5	1	0	0	0
Control Delay (s)	13.2	10.3	1.5	0.0	0.0	0.0
Lane LOS	B	B	A			
Approach Delay (s)	11.4		0.6		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	223	54	874	44	14	498
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00		1.00	1.00
Flpb, ped/bikes	0.93	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1584	1466	3389		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1584	1466	3389		1711	3421
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	248	60	971	49	16	553
RTOR Reduction (vph)	0	43	3	0	0	0
Lane Group Flow (vph)	248	17	1017	0	16	553
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	52.0		4.0	61.1
Effective Green, g (s)	28.7	28.7	52.0		4.0	61.1
Actuated g/C Ratio	0.29	0.29	0.52		0.04	0.61
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	454	420	1762		68	2090
v/s Ratio Prot			c0.30		0.01	c0.16
v/s Ratio Perm	c0.16	0.01				
v/c Ratio	0.55	0.04	0.58		0.24	0.26
Uniform Delay, d1	30.1	25.7	16.5		46.5	9.0
Progression Factor	1.00	1.00	1.90		1.06	0.90
Incremental Delay, d2	1.3	0.0	1.0		1.8	0.1
Delay (s)	31.5	25.8	32.3		51.0	8.1
Level of Service	C	C	C		D	A
Approach Delay (s)	30.4		32.3			9.4
Approach LOS	C		C			A

Intersection Summary			
HCM 2000 Control Delay	25.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	240	196	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	282	231	0
Pedestrians	25			1	1	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	398	141	256			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	398	141	256			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	568	863	1281			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	94	188	154	77
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1281	1700	1700	1700
Volume to Capacity	0.00	0.00	0.11	0.09	0.05
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.0	0.0		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	20.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	10	90	50	29	169	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	12	107	60	35	201	4
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	499					
pX, platoon unblocked						
vC, conflicting volume			169		319	165
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			169		319	165
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		66	100
cM capacity (veh/h)			1355		596	813

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	119	94	205
Volume Left	0	60	201
Volume Right	107	0	4
cSH	1700	1355	599
Volume to Capacity	0.07	0.04	0.34
Queue Length 95th (ft)	0	3	38
Control Delay (s)	0.0	5.1	14.1
Lane LOS		A	B
Approach Delay (s)	0.0	5.1	14.1
Approach LOS			B

Intersection Summary			
Average Delay	8.0		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	176	64	271	6	121	71	316	671	17	19	428	274
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1258	1365	1126	1282	1365	1099	2515	2580		1296	2415	
Flt Permitted	0.67	1.00	1.00	0.71	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	890	1365	1126	960	1365	1099	2515	2580		1296	2415	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	193	70	298	7	133	78	347	737	19	21	470	301
RTOR Reduction (vph)	0	0	195	0	0	51	0	2	0	0	103	0
Lane Group Flow (vph)	193	70	103	7	133	27	347	754	0	21	668	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	307	470	388	331	470	379	352	975		155	864	
v/s Ratio Prot		0.05			0.10		c0.14	0.29		0.02	c0.28	
v/s Ratio Perm	c0.22		0.09	0.01		0.02						
v/c Ratio	0.63	0.15	0.26	0.02	0.28	0.07	0.99	0.77		0.14	0.77	
Uniform Delay, d1	27.4	22.6	23.6	21.6	23.8	22.0	42.9	27.3		39.4	28.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.74		1.11	1.17	
Incremental Delay, d2	9.4	0.7	1.7	0.1	1.5	0.4	27.8	2.6		1.7	6.4	
Delay (s)	36.8	23.3	25.3	21.7	25.3	22.4	62.5	22.9		45.5	39.6	
Level of Service	D	C	C	C	C	C	E	C		D	D	
Approach Delay (s)		29.0			24.1			35.3			39.8	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	116.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	102	439	7	6	658	47	26	24	24	48	4	132
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1243	1621	1578		1493	1358	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.65	1.00		0.72	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1243	1101	1578		1136	1358	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	110	472	8	6	708	51	28	26	26	52	4	142
RTOR Reduction (vph)	0	0	4	0	0	28	0	19	0	0	106	0
Lane Group Flow (vph)	110	472	4	6	708	23	28	33	0	52	40	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.6	45.8	45.8	2.7	37.9	37.9	21.3	21.3		21.3	21.3	
Effective Green, g (s)	10.6	45.8	45.8	2.7	37.9	37.9	21.3	21.3		21.3	21.3	
Actuated g/C Ratio	0.12	0.54	0.54	0.03	0.45	0.45	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	202	921	783	51	762	555	276	396		285	341	
v/s Ratio Prot	c0.07	0.28		0.00	c0.42			0.02			0.03	
v/s Ratio Perm			0.00			0.02	0.03			c0.05		
v/c Ratio	0.54	0.51	0.01	0.12	0.93	0.04	0.10	0.08		0.18	0.12	
Uniform Delay, d1	34.8	12.4	9.0	39.9	22.2	13.2	24.4	24.3		24.9	24.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.0	2.0	0.0	1.0	17.5	0.0	0.2	0.1		0.3	0.2	
Delay (s)	37.8	14.4	9.0	40.9	39.6	13.2	24.6	24.4		25.2	24.6	
Level of Service	D	B	A	D	D	B	C	C		C	C	
Approach Delay (s)		18.7			37.9			24.4			24.8	
Approach LOS		B			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	84.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	86.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	358	14	21	696	99	49	134	60	130	54	165
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1050	1540	2937			2974	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.63	1.00			0.68	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1050	1024	2937			2107	1072
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	131	373	15	22	725	103	51	140	62	135	56	172
RTOR Reduction (vph)	0	0	5	0	0	22	0	52	0	0	0	146
Lane Group Flow (vph)	131	373	10	22	725	81	51	150	0	0	191	26
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	7.0	57.6	57.6	1.9	51.5	51.5	14.3	14.3			13.3	13.3
Effective Green, g (s)	7.0	57.6	57.6	1.9	51.5	51.5	14.3	14.3			13.3	13.3
Actuated g/C Ratio	0.08	0.66	0.66	0.02	0.59	0.59	0.16	0.16			0.15	0.15
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	97	806	914	33	720	622	168	483			322	164
v/s Ratio Prot	c0.11	0.31		0.01	c0.60			0.05				
v/s Ratio Perm			0.01			0.08	0.05				c0.09	0.02
v/c Ratio	1.35	0.46	0.01	0.67	1.01	0.13	0.30	0.31			0.89dl	0.16
Uniform Delay, d1	39.9	7.1	4.9	42.1	17.6	7.8	31.9	31.9			34.2	31.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	211.1	0.4	0.0	40.8	35.3	0.1	1.0	0.4			2.9	0.5
Delay (s)	251.0	7.5	5.0	83.0	52.9	7.9	32.9	32.3			37.2	32.4
Level of Service	F	A	A	F	D	A	C	C			D	C
Approach Delay (s)		68.9			48.2			32.4			34.9	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	49.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	86.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	95.4%	ICU Level of Service	F
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	377	84	36	470	404	43	357	34	87	130	38
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.90		1.00	*0.90	*0.80	*0.80	*0.80	*0.80	*1.00	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.89	1.00	1.00	0.97	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1337	1039		1335	1267	853	1070	957	924	1337	1073	
Flt Permitted	0.16	1.00		0.30	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	220	1039		416	1267	853	1070	957	924	1337	1073	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	43	401	89	38	500	430	46	380	36	93	138	40
RTOR Reduction (vph)	0	7	0	0	0	132	0	0	25	0	9	0
Lane Group Flow (vph)	43	483	0	38	500	298	46	380	11	93	169	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	46.1	46.1		46.1	46.1	53.1	7.8	35.2	35.2	7.0	34.4	
Effective Green, g (s)	46.1	46.1		46.1	46.1	53.1	7.8	35.2	35.2	7.0	34.4	
Actuated g/C Ratio	0.42	0.42		0.42	0.42	0.48	0.07	0.32	0.32	0.06	0.31	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	114	433		192	528	448	75	304	294	84	333	
v/s Ratio Prot	0.01	c0.46		0.00	0.39	c0.04	0.04	c0.40		c0.07	0.16	
v/s Ratio Perm	0.15			0.08		0.31			0.01			
v/c Ratio	0.38	1.12		0.20	0.95	0.67	0.61	1.25	0.04	1.11	0.51	
Uniform Delay, d1	23.5	32.2		30.9	31.1	22.0	49.9	37.7	26.0	51.8	31.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.1	78.5		0.5	26.2	3.7	14.0	136.8	0.1	130.2	1.2	
Delay (s)	25.5	110.8		31.4	57.3	25.7	63.9	174.5	26.1	182.0	32.4	
Level of Service	C	F		C	E	C	E	F	C	F	C	
Approach Delay (s)		103.9			42.2			152.0			83.7	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM 2000 Control Delay	84.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	110.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	35	241	86	75	181	18	55	132	70	19	118	38
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	39	268	96	83	201	20	61	147	78	21	131	42

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	402	83	221	208	78	194
Volume Left (vph)	39	83	0	61	0	21
Volume Right (vph)	96	0	20	0	78	42
Hadj (s)	-0.09	0.53	-0.03	0.18	-0.67	-0.07
Departure Headway (s)	6.8	7.6	7.0	7.5	6.6	7.5
Degree Utilization, x	0.75	0.18	0.43	0.43	0.14	0.40
Capacity (veh/h)	518	440	469	440	494	426
Control Delay (s)	27.6	11.0	14.1	14.9	9.6	15.5
Approach Delay (s)	27.6	13.2		13.5		15.5
Approach LOS	D	B		B		C

Intersection Summary			
Delay	18.5		
Level of Service	C		
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	256	306	42	10	229	35	39	713	34	22	396	287
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1300	1300	1300	1300	1300	1300
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.98		1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1495	2992		1509	2981		1170	2320		1170	2161	
Flt Permitted	0.57	1.00		0.49	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	897	2992		779	2981		1170	2320		1170	2161	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	272	326	45	11	244	37	41	759	36	23	421	305
RTOR Reduction (vph)	0	11	0	0	12	0	0	3	0	0	130	0
Lane Group Flow (vph)	272	360	0	11	269	0	41	792	0	23	596	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Effective Green, g (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.12	0.35		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	311	1038		270	1034		139	809		174	819	
v/s Ratio Prot		0.12			0.09		0.04	c0.34		0.02	c0.28	
v/s Ratio Perm	c0.30			0.01								
v/c Ratio	0.87	0.35		0.04	0.26		0.29	0.98		0.13	0.73	
Uniform Delay, d1	30.6	24.2		21.6	23.4		40.2	32.2		36.9	26.6	
Progression Factor	1.00	1.00		1.00	1.00		0.91	0.80		1.45	0.72	
Incremental Delay, d2	27.2	0.9		0.3	0.6		3.5	21.1		1.1	4.1	
Delay (s)	57.8	25.2		21.9	24.1		40.1	46.8		54.9	23.3	
Level of Service	E	C		C	C		D	D		D	C	
Approach Delay (s)		39.0			24.0			46.5			24.3	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	35.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	963	28	2	588	2	38	0	8	13	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor		0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00			0.99		1.00	0.96	
Flpb, ped/bikes		1.00		0.99	1.00			0.99		0.98	1.00	
Frt		1.00		1.00	1.00			0.98		1.00	0.85	
Flt Protected		1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)		3402		1702	3419			1653		1682	1477	
Flt Permitted		1.00		0.17	1.00			0.83		0.72	1.00	
Satd. Flow (perm)		3402		296	3419			1421		1283	1477	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1047	30	2	639	2	41	0	9	14	0	14
RTOR Reduction (vph)	0	3	0	0	1	0	0	22	0	0	9	0
Lane Group Flow (vph)	0	1074	0	2	640	0	0	28	0	14	5	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		27.0		27.0	27.0			23.0		23.0	23.0	
Effective Green, g (s)		27.0		27.0	27.0			23.0		23.0	23.0	
Actuated g/C Ratio		0.45		0.45	0.45			0.38		0.38	0.38	
Clearance Time (s)		5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)		1530		133	1538			544		491	566	
v/s Ratio Prot		c0.32			0.19						0.00	
v/s Ratio Perm				0.01				c0.02		0.01		
v/c Ratio		0.70		0.02	0.42			0.05		0.03	0.01	
Uniform Delay, d1		13.3		9.1	11.2			11.6		11.5	11.4	
Progression Factor		1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2		2.7		0.2	0.8			0.2		0.1	0.0	
Delay (s)		16.0		9.3	12.0			11.8		11.6	11.5	
Level of Service		B		A	B			B		B	B	
Approach Delay (s)		16.0			12.0			11.8			11.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	93	0	0	760	6	467	112	662	0	0	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frpb, ped/bikes		1.00			1.00		1.00	0.98				1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Frt		1.00			1.00		1.00	0.87				0.85
Flt Protected		1.00			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3416			5125		1711	2925				2694
Flt Permitted		0.95			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3235			5125		1711	2925				2694
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	3	97	0	0	792	6	486	117	690	0	0	132
RTOR Reduction (vph)	0	0	0	0	1	0	0	368	0	0	0	126
Lane Group Flow (vph)	0	100	0	0	797	0	486	439	0	0	0	6
Confl. Peds. (#/hr)	20					20	1		10			
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		38.5			29.5		42.0	42.0				4.0
Effective Green, g (s)		38.5			29.5		42.0	42.0				4.0
Actuated g/C Ratio		0.43			0.33		0.47	0.47				0.04
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1391			1679		798	1365				119
v/s Ratio Prot		c0.00			c0.16		c0.28	0.15				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.07			0.47		0.61	0.32				0.05
Uniform Delay, d1		15.2			24.1		17.9	15.1				41.2
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			1.0		3.4	0.6				0.8
Delay (s)		15.3			25.0		21.3	15.7				42.0
Level of Service		B			C		C	B				D
Approach Delay (s)		15.3			25.0			17.8			42.0	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	21.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.
4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	96	616	656	698	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.98	0.97	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.89	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1494	1417	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1494	1417	3319	1801		
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	98	629	669	712	0	0
RTOR Reduction (vph)	39	39	0	0	0	0
Lane Group Flow (vph)	329	320	669	712	0	0
Confl. Peds. (#/hr)		4	5			
Confl. Bikes (#/hr)		24				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	32.8	32.8	17.2	60.0		
Effective Green, g (s)	32.8	32.8	17.2	60.0		
Actuated g/C Ratio	0.55	0.55	0.29	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	816	774	951	1801		
v/s Ratio Prot	0.22		c0.20	c0.40		
v/s Ratio Perm		0.23				
v/c Ratio	0.40	0.41	0.70	0.40		
Uniform Delay, d1	7.9	8.0	19.1	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.3	0.4	2.4	0.1		
Delay (s)	8.2	8.3	21.5	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	8.3			10.5	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	208	159	178	8	222	16	199	623	5	25	420	151
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.98	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.99		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1191	1972		1141	1254		1215	2426		1215	2267	
Flt Permitted	0.34	1.00		0.54	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	431	1972		650	1254		1215	2426		1215	2267	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	217	166	185	8	231	17	207	649	5	26	438	157
RTOR Reduction (vph)	0	114	0	0	3	0	0	1	0	0	38	0
Lane Group Flow (vph)	217	237	0	8	245	0	207	653	0	26	557	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	38.3	38.3		23.1	23.1		16.1	41.6		3.8	29.3	
Effective Green, g (s)	38.3	38.3		23.1	23.1		16.1	41.6		3.8	29.3	
Actuated g/C Ratio	0.38	0.38		0.23	0.23		0.16	0.42		0.04	0.29	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	240	755		150	289		195	1009		46	664	
v/s Ratio Prot	c0.09	0.12			0.20		c0.17	0.27		0.02	c0.25	
v/s Ratio Perm	c0.26			0.01								
v/c Ratio	0.90	0.31		0.05	0.85		1.06	0.65		0.57	0.84	
Uniform Delay, d1	27.6	21.6		29.9	36.8		42.0	23.3		47.3	33.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.91	
Incremental Delay, d2	33.5	0.2		0.1	20.0		81.7	3.2		10.9	9.0	
Delay (s)	61.0	21.9		30.1	56.7		123.6	26.6		58.3	39.0	
Level of Service	E	C		C	E		F	C		E	D	
Approach Delay (s)		36.8			55.9			49.9			39.8	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	44.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	97.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania Street & I-280 SB On-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	257	680	459	501
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	279	739	499	545
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			525			
pX, platoon unblocked						
vC, conflicting volume	1822	140			279	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1822	140			279	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			61	
cM capacity (veh/h)	42	883			1280	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	140	140	739	499	545
Volume Left	0	0	0	499	0
Volume Right	0	0	739	0	0
cSH	1700	1700	1700	1280	1700
Volume to Capacity	0.08	0.08	0.43	0.39	0.32
Queue Length 95th (ft)	0	0	0	47	0
Control Delay (s)	0.0	0.0	0.0	9.6	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.6	
Approach LOS					

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	171	137	0	158	147
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	186	149	0	172	160
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	149				242	149
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	149				242	149
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				76	82
cM capacity (veh/h)	1430				725	871

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	93	93	149	332
Volume Left	0	0	0	172
Volume Right	0	0	0	160
cSH	1700	1700	1700	789
Volume to Capacity	0.05	0.05	0.09	0.42
Queue Length 95th (ft)	0	0	0	52
Control Delay (s)	0.0	0.0	0.0	12.8
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.8
Approach LOS				B

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp
9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	38	291	137	55	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	316	149	60	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	209				390	149
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	209				390	149
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				100	100
cM capacity (veh/h)	1359				569	871

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	147	211	149	60	0
Volume Left	41	0	0	0	0
Volume Right	0	0	0	60	0
cSH	1359	1700	1700	1700	1700
Volume to Capacity	0.03	0.12	0.09	0.04	0.00
Queue Length 95th (ft)	2	0	0	0	0
Control Delay (s)	2.4	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	28	31	37	54	25	47	595	41	20	392	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.97		1.00	0.99		1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1516			1549		1540	3049		1540	3063	
Flt Permitted		0.84			0.84		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1297			1328		1540	3049		1540	3063	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	30	34	40	59	27	51	647	45	22	426	15
RTOR Reduction (vph)	0	22	0	0	10	0	0	2	0	0	1	0
Lane Group Flow (vph)	0	67	0	0	116	0	51	690	0	22	440	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		15.3			15.3		7.5	83.8		5.7	82.0	
Effective Green, g (s)		15.3			15.3		7.5	83.8		5.7	82.0	
Actuated g/C Ratio		0.13			0.13		0.06	0.70		0.05	0.68	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		165			169		96	2129		73	2093	
v/s Ratio Prot							c0.03	c0.23		0.01	c0.14	
v/s Ratio Perm		0.05			c0.09							
v/c Ratio		0.41			0.69		0.53	0.32		0.30	0.21	
Uniform Delay, d1		48.2			50.1		54.5	7.1		55.2	7.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			11.1		2.8	0.4		0.8	0.2	
Delay (s)		49.8			61.2		57.4	7.5		56.1	7.3	
Level of Service		D			E		E	A		E	A	
Approach Delay (s)		49.8			61.2			10.9			9.6	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	505	74	256	0	0	312
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	549	80	278	0	0	339

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	274	274	80	139	139	339
Volume Left (vph)	274	274	0	0	0	0
Volume Right (vph)	0	0	80	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.9	6.9	3.2	6.8	6.8	6.4
Degree Utilization, x	0.52	0.52	0.07	0.26	0.26	0.60
Capacity (veh/h)	508	509	1121	505	505	551
Control Delay (s)	16.0	16.0	5.2	11.0	11.0	18.4
Approach Delay (s)	14.7			11.0		18.4
Approach LOS	B			B		C

Intersection Summary			
Delay	14.9		
Level of Service	B		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	68	167	0	0	238	69	35	202	30	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	182	0	0	259	75	38	220	33	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	255	334	148	142
Volume Left (vph)	74	0	38	0
Volume Right (vph)	0	75	0	33
Hadj (s)	0.09	-0.10	0.16	-0.13
Departure Headway (s)	5.3	5.0	6.2	5.9
Degree Utilization, x	0.37	0.46	0.25	0.23
Capacity (veh/h)	648	692	550	575
Control Delay (s)	11.4	12.2	10.0	9.4
Approach Delay (s)	11.4	12.2	9.7	
Approach LOS	B	B	A	

Intersection Summary			
Delay	11.2		
Level of Service	B		
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

30: Third St. & 25th

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↑↱			↑↱	
Volume (vph)	17	22	81	6	59	6	68	770	12	0	573	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.90			0.99		1.00	0.99			0.99	
Flpb, ped/bikes		0.98			0.99		1.00	1.00			1.00	
Frt		0.91			0.99		1.00	1.00			0.99	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1132			1565		1540	2251			2222	
Flt Permitted		0.95			0.96		0.95	1.00			1.00	
Satd. Flow (perm)		1083			1506		1540	2251			2222	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	23	85	6	62	6	72	811	13	0	603	26
RTOR Reduction (vph)	0	75	0	0	4	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	51	0	0	70	0	72	824	0	0	628	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		12.1			12.1		9.7	97.6			82.8	
Effective Green, g (s)		12.1			12.1		9.7	97.6			82.8	
Actuated g/C Ratio		0.10			0.10		0.08	0.81			0.69	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		109			151		124	1830			1533	
v/s Ratio Prot							c0.05	c0.37			0.28	
v/s Ratio Perm		c0.05			0.05							
v/c Ratio		0.47			0.47		0.58	0.45			0.41	
Uniform Delay, d1		50.9			50.9		53.2	3.3			8.0	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		3.2			2.3		6.8	0.8			0.8	
Delay (s)		54.1			53.2		59.9	4.1			8.8	
Level of Service		D			D		E	A			A	
Approach Delay (s)		54.1			53.2			8.6			8.8	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↑↑	↱	↰	↑	↱	↰		↱
Volume (vph)	377	432	0	0	240	404	223	156	369	69	0	432
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.84	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1013	1540	1621	1193	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1013	1540	1621	1193	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	397	455	0	0	253	425	235	164	388	73	0	455
RTOR Reduction (vph)	0	0	0	0	0	269	0	0	200	0	0	404
Lane Group Flow (vph)	397	455	0	0	253	156	235	164	188	73	0	51
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	18.1	41.2			18.1	18.1	18.4	18.4	18.4	9.6		9.6
Effective Green, g (s)	18.1	41.2			18.1	18.1	18.4	18.4	18.4	9.6		9.6
Actuated g/C Ratio	0.21	0.48			0.21	0.21	0.22	0.22	0.22	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	327	1488			654	215	332	350	257	173		135
v/s Ratio Prot	c0.26	0.15			0.08		0.15	0.10		c0.05		0.04
v/s Ratio Perm						c0.15			c0.16			
v/c Ratio	1.21	0.31			0.39	0.73	0.71	0.47	0.73	0.42		0.38
Uniform Delay, d1	33.5	13.3			28.8	31.3	30.9	29.1	31.1	35.2		35.0
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	121.2	0.5			1.7	19.3	6.7	1.0	10.3	1.7		1.8
Delay (s)	154.7	13.9			30.5	50.6	37.7	30.1	41.4	36.9		36.8
Level of Service	F	B			C	D	D	C	D	D		D
Approach Delay (s)		79.5			43.1			37.9			36.8	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	51.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	85.2	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	82	40	73	3	63	25	133	93	2	12	90	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.94			0.96		1.00	1.00		1.00	0.95	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3162			1731		1711	1795		1711	1705	
Flt Permitted		0.82			0.99		0.66	1.00		0.69	1.00	
Satd. Flow (perm)		2660			1722		1189	1795		1243	1705	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	43	79	3	68	27	145	101	2	13	98	54
RTOR Reduction (vph)	0	46	0	0	16	0	0	1	0	0	32	0
Lane Group Flow (vph)	0	165	0	0	82	0	145	102	0	13	121	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Effective Green, g (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Actuated g/C Ratio		0.42			0.42		0.42	0.42		0.42	0.42	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		1108			717		495	747		517	710	
v/s Ratio Prot								0.06			0.07	
v/s Ratio Perm		c0.06			0.05		c0.12			0.01		
v/c Ratio		0.15			0.11		0.29	0.14		0.03	0.17	
Uniform Delay, d1		8.7			8.6		9.3	8.7		8.3	8.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.3		1.5	0.4		0.1	0.5	
Delay (s)		9.0			8.9		10.8	9.0		8.3	9.3	
Level of Service		A			A		B	A		A	A	
Approach Delay (s)		9.0			8.9			10.1			9.2	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

EXISTING 2015 (NO PROJECT)
NO SF GIANTS GAME AT AT&T PARK
WEEKDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	808	695	17	159	920	53	44	831	236	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3046		2987	2999			5475	941			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3046		2987	2999			5475	941			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	878	755	18	173	1000	58	48	903	257	0	0	0
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	184	0	0	0
Lane Group Flow (vph)	878	772	0	173	1057	0	0	951	73	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	48.5		11.3	41.6			31.3	31.3			
Effective Green, g (s)	18.2	48.5		11.3	41.6			31.3	31.3			
Actuated g/C Ratio	0.17	0.44		0.10	0.38			0.28	0.28			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1343		306	1134			1557	267			
v/s Ratio Prot	c0.20	0.25		0.06	c0.35							
v/s Ratio Perm								0.17	0.08			
v/c Ratio	1.18	0.57		0.57	0.93			0.61	0.27			
Uniform Delay, d1	45.9	23.0		47.0	32.9			34.1	30.5			
Progression Factor	0.63	0.55		0.98	0.46			1.43	5.39			
Incremental Delay, d2	92.7	1.2		1.1	7.0			0.6	0.5			
Delay (s)	121.4	13.9		47.3	22.2			49.5	165.1			
Level of Service	F	B		D	C			D	F			
Approach Delay (s)		71.1			25.7			74.1			0.0	
Approach LOS		E			C			E			A	

Intersection Summary			
HCM 2000 Control Delay	58.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	187	1389	24	31	902	31	26	87	80	51	279	458
Ideal Flow (vphpl)	1700	1700	1700	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.63	1.00	0.77	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.95	1.00	0.70	1.00	1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.93	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1377	3923		1296	2527			1524	856	1077	2107	581
Flt Permitted	0.95	1.00		0.95	1.00			0.65	1.00	0.68	1.00	1.00
Satd. Flow (perm)	1377	3923		1296	2527			1000	856	768	2107	581
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	205	1526	26	34	991	34	29	96	88	56	307	503
RTOR Reduction (vph)	0	1	0	0	2	0	0	0	66	0	152	191
Lane Group Flow (vph)	205	1551	0	34	1023	0	0	125	22	56	401	66
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	23.1	53.8		8.9	38.0			27.4	27.4	28.4	28.4	28.4
Effective Green, g (s)	23.1	53.8		8.9	38.0			27.4	27.4	28.4	28.4	28.4
Actuated g/C Ratio	0.21	0.49		0.08	0.35			0.25	0.25	0.26	0.26	0.26
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	289	1918		104	872			249	213	198	543	150
v/s Ratio Prot	0.15	c0.40		0.03	c0.40						c0.19	
v/s Ratio Perm								0.13	0.03	0.07		0.11
v/c Ratio	0.71	0.81		0.33	1.17			0.50	0.10	0.28	0.74	0.44
Uniform Delay, d1	40.3	23.7		47.7	36.0			35.4	31.8	32.7	37.4	34.2
Progression Factor	0.63	0.79		0.59	0.63			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.4		0.8	83.3			1.6	0.2	0.8	5.2	2.1
Delay (s)	26.2	19.0		28.7	105.9			37.0	32.0	33.4	42.6	36.2
Level of Service	C	B		C	F			D	C	C	D	D
Approach Delay (s)		19.9			103.4			35.0			40.1	
Approach LOS		B			F			C			D	

Intersection Summary			
HCM 2000 Control Delay	47.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	118.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1581	199	2	1384	74	19
Ideal Flow (vphpl)	1850	1850	1850	1850	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2937			2998	1540	1357
Flt Permitted	1.00			0.93	0.95	1.00
Satd. Flow (perm)	2937			2789	1540	1357
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1664	209	2	1457	78	20
RTOR Reduction (vph)	9	0	0	0	0	11
Lane Group Flow (vph)	1864	0	0	1459	78	9
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1658			1574	512	451
v/s Ratio Prot	c0.63				c0.05	
v/s Ratio Perm				0.52		0.01
v/c Ratio	1.12			0.93	0.15	0.02
Uniform Delay, d1	23.9			21.9	25.8	24.7
Progression Factor	1.00			0.72	1.00	1.00
Incremental Delay, d2	64.5			3.3	0.6	0.1
Delay (s)	88.5			19.1	26.4	24.7
Level of Service	F			B	C	C
Approach Delay (s)	88.5			19.1	26.1	
Approach LOS	F			B	C	

Intersection Summary			
HCM 2000 Control Delay	57.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	97.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	122	1129	155	29	278	527	260	144	654	258
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.95			1.00	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5773			2869	2440			4080	1122
Flt Permitted		1.00			0.75	1.00			0.95	1.00
Satd. Flow (perm)		5773			2150	2440			4080	1122
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	139	1283	176	33	316	599	295	164	743	293
RTOR Reduction (vph)	0	29	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1569	0	0	349	893	0	0	936	264
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		20.5			22.0	22.0			15.0	15.0
Effective Green, g (s)		22.5			25.0	25.0			18.0	18.0
Actuated g/C Ratio		0.30			0.33	0.33			0.24	0.24
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1731			716	813			979	269
v/s Ratio Prot						c0.37			0.23	c0.24
v/s Ratio Perm		0.27			0.16					
v/c Ratio		0.91			0.49	1.10			0.96	0.98
Uniform Delay, d1		25.2			19.9	25.0			28.1	28.3
Progression Factor		1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2		7.2			0.5	61.8			18.8	49.5
Delay (s)		32.4			20.4	86.8			47.0	77.8
Level of Service		C			C	F			D	E
Approach Delay (s)		32.4			20.4	86.8			53.7	
Approach LOS		C			C	F			D	

Intersection Summary			
HCM 2000 Control Delay	49.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	87.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp
4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	29	453	654	48	278	283	30	212	105	476
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)	2.0	4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor	1.00	0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes	1.00	1.00	0.99		0.85		0.98		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Frt	1.00	1.00	0.99		0.92		0.85		1.00	1.00
Flt Protected	0.95	0.95	1.00		1.00		1.00		0.95	0.99
Satd. Flow (prot)	810	1313	1911		2182		1161		1327	2539
Flt Permitted	0.95	0.95	1.00		1.00		1.00		0.20	0.72
Satd. Flow (perm)	810	1313	1911		2182		1161		279	1849
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	31	477	688	51	293	298	32	223	111	501
RTOR Reduction (vph)	0	0	9	0	1	0	23	0	0	0
Lane Group Flow (vph)	31	429	778	0	593	0	6	0	244	591
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)	18.5	18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)	21.0	18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio	0.27	0.24	0.27		0.23		0.21		0.42	0.42
Clearance Time (s)	4.5	4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)	220	315	521		495		241		287	892
v/s Ratio Prot	0.04	0.33	c0.41		c0.27				c0.14	0.11
v/s Ratio Perm							0.01		0.22	0.17
v/c Ratio	0.14	1.36	1.49		1.28dr		0.03		0.85	0.66
Uniform Delay, d1	21.2	29.2	28.0		29.8		24.3		25.7	17.9
Progression Factor	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2	1.3	182.1	232.2		107.5		0.2		25.8	3.9
Delay (s)	22.5	211.3	260.2		137.3		24.5		51.5	21.7
Level of Service	C	F	F		F		C		D	C
Approach Delay (s)			237.5		132.0					30.4
Approach LOS			F		F					C

Intersection Summary			
HCM 2000 Control Delay	149.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	77.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	89.1%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	17	99	12	2	26	20	765	1	4	156	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	1.00		1.00	0.98	
Flt Protected		0.97	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1557	1353		1428		1272	2544		1540	3004	
Flt Permitted		0.83	1.00		0.93		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1339	1353		1352		1272	2544		1540	3004	
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	38	21	122	15	2	32	25	944	1	5	193	30
RTOR Reduction (vph)	0	0	83	0	22	0	0	0	0	0	13	0
Lane Group Flow (vph)	0	59	39	0	27	0	25	945	0	5	211	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.1	32.1		32.1		14.8	37.5		14.5	37.5	
Effective Green, g (s)		32.1	32.1		32.1		14.8	37.5		14.5	37.5	
Actuated g/C Ratio		0.32	0.32		0.32		0.15	0.38		0.14	0.38	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Grp Cap (vph)		429	434		433		188	954		223	1126	
v/s Ratio Prot							0.02	c0.37		0.00	c0.07	
v/s Ratio Perm		c0.04	0.03		0.02							
v/c Ratio		0.14	0.09		0.06		0.13	0.99		0.02	0.19	
Uniform Delay, d1		24.1	23.7		23.5		37.0	31.1		36.7	21.0	
Progression Factor		1.00	1.00		1.00		1.65	0.50		1.00	1.00	
Incremental Delay, d2		0.7	0.4		0.3		1.0	21.8		0.2	0.4	
Delay (s)		24.8	24.2		23.8		62.0	37.3		36.9	21.4	
Level of Service		C	C		C		E	D		D	C	
Approach Delay (s)		24.4			23.8			37.9			21.7	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	33.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	5	8	4	9	33	13	54	4	138	119	23
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	1.00	1.00	1.00		1.00	0.97	
Flpb, ped/bikes		0.99			1.00	1.00	0.84	1.00		1.00	1.00	
Frt		0.95			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2362			1427	1230	1160	1430		1377	1366	
Flt Permitted		0.95			1.00	1.00	0.93	1.00		0.95	1.00	
Satd. Flow (perm)		2302			1449	1230	1136	1430		1377	1366	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	9	5	8	4	9	34	14	56	4	144	124	24
RTOR Reduction (vph)	0	8	0	0	0	17	0	4	0	0	7	0
Lane Group Flow (vph)	0	14	0	0	13	17	14	56	0	144	141	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.0			1.0	19.0	4.3	4.3		18.0	27.3	
Effective Green, g (s)		1.0			1.0	19.0	4.3	4.3		18.0	27.3	
Actuated g/C Ratio		0.03			0.03	0.50	0.11	0.11		0.47	0.71	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		60			37	770	127	160		647	973	
v/s Ratio Prot						0.01		c0.04		c0.10	0.10	
v/s Ratio Perm		0.01			c0.01	0.00	0.01					
v/c Ratio		0.24			0.35	0.02	0.11	0.35		0.22	0.15	
Uniform Delay, d1		18.3			18.3	4.9	15.3	15.7		6.0	1.8	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.0			5.7	0.0	0.4	1.3		0.2	0.1	
Delay (s)		20.3			24.0	4.9	15.7	17.1		6.2	1.8	
Level of Service		C			C	A	B	B		A	A	
Approach Delay (s)		20.3			10.2			16.8			4.0	
Approach LOS		C			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	7.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	38.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	53	208	479	19	115	242
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1743	1535	849	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1743	1535	849	1134	1194
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	57	224	515	20	124	260
RTOR Reduction (vph)	0	197	0	6	0	0
Lane Group Flow (vph)	57	27	515	14	124	260
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	10.0	10.0	42.4	37.4	14.9	62.3
Effective Green, g (s)	10.0	10.0	42.4	37.4	14.9	62.3
Actuated g/C Ratio	0.12	0.12	0.52	0.45	0.18	0.76
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	137	211	790	437	205	903
v/s Ratio Prot	c0.05		c0.34	0.01	c0.11	0.22
v/s Ratio Perm		0.02		0.01		
v/c Ratio	0.42	0.13	0.65	0.03	0.60	0.29
Uniform Delay, d1	33.4	32.3	14.6	12.4	31.0	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.3	1.9	0.0	5.0	0.2
Delay (s)	35.5	32.5	16.5	12.5	36.0	3.3
Level of Service	D	C	B	B	D	A
Approach Delay (s)	33.1		16.4			13.8
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	82.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	24	2	85	96	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	24	28	2	100	113	24
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	279	168	186			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	279	168	186			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	96	100			
cM capacity (veh/h)	635	783	1332			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	24	28	36	67	75	61
Volume Left	24	0	2	0	0	0
Volume Right	0	28	0	0	0	24
cSH	635	783	1332	1700	1700	1700
Volume to Capacity	0.04	0.04	0.00	0.04	0.04	0.04
Queue Length 95th (ft)	3	3	0	0	0	0
Control Delay (s)	10.9	9.8	0.5	0.0	0.0	0.0
Lane LOS	B	A	A			
Approach Delay (s)	10.3		0.2		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	132	39	792	34	6	394
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00		1.00	1.00
Flpb, ped/bikes	0.93	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1584	1466	3394		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1584	1466	3394		1711	3421
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	148	44	890	38	7	443
RTOR Reduction (vph)	0	31	3	0	0	0
Lane Group Flow (vph)	148	13	925	0	7	443
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	54.0		2.0	61.1
Effective Green, g (s)	28.7	28.7	54.0		2.0	61.1
Actuated g/C Ratio	0.29	0.29	0.54		0.02	0.61
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	454	420	1832		34	2090
v/s Ratio Prot			c0.27		0.00	c0.13
v/s Ratio Perm	c0.09	0.01				
v/c Ratio	0.33	0.03	0.51		0.21	0.21
Uniform Delay, d1	28.0	25.6	14.5		48.2	8.7
Progression Factor	1.00	1.00	2.17		1.13	0.79
Incremental Delay, d2	0.4	0.0	0.7		3.0	0.1
Delay (s)	28.5	25.7	32.3		57.6	6.9
Level of Service	C	C	C		E	A
Approach Delay (s)	27.8		32.3			7.7
Approach LOS	C		C			A

Intersection Summary			
HCM 2000 Control Delay	24.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	87	120	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	102	141	0
Pedestrians	25			1	1	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	218	97	166			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	218	97	166			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	735	922	1382			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	34	68	94	47
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1382	1700	1700	1700
Volume to Capacity	0.00	0.00	0.04	0.06	0.03
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.0	0.0		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	19.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	3	61	23	16	86	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	4	75	28	20	106	2
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	499					
pX, platoon unblocked						
vC, conflicting volume			129		218	141
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			129		218	141
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		85	100
cM capacity (veh/h)			1401		698	839

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	79	48	109
Volume Left	0	28	106
Volume Right	75	0	2
cSH	1700	1401	701
Volume to Capacity	0.05	0.02	0.16
Queue Length 95th (ft)	0	2	14
Control Delay (s)	0.0	4.6	11.1
Lane LOS		A	B
Approach Delay (s)	0.0	4.6	11.1
Approach LOS			B

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	30.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰↰	↑↱		↰	↑↱	
Volume (vph)	136	49	219	2	67	33	202	657	5	10	337	178
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1255	1365	1126	1282	1365	1099	2515	2589		1296	2435	
Flt Permitted	0.71	1.00	1.00	0.72	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	934	1365	1126	972	1365	1099	2515	2589		1296	2435	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	156	56	252	2	77	38	232	755	6	11	387	205
RTOR Reduction (vph)	0	0	165	0	0	25	0	1	0	0	69	0
Lane Group Flow (vph)	156	56	87	2	77	13	232	760	0	11	523	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	322	470	388	335	470	379	352	978		155	871	
v/s Ratio Prot		0.04			0.06		0.09	c0.29		0.01	c0.21	
v/s Ratio Perm	c0.17		0.08	0.00		0.01						
v/c Ratio	0.48	0.12	0.22	0.01	0.16	0.03	0.66	0.78		0.07	0.60	
Uniform Delay, d1	25.8	22.4	23.2	21.5	22.7	21.7	40.7	27.4		39.1	26.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.80		1.00	0.88	
Incremental Delay, d2	5.1	0.5	1.3	0.0	0.7	0.2	6.2	4.0		0.9	3.0	
Delay (s)	30.9	22.9	24.6	21.5	23.5	21.9	43.0	26.0		39.9	26.0	
Level of Service	C	C	C	C	C	C	D	C		D	C	
Approach Delay (s)		26.5			22.9			30.0			26.3	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↱		↰	↱	
Volume (vph)	95	344	9	19	389	39	23	14	13	46	10	114
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.94	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1245	1621	1582		1491	1378	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.65	1.00		0.74	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1245	1109	1582		1157	1378	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	110	400	10	22	452	45	27	16	15	53	12	133
RTOR Reduction (vph)	0	0	5	0	0	25	0	11	0	0	99	0
Lane Group Flow (vph)	110	400	5	22	452	20	27	20	0	53	46	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.7	42.0	42.0	5.3	36.6	36.6	21.3	21.3		21.3	21.3	
Effective Green, g (s)	10.7	42.0	42.0	5.3	36.6	36.6	21.3	21.3		21.3	21.3	
Actuated g/C Ratio	0.13	0.50	0.50	0.06	0.44	0.44	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	857	728	102	746	545	282	403		294	351	
v/s Ratio Prot	c0.07	0.23		0.01	c0.26			0.01			0.03	
v/s Ratio Perm			0.00			0.02	0.02			c0.05		
v/c Ratio	0.53	0.47	0.01	0.22	0.61	0.04	0.10	0.05		0.18	0.13	
Uniform Delay, d1	34.1	13.5	10.4	37.2	18.0	13.4	23.8	23.5		24.3	24.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	1.8	0.0	1.1	1.4	0.0	0.1	0.1		0.3	0.2	
Delay (s)	36.7	15.3	10.4	38.2	19.4	13.5	23.9	23.6		24.6	24.2	
Level of Service	D	B	B	D	B	B	C	C		C	C	
Approach Delay (s)		19.8			19.7			23.7			24.3	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	83.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	317	32	55	425	47	31	102	37	94	124	106
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.98	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1049	1540	2957			3014	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.60	1.00			0.78	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1049	979	2957			2386	1072
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	345	35	60	462	51	34	111	40	102	135	115
RTOR Reduction (vph)	0	0	16	0	0	25	0	32	0	0	0	94
Lane Group Flow (vph)	75	345	19	60	462	26	34	119	0	0	237	21
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	7.2	40.4	40.4	5.4	37.6	37.6	14.7	14.7			13.7	13.7
Effective Green, g (s)	7.2	40.4	40.4	5.4	37.6	37.6	14.7	14.7			13.7	13.7
Actuated g/C Ratio	0.10	0.55	0.55	0.07	0.51	0.51	0.20	0.20			0.19	0.19
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	119	667	757	113	621	536	195	591			444	199
v/s Ratio Prot	c0.06	c0.28		0.04	c0.38			0.04				
v/s Ratio Perm			0.01			0.02	0.03				c0.10	0.02
v/c Ratio	0.63	0.52	0.03	0.53	0.74	0.05	0.17	0.20			0.53	0.11
Uniform Delay, d1	31.9	10.4	7.6	32.8	14.2	9.0	24.4	24.5			27.0	24.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	10.4	0.7	0.0	4.7	4.8	0.0	0.4	0.2			1.2	0.2
Delay (s)	42.3	11.1	7.6	37.6	19.0	9.0	24.8	24.7			28.3	25.1
Level of Service	D	B	A	D	B	A	C	C			C	C
Approach Delay (s)		16.0			20.0			24.7			27.2	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	73.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	319	77	38	321	203	69	230	17	83	109	36
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.90	1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1328	921		1335	1126	860	1070	957	921	1070	1064	
Flt Permitted	0.30	1.00		0.33	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	423	921		470	1126	860	1070	957	921	1070	1064	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	347	84	41	349	221	75	250	18	90	118	39
RTOR Reduction (vph)	0	8	0	0	0	103	0	0	13	0	12	0
Lane Group Flow (vph)	25	423	0	41	349	118	75	250	5	90	145	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	49.1	49.1		49.1	49.1	58.1	17.9	28.0	28.0	9.0	19.1	
Effective Green, g (s)	49.1	49.1		49.1	49.1	58.1	17.9	28.0	28.0	9.0	19.1	
Actuated g/C Ratio	0.45	0.45		0.45	0.45	0.54	0.17	0.26	0.26	0.08	0.18	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	210	417		231	510	500	176	247	237	88	187	
v/s Ratio Prot	0.00	c0.46		0.00	c0.31	0.02	0.07	c0.26		c0.08	0.14	
v/s Ratio Perm	0.05			0.08		0.12			0.01			
v/c Ratio	0.12	1.02		0.18	0.68	0.24	0.43	1.01	0.02	1.02	0.78	
Uniform Delay, d1	18.3	29.7		25.8	23.5	13.4	40.6	40.2	30.0	49.7	42.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	48.0		0.4	3.8	0.2	1.7	60.4	0.0	102.3	18.2	
Delay (s)	18.5	77.6		26.1	27.3	13.6	42.3	100.6	30.0	152.0	60.8	
Level of Service	B	E		C	C	B	D	F	C	F	E	
Approach Delay (s)		74.4			22.3			84.2			94.0	
Approach LOS		E			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	60.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	108.4	Sum of lost time (s)	20.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	12	62	59	47	105	6	39	74	53	8	29	26
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	13	68	65	52	115	7	43	81	58	9	32	29

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	146	52	122	124	58	69
Volume Left (vph)	13	52	0	43	0	9
Volume Right (vph)	65	0	7	0	58	29
Hadj (s)	-0.21	0.53	0.00	0.21	-0.67	-0.19
Departure Headway (s)	5.2	5.9	5.3	5.6	4.8	5.4
Degree Utilization, x	0.21	0.08	0.18	0.19	0.08	0.10
Capacity (veh/h)	653	581	642	606	709	618
Control Delay (s)	9.6	8.2	8.3	8.8	7.0	9.0
Approach Delay (s)	9.6	8.3		8.2		9.0
Approach LOS	A	A		A		A

Intersection Summary			
Delay	8.7		
Level of Service	A		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	308	90	48	7	152	11	32	546	19	25	362	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.99		1.00	0.99		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1665	3202		1677	3376		1260	2504		1260	2373	
Flt Permitted	0.64	1.00		0.65	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1118	3202		1156	3376		1260	2504		1260	2373	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	342	100	53	8	169	12	36	607	21	28	402	190
RTOR Reduction (vph)	0	37	0	0	5	0	0	2	0	0	56	0
Lane Group Flow (vph)	342	116	0	8	176	0	36	626	0	28	536	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	332	950		343	1002		212	999		187	899	
v/s Ratio Prot		0.04			0.05		0.03	c0.25		0.02	c0.23	
v/s Ratio Perm	c0.31			0.01								
v/c Ratio	1.03	0.12		0.02	0.18		0.17	0.63		0.15	0.60	
Uniform Delay, d1	35.1	25.6		24.9	26.1		35.5	24.1		37.0	24.9	
Progression Factor	1.00	1.00		1.00	1.00		0.85	0.74		1.51	0.77	
Incremental Delay, d2	57.4	0.3		0.1	0.4		1.1	1.9		1.4	2.4	
Delay (s)	92.5	25.9		25.0	26.5		31.2	19.7		57.4	21.6	
Level of Service	F	C		C	C		C	B		E	C	
Approach Delay (s)		71.9			26.4			20.3			23.2	
Approach LOS		E			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	98.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	336	55	6	379	9	36	0	5	17	1	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			0.98		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3349		1711	3409			1698		1711	1541	
Flt Permitted	0.51	1.00		0.50	1.00			0.81		0.73	1.00	
Satd. Flow (perm)	910	3349		908	3409			1441		1312	1541	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	365	60	7	412	10	39	0	5	18	1	24
RTOR Reduction (vph)	0	22	0	0	3	0	0	22	0	0	15	0
Lane Group Flow (vph)	22	403	0	7	419	0	0	22	0	18	10	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45			0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	409	1507		408	1534			552		502	590	
v/s Ratio Prot		0.12			c0.12						0.01	
v/s Ratio Perm	0.02			0.01				c0.02		0.01		
v/c Ratio	0.05	0.27		0.02	0.27			0.04		0.04	0.02	
Uniform Delay, d1	9.3	10.3		9.1	10.3			11.6		11.6	11.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.4		0.1	0.4			0.1		0.1	0.1	
Delay (s)	9.6	10.8		9.2	10.8			11.7		11.7	11.5	
Level of Service	A	B		A	B			B		B	B	
Approach Delay (s)		10.7			10.8			11.7			11.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	92	0	0	469	19	308	129	221	0	0	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.91				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3404			5102		1711	3097				2694
Flt Permitted		0.92			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3139			5102		1711	3097				2694
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	12	107	0	0	545	22	358	150	257	0	0	86
RTOR Reduction (vph)	0	0	0	0	5	0	0	151	0	0	0	80
Lane Group Flow (vph)	0	119	0	0	562	0	358	256	0	0	0	6
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		40.5			29.5		35.0	35.0				6.0
Effective Green, g (s)		40.5			29.5		35.0	35.0				6.0
Actuated g/C Ratio		0.48			0.35		0.41	0.41				0.07
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1514			1770		704	1275				190
v/s Ratio Prot		c0.01			c0.11		c0.21	0.08				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.08			0.32		0.51	0.20				0.03
Uniform Delay, d1		12.1			20.4		18.6	16.0				36.8
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.5		2.6	0.4				0.3
Delay (s)		12.2			20.8		21.2	16.4				37.1
Level of Service		B			C		C	B				D
Approach Delay (s)		12.2			20.8			18.6			37.1	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	102	444	389	461	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.90	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1529	1428	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1529	1428	3319	1801		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	121	529	463	549	0	0
RTOR Reduction (vph)	76	76	0	0	0	0
Lane Group Flow (vph)	257	241	463	549	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	36.4	36.4	13.6	60.0		
Effective Green, g (s)	36.4	36.4	13.6	60.0		
Actuated g/C Ratio	0.61	0.61	0.23	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	927	866	752	1801		
v/s Ratio Prot	0.17		c0.14	c0.30		
v/s Ratio Perm		0.17				
v/c Ratio	0.28	0.28	0.62	0.30		
Uniform Delay, d1	5.6	5.6	20.9	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.2	0.2	1.5	0.1		
Delay (s)	5.7	5.8	22.4	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	5.8			10.3	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	38.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	200	121	165	6	127	10	122	398	13	17	327	141
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.93		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.97	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1175	1943		1137	1253		1215	2411		1215	2244	
Flt Permitted	0.43	1.00		0.56	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	538	1943		670	1253		1215	2411		1215	2244	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	222	134	183	7	141	11	136	442	14	19	363	157
RTOR Reduction (vph)	0	119	0	0	3	0	0	2	0	0	49	0
Lane Group Flow (vph)	222	198	0	7	149	0	136	454	0	19	471	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	34.9	34.9		17.1	17.1		16.4	42.4		6.4	32.4	
Effective Green, g (s)	34.9	34.9		17.1	17.1		16.4	42.4		6.4	32.4	
Actuated g/C Ratio	0.35	0.35		0.17	0.17		0.16	0.42		0.06	0.32	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	267	678		114	214		199	1022		77	727	
v/s Ratio Prot	c0.10	0.10			0.12		c0.11	0.19		0.02	c0.21	
v/s Ratio Perm	c0.19			0.01								
v/c Ratio	0.83	0.29		0.06	0.69		0.68	0.44		0.25	0.65	
Uniform Delay, d1	27.8	23.6		34.7	39.0		39.4	20.4		44.5	28.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.10	1.02	
Incremental Delay, d2	19.3	0.2		0.2	9.4		9.3	1.4		1.2	3.2	
Delay (s)	47.1	23.8		35.0	48.4		48.7	21.8		50.1	32.7	
Level of Service	D	C		C	D		D	C		D	C	
Approach Delay (s)		33.4			47.8			28.0			33.3	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	32.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	90.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania Street & I-280 SB On-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	217	386	369	377
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	236	420	401	410
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			484			
pX, platoon unblocked						
vC, conflicting volume	1448	118			236	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1448	118			236	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			70	
cM capacity (veh/h)	85	912			1328	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	118	118	420	401	410
Volume Left	0	0	0	401	0
Volume Right	0	0	420	0	0
cSH	1700	1700	1700	1328	1700
Volume to Capacity	0.07	0.07	0.25	0.30	0.24
Queue Length 95th (ft)	0	0	0	32	0
Control Delay (s)	0.0	0.0	0.0	8.9	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.4	
Approach LOS					

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	137	111	0	146	180
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	149	121	0	159	196
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	121				195	121
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	121				195	121
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				80	78
cM capacity (veh/h)	1465				775	908

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	74	74	121	354
Volume Left	0	0	0	159
Volume Right	0	0	0	196
cSH	1700	1700	1700	843
Volume to Capacity	0.04	0.04	0.07	0.42
Queue Length 95th (ft)	0	0	0	53
Control Delay (s)	0.0	0.0	0.0	12.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.3
Approach LOS				B

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	44	239	111	64	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	48	260	121	70	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	190				346	121
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	190				346	121
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				100	100
cM capacity (veh/h)	1381				603	908

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	134	173	121	70	0
Volume Left	48	0	0	0	0
Volume Right	0	0	0	70	0
cSH	1381	1700	1700	1700	1700
Volume to Capacity	0.03	0.10	0.07	0.04	0.00
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	2.9	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.3		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	16	20	8	33	16	48	417	28	19	333	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.96		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1514			1549		1540	3050		1540	3039	
Flt Permitted		0.89			0.95		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1378			1478		1540	3050		1540	3039	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	17	22	9	36	17	52	453	30	21	362	34
RTOR Reduction (vph)	0	20	0	0	15	0	0	3	0	0	5	0
Lane Group Flow (vph)	0	40	0	0	47	0	52	480	0	21	391	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.1			7.1		5.2	52.4		5.5	52.7	
Effective Green, g (s)		7.1			7.1		5.2	52.4		5.5	52.7	
Actuated g/C Ratio		0.09			0.09		0.06	0.65		0.07	0.66	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		121			130		99	1992		105	1996	
v/s Ratio Prot							c0.03	c0.16		0.01	c0.13	
v/s Ratio Perm		0.03			c0.03							
v/c Ratio		0.33			0.36		0.53	0.24		0.20	0.20	
Uniform Delay, d1		34.3			34.4		36.3	5.7		35.3	5.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			1.7		2.3	0.3		0.3	0.2	
Delay (s)		35.9			36.1		38.6	6.0		35.6	5.6	
Level of Service		D			D		D	A		D	A	
Approach Delay (s)		35.9			36.1			9.2			7.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	374	17	161	0	0	203
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	407	18	175	0	0	221

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	203	203	18	88	88	221
Volume Left (vph)	203	203	0	0	0	0
Volume Right (vph)	0	0	18	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.1	6.1	3.2	6.0	6.0	5.7
Degree Utilization, x	0.35	0.35	0.02	0.15	0.15	0.35
Capacity (veh/h)	562	564	1121	564	563	600
Control Delay (s)	11.2	11.2	5.1	8.9	8.9	11.8
Approach Delay (s)	10.9			8.9		11.8
Approach LOS	B			A		B

Intersection Summary			
Delay	10.7		
Level of Service	B		
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	84	105	0	0	150	65	23	173	5	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	91	114	0	0	163	71	25	188	5	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	205	234	119	99
Volume Left (vph)	91	0	25	0
Volume Right (vph)	0	71	0	5
Hadj (s)	0.12	-0.15	0.14	0.00
Departure Headway (s)	4.9	4.6	5.7	5.6
Degree Utilization, x	0.28	0.30	0.19	0.15
Capacity (veh/h)	696	742	595	608
Control Delay (s)	9.8	9.6	8.8	8.4
Approach Delay (s)	9.8	9.6	8.6	
Approach LOS	A	A	A	

Intersection Summary			
Delay	9.3		
Level of Service	A		
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑↱			↑↑↱	
Volume (vph)	13	26	62	4	62	4	76	447	6	0	351	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.92			0.99		1.00	1.00			0.97	
Flpb, ped/bikes		0.99			1.00		1.00	1.00			1.00	
Frt		0.92			0.99		1.00	1.00			0.98	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1182			1587		1540	2257			2162	
Flt Permitted		0.96			0.98		0.95	1.00			1.00	
Satd. Flow (perm)		1140			1565		1540	2257			2162	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	27	65	4	65	4	80	471	6	0	369	47
RTOR Reduction (vph)	0	59	0	0	3	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	47	0	0	70	0	80	477	0	0	412	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		8.8			8.8		8.8	71.3			57.4	
Effective Green, g (s)		8.8			8.8		8.8	71.3			57.4	
Actuated g/C Ratio		0.10			0.10		0.10	0.79			0.63	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		110			152		149	1780			1372	
v/s Ratio Prot							c0.05	0.21			c0.19	
v/s Ratio Perm		0.04			c0.04							
v/c Ratio		0.43			0.46		0.54	0.27			0.30	
Uniform Delay, d1		38.4			38.6		38.9	2.6			7.4	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		2.7			2.2		3.7	0.4			0.6	
Delay (s)		41.1			40.8		42.5	2.9			8.0	
Level of Service		D			D		D	A			A	
Approach Delay (s)		41.1			40.8			8.6			8.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	90.4	Sum of lost time (s)	15.4
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↑↑	↱	↰	↑	↱	↰		↱
Volume (vph)	214	281	0	0	177	209	181	180	288	82	0	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.85	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1019	1540	1621	1195	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1019	1540	1621	1195	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	225	296	0	0	186	220	191	189	303	86	0	311
RTOR Reduction (vph)	0	0	0	0	0	166	0	0	243	0	0	275
Lane Group Flow (vph)	225	296	0	0	186	54	191	189	60	86	0	36
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	15.7	41.3			20.6	20.6	16.4	16.4	16.4	9.5		9.5
Effective Green, g (s)	15.7	41.3			20.6	20.6	16.4	16.4	16.4	9.5		9.5
Actuated g/C Ratio	0.19	0.50			0.25	0.25	0.20	0.20	0.20	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	290	1528			762	252	303	319	235	175		137
v/s Ratio Prot	c0.15	0.10			c0.06		c0.12	0.12		c0.06		0.03
v/s Ratio Perm						0.05			0.05			
v/c Ratio	0.78	0.19			0.24	0.22	0.63	0.59	0.25	0.49		0.26
Uniform Delay, d1	32.1	11.7			25.1	24.9	30.6	30.4	28.2	34.6		33.6
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	12.2	0.3			0.8	2.0	4.2	2.9	0.6	2.2		1.0
Delay (s)	44.3	12.0			25.8	26.8	34.8	33.3	28.8	36.7		34.6
Level of Service	D	B			C	C	C	C	C	D		C
Approach Delay (s)		25.9			26.4			31.7			35.1	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	29.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	83.2	Sum of lost time (s)	21.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	48	55	0	36	8	62	49	3	4	36	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.95			0.97		1.00	0.99		1.00	0.92	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3185			1750		1711	1786		1711	1650	
Flt Permitted		0.87			1.00		0.70	1.00		0.72	1.00	
Satd. Flow (perm)		2824			1750		1260	1786		1297	1650	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	52	60	0	39	9	67	53	3	4	39	49
RTOR Reduction (vph)	0	35	0	0	5	0	0	2	0	0	29	0
Lane Group Flow (vph)	0	134	0	0	43	0	67	54	0	4	59	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Effective Green, g (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Actuated g/C Ratio		0.42			0.42		0.42	0.42		0.42	0.42	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		1176			729		525	744		540	687	
v/s Ratio Prot					0.02			0.03			0.04	
v/s Ratio Perm		c0.05					c0.05			0.00		
v/c Ratio		0.11			0.06		0.13	0.07		0.01	0.09	
Uniform Delay, d1		8.6			8.4		8.6	8.4		8.2	8.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.2		0.5	0.2		0.0	0.2	
Delay (s)		8.8			8.5		9.1	8.6		8.2	8.7	
Level of Service		A			A		A	A		A	A	
Approach Delay (s)		8.8			8.5			8.9			8.7	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

EXISTING 2015 (NO PROJECT)
WITH SF GIANTS GAME AT AT&T PARK
WEEKDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	618	425	132	313	481	52	26	509	71	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.92		1.00	0.97			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00			
Frt	1.00	0.96		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	2745		2987	2938			5477	938			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	2745		2987	2938			5477	938			
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	702	483	150	356	547	59	30	578	81	0	0	0
RTOR Reduction (vph)	0	22	0	0	2	0	0	0	66	0	0	0
Lane Group Flow (vph)	702	611	0	356	604	0	0	608	15	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	28.5	50.8		20.4	42.7			19.9	19.9			
Effective Green, g (s)	28.5	50.8		20.4	42.7			19.9	19.9			
Actuated g/C Ratio	0.26	0.46		0.19	0.39			0.18	0.18			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	1160	1267		553	1140			990	169			
v/s Ratio Prot	c0.16	0.22		c0.12	c0.21							
v/s Ratio Perm								0.11	0.02			
v/c Ratio	0.61	0.48		0.64	0.53			0.61	0.09			
Uniform Delay, d1	35.8	20.5		41.4	25.9			41.5	37.5			
Progression Factor	1.00	1.00		1.11	0.27			1.12	1.00			
Incremental Delay, d2	0.9	1.3		0.8	0.1			1.0	0.2			
Delay (s)	36.7	21.8		46.8	7.2			47.5	37.7			
Level of Service	D	C		D	A			D	D			
Approach Delay (s)		29.6			21.9			46.4			0.0	
Approach LOS		C			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	31.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	89.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	985	22	33	431	43	10	140	76	114	603	357
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.94			1.00	0.65	1.00	0.95	0.51
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00	0.73	1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.98	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4373		1296	2408			1598	878	1123	2761	627
Flt Permitted	0.95	1.00		0.95	1.00			0.93	1.00	0.64	1.00	1.00
Satd. Flow (perm)	1540	4373		1296	2408			1499	878	758	2761	627
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	134	1048	23	35	459	46	11	149	81	121	641	380
RTOR Reduction (vph)	0	2	0	0	6	0	0	0	53	0	7	153
Lane Group Flow (vph)	134	1069	0	35	499	0	0	160	28	121	706	155
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	13.8	51.8		7.3	43.7			41.0	41.0	42.0	42.0	42.0
Effective Green, g (s)	13.8	51.8		7.3	43.7			41.0	41.0	42.0	42.0	42.0
Actuated g/C Ratio	0.12	0.43		0.06	0.36			0.34	0.34	0.35	0.35	0.35
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	177	1887		78	876			512	299	265	966	219
v/s Ratio Prot	0.09	c0.24		0.03	c0.21						c0.26	
v/s Ratio Perm								0.11	0.03	0.16		0.25
v/c Ratio	0.76	0.57		0.45	0.57			0.31	0.09	0.46	0.73	0.71
Uniform Delay, d1	51.5	25.7		54.4	30.6			29.1	26.9	30.2	34.1	33.7
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.8	1.2		4.1	0.9			0.4	0.1	1.2	2.9	10.0
Delay (s)	68.2	26.9		58.5	31.5			29.5	27.0	31.4	36.9	43.8
Level of Service	E	C		E	C			C	C	C	D	D
Approach Delay (s)		31.5			33.2			28.6			38.2	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	34.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	140.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1111	131	2	796	87	22
Ideal Flow (vphpl)	1200	1200	1200	1200	1200	1200
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1908			1944	972	857
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	1908			1853	972	857
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1145	135	2	821	90	23
RTOR Reduction (vph)	8	0	0	0	0	15
Lane Group Flow (vph)	1272	0	0	823	90	8
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1077			1046	323	285
v/s Ratio Prot	c0.67				c0.09	
v/s Ratio Perm				0.44		0.01
v/c Ratio	1.18			0.79	0.28	0.03
Uniform Delay, d1	23.9			18.8	27.0	24.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	91.1			6.0	2.1	0.2
Delay (s)	115.1			24.7	29.1	24.9
Level of Service	F			C	C	C
Approach Delay (s)	115.1			24.7	28.3	
Approach LOS	F			C	C	

Intersection Summary			
HCM 2000 Control Delay	77.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	101.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	114	935	103	43	245	586	279	247	667	218
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	1.00
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.99			1.00	0.95			1.00	0.85
Flt Protected		1.00			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5800			2858	2445			4091	1122
Flt Permitted		1.00			0.68	1.00			0.95	1.00
Satd. Flow (perm)		5800			1962	2445			4091	1122
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	119	974	107	45	255	610	291	257	695	227
RTOR Reduction (vph)	0	24	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	1176	0	0	300	898	0	0	975	204
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		20.0			22.0	22.0			15.5	15.5
Effective Green, g (s)		22.0			25.0	25.0			18.5	18.5
Actuated g/C Ratio		0.29			0.33	0.33			0.25	0.25
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1701			654	815			1009	276
v/s Ratio Prot						c0.37			c0.24	0.18
v/s Ratio Perm		0.20			0.15					
v/c Ratio		0.69			0.46	1.10			0.97	0.74
Uniform Delay, d1		23.5			19.7	25.0			27.9	26.0
Progression Factor		1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2		1.2			0.5	63.0			20.4	9.9
Delay (s)		24.7			20.2	88.0			48.4	35.9
Level of Service		C			C	F			D	D
Approach Delay (s)		24.7			20.2	88.0			46.2	
Approach LOS		C			C	F			D	

Intersection Summary			
HCM 2000 Control Delay	47.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	96.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	39	417	673	91	249	240	54	174	124	649
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)	2.0	4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor	1.00	0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes	1.00	1.00	0.99		0.86		0.98		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Frt	1.00	1.00	0.98		0.93		0.85		1.00	1.00
Flt Protected	0.95	0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)	810	1313	1889		2193		1161		1327	2554
Flt Permitted	0.95	0.95	1.00		1.00		1.00		0.23	0.94
Satd. Flow (perm)	810	1313	1889		2193		1161		326	2410
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	43	458	740	100	274	264	59	191	136	713
RTOR Reduction (vph)	0	0	17	0	1	0	42	0	0	0
Lane Group Flow (vph)	43	412	869	0	543	0	11	0	300	740
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)	18.5	18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)	21.0	18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio	0.27	0.24	0.27		0.23		0.21		0.42	0.42
Clearance Time (s)	4.5	4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)	220	315	515		498		241		300	1040
v/s Ratio Prot	0.05	0.31	c0.46		c0.25				c0.16	0.12
v/s Ratio Perm							0.01		0.26	0.18
v/c Ratio	0.20	1.31	1.69		1.14dr		0.05		1.00	0.71
Uniform Delay, d1	21.5	29.2	28.0		29.8		24.4		26.1	18.4
Progression Factor	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2	2.0	159.6	317.3		67.3		0.4		52.0	4.1
Delay (s)	23.5	188.9	345.3		97.0		24.8		78.0	22.5
Level of Service	C	F	F		F		C		E	C
Approach Delay (s)			286.9		90.6					38.5
Approach LOS			F		F					D

Intersection Summary			
HCM 2000 Control Delay	160.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	77.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	137	59	1	2	1	71	447	162	204	162	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1700	1700	1700	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	0.97		1.00	0.99	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.97		1.00	0.96		1.00	0.97	
Flt Protected		0.99	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1604	1352		1535		1377	2554		1540	2980	
Flt Permitted		0.96	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1553	1352		1501		1377	2554		1540	2980	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	28	147	63	1	2	1	76	481	174	219	174	38
RTOR Reduction (vph)	0	0	44	0	1	0	0	30	0	0	17	0
Lane Group Flow (vph)	0	175	19	0	3	0	76	625	0	219	195	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.2	32.2		32.2		11.7	36.3		22.0	46.9	
Effective Green, g (s)		32.2	32.2		32.2		11.7	36.3		22.0	46.9	
Actuated g/C Ratio		0.30	0.30		0.30		0.11	0.34		0.21	0.44	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		469	409		454		151	871		318	1313	
v/s Ratio Prot							0.06	c0.24		c0.14	0.07	
v/s Ratio Perm		c0.11	0.01		0.00							
v/c Ratio		0.37	0.05		0.01		0.50	0.72		0.69	0.15	
Uniform Delay, d1		29.2	26.2		25.9		44.6	30.6		39.0	17.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5	0.0		0.0		2.6	2.9		6.1	0.1	
Delay (s)		29.7	26.3		25.9		47.2	33.4		45.1	17.9	
Level of Service		C	C		C		D	C		D	B	
Approach Delay (s)		28.8			25.9			34.9			31.7	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	32.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	106.4	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	11	13	7	8	93	21	106	16	195	168	33
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	1.00	1.00	0.99		1.00	0.96	
Flpb, ped/bikes		0.99			1.00	1.00	0.84	1.00		1.00	1.00	
Frt		0.95			1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected		0.98			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2381			1415	1227	1160	1412		1377	1360	
Flt Permitted		0.95			1.00	1.00	0.62	1.00		0.95	1.00	
Satd. Flow (perm)		2312			1448	1227	757	1412		1377	1360	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	13	12	14	8	9	102	23	116	18	214	185	36
RTOR Reduction (vph)	0	13	0	0	0	54	0	9	0	0	7	0
Lane Group Flow (vph)	0	26	0	0	17	48	23	125	0	214	214	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		2.2			2.2	20.0	7.4	7.4		17.8	30.2	
Effective Green, g (s)		2.2			2.2	20.0	7.4	7.4		17.8	30.2	
Actuated g/C Ratio		0.05			0.05	0.47	0.17	0.17		0.42	0.71	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		119			75	723	132	246		578	968	
v/s Ratio Prot						0.03		c0.09		c0.16	0.16	
v/s Ratio Perm		0.01			c0.01	0.01	0.03					
v/c Ratio		0.22			0.23	0.07	0.17	0.51		0.37	0.22	
Uniform Delay, d1		19.3			19.3	6.1	14.9	15.9		8.4	2.1	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9			1.5	0.0	0.6	1.6		0.4	0.1	
Delay (s)		20.2			20.8	6.1	15.5	17.5		8.9	2.2	
Level of Service		C			C	A	B	B		A	A	
Approach Delay (s)		20.2			8.2			17.2			5.5	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	42.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	42	216	496	28	94	243
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1743	1535	847	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1743	1535	847	1134	1194
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	54	277	636	36	121	312
RTOR Reduction (vph)	0	246	0	8	0	0
Lane Group Flow (vph)	54	31	636	28	121	312
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	9.8	9.8	47.3	42.3	14.6	66.9
Effective Green, g (s)	9.8	9.8	47.3	42.3	14.6	66.9
Actuated g/C Ratio	0.11	0.11	0.55	0.49	0.17	0.77
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	128	197	837	462	190	921
v/s Ratio Prot	c0.05		c0.41	0.01	c0.11	0.26
v/s Ratio Perm		0.02		0.02		
v/c Ratio	0.42	0.16	0.76	0.06	0.64	0.34
Uniform Delay, d1	35.8	34.7	15.3	11.7	33.6	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	0.4	4.0	0.1	6.8	0.2
Delay (s)	38.0	35.1	19.3	11.8	40.4	3.3
Level of Service	D	D	B	B	D	A
Approach Delay (s)	35.6		18.9			13.7
Approach LOS	D		B			B

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	86.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	37	33	19	287	82	43
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	44	39	23	342	98	51
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	439	174	199			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	439	174	199			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	95	98			
cM capacity (veh/h)	496	776	1319			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	44	39	137	228	65	84
Volume Left	44	0	23	0	0	0
Volume Right	0	39	0	0	0	51
cSH	496	776	1319	1700	1700	1700
Volume to Capacity	0.09	0.05	0.02	0.13	0.04	0.05
Queue Length 95th (ft)	7	4	1	0	0	0
Control Delay (s)	13.0	9.9	1.4	0.0	0.0	0.0
Lane LOS	B	A	A			
Approach Delay (s)	11.5		0.5		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	123	50	800	82	20	371
Ideal Flow (vphpl)	1200	1200	1200	1200	1200	1200
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.95	1.00		1.00	1.00
Flpb, ped/bikes	0.91	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	984	920	2122		1080	2161
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	984	920	2122		1080	2161
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	137	56	889	91	22	412
RTOR Reduction (vph)	0	43	5	0	0	0
Lane Group Flow (vph)	137	13	975	0	22	412
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	71.7		4.3	81.1
Effective Green, g (s)	28.7	28.7	71.7		4.3	81.1
Actuated g/C Ratio	0.24	0.24	0.60		0.04	0.68
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	235	220	1267		38	1460
v/s Ratio Prot			c0.46		c0.02	0.19
v/s Ratio Perm	c0.14	0.01				
v/c Ratio	0.58	0.06	0.77		0.58	0.28
Uniform Delay, d1	40.4	35.2	18.0		57.0	7.8
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.7	0.1	4.5		19.6	0.1
Delay (s)	44.0	35.4	22.5		76.6	7.9
Level of Service	D	D	C		E	A
Approach Delay (s)	41.5		22.5			11.4
Approach LOS	D		C			B

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	0	0	0	306	115	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	360	135	0

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	0	120	240	90	45
Volume Left (vph)	0	0	0	0	0
Volume Right (vph)	0	0	0	0	0
Hadj (s)	0.00	0.03	0.03	0.03	0.03
Departure Headway (s)	4.9	4.6	4.6	4.8	4.8
Degree Utilization, x	0.00	0.15	0.31	0.12	0.06
Capacity (veh/h)	681	766	768	734	735
Control Delay (s)	7.9	7.3	8.5	7.2	6.9
Approach Delay (s)	0.0	8.1		7.1	
Approach LOS	A	A		A	

Intersection Summary			
Delay	7.8		
Level of Service	A		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	9	70	22	18	0	108	0	3	0	0	0
Peak Hour Factor	0.92	0.77	0.77	0.77	0.77	0.92	0.77	0.92	0.77	0.92	0.92	0.92
Hourly flow rate (vph)	0	12	91	29	23	0	140	0	4	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	103	52	144	0
Volume Left (vph)	0	29	140	0
Volume Right (vph)	91	0	4	0
Hadj (s)	-0.50	0.14	0.21	0.00
Departure Headway (s)	3.8	4.5	4.4	4.4
Degree Utilization, x	0.11	0.06	0.18	0.00
Capacity (veh/h)	906	760	781	792
Control Delay (s)	7.3	7.8	8.4	7.4
Approach Delay (s)	7.3	7.8	8.4	0.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.9		
Level of Service	A		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	187	46	260	4	82	40	175	655	22	11	308	174
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1255	1365	1126	1282	1365	1099	2515	2577		1296	2428	
Flt Permitted	0.70	1.00	1.00	0.73	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	928	1365	1126	980	1365	1099	2515	2577		1296	2428	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	191	47	265	4	84	41	179	668	22	11	314	178
RTOR Reduction (vph)	0	0	174	0	0	27	0	2	0	0	79	0
Lane Group Flow (vph)	191	47	91	4	84	14	179	688	0	11	413	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	320	470	388	338	470	379	352	974		155	869	
v/s Ratio Prot		0.03			0.06		0.07	c0.27		0.01	c0.17	
v/s Ratio Perm	c0.21		0.08	0.00		0.01						
v/c Ratio	0.60	0.10	0.24	0.01	0.18	0.04	0.51	0.71		0.07	0.48	
Uniform Delay, d1	27.0	22.2	23.3	21.5	22.9	21.7	39.8	26.4		39.1	24.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.78		1.00	1.00	
Incremental Delay, d2	8.0	0.4	1.4	0.1	0.8	0.2	3.3	2.8		0.9	1.9	
Delay (s)	35.0	22.6	24.8	21.6	23.7	21.9	39.9	23.3		39.9	26.7	
Level of Service	C	C	C	C	C	C	D	C		D	C	
Approach Delay (s)		28.5			23.1			26.7			27.0	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	116	424	10	17	367	47	20	13	27	41	11	117
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.94	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.90		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1244	1621	1531		1492	1378	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.67	1.00		0.73	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1244	1147	1531		1147	1378	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	120	437	10	18	378	48	21	13	28	42	11	121
RTOR Reduction (vph)	0	0	5	0	0	27	0	21	0	0	90	0
Lane Group Flow (vph)	120	437	5	18	378	21	21	20	0	42	42	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.7	45.0	45.0	2.6	36.9	36.9	21.4	21.4		21.4	21.4	
Effective Green, g (s)	10.7	45.0	45.0	2.6	36.9	36.9	21.4	21.4		21.4	21.4	
Actuated g/C Ratio	0.13	0.54	0.54	0.03	0.44	0.44	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	206	913	776	50	749	546	292	390		292	351	
v/s Ratio Prot	c0.07	c0.26		0.01	0.22			0.01			0.03	
v/s Ratio Perm			0.00			0.02	0.02			c0.04		
v/c Ratio	0.58	0.48	0.01	0.36	0.50	0.04	0.07	0.05		0.14	0.12	
Uniform Delay, d1	34.5	12.2	9.1	39.9	17.0	13.4	23.8	23.6		24.2	24.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.2	1.8	0.0	4.4	0.5	0.0	0.1	0.1		0.2	0.2	
Delay (s)	38.7	14.0	9.1	44.3	17.5	13.5	23.9	23.7		24.4	24.2	
Level of Service	D	B	A	D	B	B	C	C		C	C	
Approach Delay (s)		19.1			18.2			23.8			24.3	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	84.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	413	32	55	409	41	31	102	37	100	124	116
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.98	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1048	1540	2956			3012	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.59	1.00			0.77	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1048	963	2956			2360	1072
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	64	469	36	62	465	47	35	116	42	114	141	132
RTOR Reduction (vph)	0	0	16	0	0	23	0	33	0	0	0	106
Lane Group Flow (vph)	64	469	20	62	465	24	35	125	0	0	255	26
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	7.2	40.7	40.7	5.1	37.6	37.6	15.8	15.8			14.8	14.8
Effective Green, g (s)	7.2	40.7	40.7	5.1	37.6	37.6	15.8	15.8			14.8	14.8
Actuated g/C Ratio	0.10	0.55	0.55	0.07	0.50	0.50	0.21	0.21			0.20	0.20
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	117	662	751	105	612	528	203	626			468	212
v/s Ratio Prot	c0.05	c0.39		0.04	c0.38			0.04				
v/s Ratio Perm			0.01			0.02	0.04				c0.11	0.02
v/c Ratio	0.55	0.71	0.03	0.59	0.76	0.04	0.17	0.20			0.54	0.12
Uniform Delay, d1	32.1	12.6	7.8	33.7	14.9	9.4	24.1	24.2			26.9	24.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	5.1	3.5	0.0	8.6	5.4	0.0	0.4	0.2			1.3	0.3
Delay (s)	37.3	16.0	7.8	42.3	20.3	9.4	24.5	24.4			28.2	24.8
Level of Service	D	B	A	D	C	A	C	C			C	C
Approach Delay (s)		17.9			21.8			24.4			27.0	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	74.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	349	68	42	314	200	64	198	40	113	122	32
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.90	1.00	1.00	0.96	1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1328	927		1335	1126	865	1070	957	917	1070	1075	
Flt Permitted	0.30	1.00		0.28	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	425	927		400	1126	865	1070	957	917	1070	1075	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	34	401	78	48	361	230	74	228	46	130	140	37
RTOR Reduction (vph)	0	6	0	0	0	95	0	0	36	0	9	0
Lane Group Flow (vph)	34	473	0	48	361	135	74	228	10	130	168	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	51.1	51.1		52.8	52.8	64.8	14.0	23.0	23.0	12.0	21.0	
Effective Green, g (s)	51.1	51.1		52.8	52.8	64.8	14.0	23.0	23.0	12.0	21.0	
Actuated g/C Ratio	0.46	0.46		0.48	0.48	0.59	0.13	0.21	0.21	0.11	0.19	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	216	429		226	539	547	135	199	191	116	204	
v/s Ratio Prot	0.00	c0.51		0.01	c0.32	0.03	0.07	c0.24		c0.12	0.16	
v/s Ratio Perm	0.07			0.09		0.13			0.01			
v/c Ratio	0.16	1.10		0.21	0.67	0.25	0.55	1.15	0.05	1.12	0.82	
Uniform Delay, d1	18.0	29.6		27.3	22.0	10.9	45.1	43.6	34.9	49.1	42.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	73.9		0.5	3.2	0.2	4.5	108.5	0.1	119.7	22.8	
Delay (s)	18.4	103.4		27.8	25.2	11.2	49.6	152.1	35.0	168.8	65.7	
Level of Service	B	F		C	C	B	D	F	C	F	E	
Approach Delay (s)		97.8			20.3			114.9			109.3	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	75.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	110.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd. 4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	13	295	27	35	141	7	35	100	69	5	48	24
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	13	304	28	36	145	7	36	103	71	5	49	25

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	345	36	153	139	71	79
Volume Left (vph)	13	36	0	36	0	5
Volume Right (vph)	28	0	7	0	71	25
Hadj (s)	-0.01	0.53	0.00	0.16	-0.67	-0.14
Departure Headway (s)	5.7	6.4	5.8	6.3	5.5	6.3
Degree Utilization, x	0.54	0.06	0.25	0.24	0.11	0.14
Capacity (veh/h)	613	531	581	531	604	516
Control Delay (s)	15.1	8.6	9.5	10.1	7.9	10.3
Approach Delay (s)	15.1	9.4		9.4		10.3
Approach LOS	C	A		A		B

Intersection Summary			
Delay	11.9		
Level of Service	B		
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St. 4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	286	290	46	11	144	45	51	522	20	26	344	202
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1300	1300	1300	1300	1300	1300
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.96		1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1491	2984		1509	2918		1170	2324		1170	2183	
Flt Permitted	0.62	1.00		0.48	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	980	2984		766	2918		1170	2324		1170	2183	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	308	312	49	12	155	48	55	561	22	28	370	217
RTOR Reduction (vph)	0	13	0	0	30	0	0	3	0	0	85	0
Lane Group Flow (vph)	308	348	0	12	173	0	55	580	0	28	502	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	291	886		227	866		197	927		174	827	
v/s Ratio Prot		0.12			0.06		0.05	c0.25		0.02	c0.23	
v/s Ratio Perm	c0.31			0.02								
v/c Ratio	1.06	0.39		0.05	0.20		0.28	0.63		0.16	0.61	
Uniform Delay, d1	35.1	28.0		25.1	26.3		36.2	24.1		37.1	25.0	
Progression Factor	1.00	1.00		1.00	1.00		0.83	0.74		1.41	0.65	
Incremental Delay, d2	69.0	1.3		0.4	0.5		2.3	2.1		1.8	3.0	
Delay (s)	104.1	29.3		25.5	26.8		32.4	19.9		54.0	19.2	
Level of Service	F	C		C	C		C	B		D	B	
Approach Delay (s)		63.7			26.7			21.0			20.8	
Approach LOS		E			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

19: Minnesota St./4th St. & Mariposa St.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	636	55	6	419	9	36	0	5	17	1	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.98		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3380		1711	3410			1698		1711	1541	
Flt Permitted	0.48	1.00		0.31	1.00			0.81		0.73	1.00	
Satd. Flow (perm)	867	3380		555	3410			1441		1312	1541	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	691	60	7	455	10	39	0	5	18	1	24
RTOR Reduction (vph)	0	11	0	0	3	0	0	22	0	0	15	0
Lane Group Flow (vph)	22	740	0	7	462	0	0	22	0	18	10	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45			0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	390	1521		249	1534			552		502	590	
v/s Ratio Prot		c0.22			0.14						0.01	
v/s Ratio Perm	0.03			0.01				c0.02		0.01		
v/c Ratio	0.06	0.49		0.03	0.30			0.04		0.04	0.02	
Uniform Delay, d1	9.3	11.6		9.2	10.5			11.6		11.6	11.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	1.1		0.2	0.5			0.1		0.1	0.1	
Delay (s)	9.6	12.7		9.4	11.0			11.7		11.7	11.5	
Level of Service	A	B		A	B			B		B	B	
Approach Delay (s)		12.6			11.0			11.7			11.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

20: I-280 NB Off-Ramp & Mariposa St.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	102	0	0	509	19	253	129	615	0	0	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.88				0.85
Flt Protected		1.00			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3406			5104		1711	2997				2694
Flt Permitted		0.92			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3151			5104		1711	2997				2694
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	111	0	0	553	21	275	140	668	0	0	80
RTOR Reduction (vph)	0	0	0	0	4	0	0	393	0	0	0	75
Lane Group Flow (vph)	0	122	0	0	570	0	275	415	0	0	0	5
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		43.5			32.5		37.0	37.0				6.0
Effective Green, g (s)		43.5			32.5		37.0	37.0				6.0
Actuated g/C Ratio		0.48			0.36		0.41	0.41				0.07
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1539			1843		703	1232				179
v/s Ratio Prot		c0.01			c0.11		c0.16	0.14				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.08			0.31		0.39	0.34				0.03
Uniform Delay, d1		12.5			20.7		18.6	18.1				39.3
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.4		1.6	0.7				0.3
Delay (s)		12.6			21.1		20.2	18.9				39.6
Level of Service		B			C		C	B				D
Approach Delay (s)		12.6			21.1			19.2			39.6	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	112	498	407	428	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.90	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1528	1428	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1528	1428	3319	1801		
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	127	566	462	486	0	0
RTOR Reduction (vph)	76	76	0	0	0	0
Lane Group Flow (vph)	277	264	462	486	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	36.4	36.4	13.6	60.0		
Effective Green, g (s)	36.4	36.4	13.6	60.0		
Actuated g/C Ratio	0.61	0.61	0.23	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	926	866	752	1801		
v/s Ratio Prot	0.18		c0.14	c0.27		
v/s Ratio Perm		0.18				
v/c Ratio	0.30	0.30	0.61	0.27		
Uniform Delay, d1	5.7	5.7	20.8	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.2	0.2	1.5	0.1		
Delay (s)	5.9	5.9	22.3	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	5.9			10.9	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	206	154	144	3	120	9	127	336	9	8	305	100
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.97	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.99		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1173	1996		1139	1254		1215	2414		1215	2278	
Flt Permitted	0.44	1.00		0.55	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	545	1996		659	1254		1215	2414		1215	2278	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	231	173	162	3	135	10	143	378	10	9	343	112
RTOR Reduction (vph)	0	103	0	0	3	0	0	2	0	0	34	0
Lane Group Flow (vph)	231	232	0	3	142	0	143	386	0	9	421	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.4	36.4		16.5	16.5		17.5	43.9		3.4	29.8	
Effective Green, g (s)	36.4	36.4		16.5	16.5		17.5	43.9		3.4	29.8	
Actuated g/C Ratio	0.36	0.36		0.16	0.16		0.18	0.44		0.03	0.30	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	290	726		108	206		212	1059		41	678	
v/s Ratio Prot	c0.12	0.12			0.11		c0.12	0.16		0.01	c0.18	
v/s Ratio Perm	c0.17			0.00								
v/c Ratio	0.80	0.32		0.03	0.69		0.67	0.36		0.22	0.62	
Uniform Delay, d1	26.0	22.9		35.0	39.3		38.6	18.7		47.0	30.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.21	1.07	
Incremental Delay, d2	14.0	0.3		0.1	9.2		8.2	1.0		1.9	3.1	
Delay (s)	40.0	23.1		35.1	48.5		46.8	19.7		58.9	35.3	
Level of Service	D	C		D	D		D	B		E	D	
Approach Delay (s)		30.0			48.2			27.0			35.8	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	32.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	91.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania Street & I-280 SB On-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	197	413	333	314
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	214	449	362	341
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			544			
pX, platoon unblocked						
vC, conflicting volume	1279	107			214	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1279	107			214	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			73	
cM capacity (veh/h)	116	926			1353	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	107	107	449	362	341
Volume Left	0	0	0	362	0
Volume Right	0	0	449	0	0
cSH	1700	1700	1700	1353	1700
Volume to Capacity	0.06	0.06	0.26	0.27	0.20
Queue Length 95th (ft)	0	0	0	27	0
Control Delay (s)	0.0	0.0	0.0	8.6	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.4	
Approach LOS					

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	125	115	0	163	172
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	136	125	0	177	187
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	125				193	125
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	125				193	125
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				77	79
cM capacity (veh/h)	1459				778	902

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	68	68	125	364
Volume Left	0	0	0	177
Volume Right	0	0	0	187
cSH	1700	1700	1700	837
Volume to Capacity	0.04	0.04	0.07	0.44
Queue Length 95th (ft)	0	0	0	56
Control Delay (s)	0.0	0.0	0.0	12.6
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.6
Approach LOS				B

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	92	196	115	106	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	100	213	125	115	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	240				432	125
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	240				432	125
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				100	100
cM capacity (veh/h)	1324				510	902

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	171	142	125	115	0
Volume Left	100	0	0	0	0
Volume Right	0	0	0	115	0
cSH	1324	1700	1700	1700	1700
Volume to Capacity	0.08	0.08	0.07	0.07	0.00
Queue Length 95th (ft)	6	0	0	0	0
Control Delay (s)	4.9	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.7		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	17	22	27	27	17	45	486	43	17	365	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.94			0.97		1.00	0.99		1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1507			1539		1540	3041		1540	3048	
Flt Permitted		0.92			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1396			1387		1540	3041		1540	3048	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	18	24	29	29	18	49	528	47	18	397	29
RTOR Reduction (vph)	0	22	0	0	11	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	32	0	0	65	0	49	573	0	18	424	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		9.8			9.8		7.3	90.5		4.5	87.7	
Effective Green, g (s)		9.8			9.8		7.3	90.5		4.5	87.7	
Actuated g/C Ratio		0.08			0.08		0.06	0.75		0.04	0.73	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		114			113		93	2293		57	2227	
v/s Ratio Prot							c0.03	c0.19		c0.01	0.14	
v/s Ratio Perm		0.02			c0.05							
v/c Ratio		0.28			0.58		0.53	0.25		0.32	0.19	
Uniform Delay, d1		51.8			53.1		54.7	4.5		56.3	5.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3			6.9		2.5	0.3		1.2	0.2	
Delay (s)		53.1			60.0		57.1	4.7		57.4	5.2	
Level of Service		D			E		E	A		E	A	
Approach Delay (s)		53.1			60.0			8.8			7.4	
Approach LOS		D			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	337	23	170	0	0	208
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	366	25	185	0	0	226

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	183	183	25	92	92	226
Volume Left (vph)	183	183	0	0	0	0
Volume Right (vph)	0	0	25	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.2	6.2	3.2	5.9	5.9	5.6
Degree Utilization, x	0.31	0.31	0.02	0.15	0.15	0.35
Capacity (veh/h)	558	560	1121	575	574	609
Control Delay (s)	10.8	10.8	5.1	8.8	8.8	11.7
Approach Delay (s)	10.4			8.8		11.7
Approach LOS	B			A		B

Intersection Summary			
Delay	10.4		
Level of Service	B		
Intersection Capacity Utilization	27.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	56	126	0	0	133	63	8	185	18	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	137	0	0	145	68	9	201	20	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	198	213	109	120
Volume Left (vph)	61	0	9	0
Volume Right (vph)	0	68	0	20
Hadj (s)	0.10	-0.16	0.07	-0.08
Departure Headway (s)	4.9	4.6	5.6	5.4
Degree Utilization, x	0.27	0.27	0.17	0.18
Capacity (veh/h)	701	742	611	626
Control Delay (s)	9.6	9.3	8.5	8.4
Approach Delay (s)	9.6	9.3	8.4	
Approach LOS	A	A	A	

Intersection Summary			
Delay	9.1		
Level of Service	A		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑↱			↑↑↱	
Volume (vph)	29	31	76	7	49	2	68	522	11	0	351	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.92			1.00		1.00	0.99			0.97	
Flpb, ped/bikes		0.98			0.99		1.00	1.00			1.00	
Frt		0.93			1.00		1.00	1.00			0.99	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1164			1581		1540	2245			2166	
Flt Permitted		0.93			0.97		0.95	1.00			1.00	
Satd. Flow (perm)		1090			1536		1540	2245			2166	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	31	33	80	7	52	2	72	549	12	0	369	37
RTOR Reduction (vph)	0	43	0	0	1	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	101	0	0	60	0	72	560	0	0	403	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		16.1			16.1		9.7	93.6			78.8	
Effective Green, g (s)		16.1			16.1		9.7	93.6			78.8	
Actuated g/C Ratio		0.13			0.13		0.08	0.78			0.66	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		146			206		124	1751			1422	
v/s Ratio Prot							c0.05	c0.25			0.19	
v/s Ratio Perm		c0.09			0.04							
v/c Ratio		0.69			0.29		0.58	0.32			0.28	
Uniform Delay, d1		49.6			46.8		53.2	3.9			8.7	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		12.8			0.8		6.8	0.5			0.5	
Delay (s)		62.3			47.6		59.9	4.4			9.2	
Level of Service		E			D		E	A			A	
Approach Delay (s)		62.3			47.6			10.7			9.2	
Approach LOS		E			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↑↑	↱	↰	↑	↱	↰		↱
Volume (vph)	228	316	0	0	216	236	104	146	414	56	0	264
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.85	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1020	1540	1621	1197	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1020	1540	1621	1197	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	240	333	0	0	227	248	109	154	436	59	0	278
RTOR Reduction (vph)	0	0	0	0	0	187	0	0	264	0	0	248
Lane Group Flow (vph)	240	333	0	0	227	61	109	154	172	59	0	30
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	16.0	41.4			20.4	20.4	16.1	16.1	16.1	8.8		8.8
Effective Green, g (s)	16.0	41.4			20.4	20.4	16.1	16.1	16.1	8.8		8.8
Actuated g/C Ratio	0.19	0.50			0.25	0.25	0.20	0.20	0.20	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	299	1548			763	252	301	317	234	164		128
v/s Ratio Prot	c0.16	0.11			c0.07		0.07	0.10		c0.04		0.02
v/s Ratio Perm						0.06			c0.14			
v/c Ratio	0.80	0.22			0.30	0.24	0.36	0.49	0.74	0.36		0.23
Uniform Delay, d1	31.6	11.4			25.1	24.8	28.7	29.4	31.1	34.1		33.7
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	14.3	0.3			1.0	2.3	0.7	1.2	11.4	1.4		0.9
Delay (s)	46.0	11.7			26.1	27.1	29.4	30.6	42.5	35.5		34.6
Level of Service	D	B			C	C	C	C	D	D		C
Approach Delay (s)		26.1			26.6			37.8			34.7	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	31.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	82.3	Sum of lost time (s)	21.0
Intersection Capacity Utilization	87.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	103	21	47	3	35	5	59	52	0	1	45	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.96			0.99		1.00	1.00		1.00	0.92	
Flt Protected		0.97			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3185			1768		1711	1801		1711	1659	
Flt Permitted		0.80			0.99		0.69	1.00		0.72	1.00	
Satd. Flow (perm)		2612			1751		1243	1801		1296	1659	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	112	23	51	3	38	5	64	57	0	1	49	54
RTOR Reduction (vph)	0	30	0	0	3	0	0	0	0	0	32	0
Lane Group Flow (vph)	0	156	0	0	43	0	64	57	0	1	72	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Effective Green, g (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Actuated g/C Ratio		0.42			0.42		0.42	0.42		0.42	0.42	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		1088			729		517	750		540	691	
v/s Ratio Prot								0.03			0.04	
v/s Ratio Perm		c0.06			0.02		c0.05			0.00		
v/c Ratio		0.14			0.06		0.12	0.08		0.00	0.10	
Uniform Delay, d1		8.7			8.4		8.6	8.4		8.2	8.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.2		0.5	0.2		0.0	0.3	
Delay (s)		9.0			8.5		9.1	8.6		8.2	8.8	
Level of Service		A			A		A	A		A	A	
Approach Delay (s)		9.0			8.5			8.9			8.8	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	29.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

EXISTING 2015 (NO PROJECT)
NO SF GIANTS GAME AT AT&T PARK
WEEKDAY LATE EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	478	420	8	83	764	52	37	263	82	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.89			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (prot)	4480	3064		2987	3028			5482	1226			
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (perm)	4480	3064		2987	3028			5482	1226			
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	576	506	10	100	920	63	45	317	99	0	0	0
RTOR Reduction (vph)	0	1	0	0	3	0	0	0	87	0	0	0
Lane Group Flow (vph)	576	515	0	100	980	0	0	362	12	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	68.7		9.0	59.5			13.4	13.4			
Effective Green, g (s)	18.2	68.7		9.0	59.5			13.4	13.4			
Actuated g/C Ratio	0.17	0.62		0.08	0.54			0.12	0.12			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1913		244	1637			667	149			
v/s Ratio Prot	c0.13	0.17		0.03	c0.32							
v/s Ratio Perm								0.07	0.01			
v/c Ratio	0.78	0.27		0.41	0.60			0.54	0.08			
Uniform Delay, d1	44.0	9.3		48.0	17.1			45.4	42.8			
Progression Factor	0.55	0.25		1.51	0.22			1.00	1.00			
Incremental Delay, d2	4.5	0.3		0.3	0.2			0.9	0.2			
Delay (s)	28.7	2.6		72.9	4.0			46.3	43.1			
Level of Service	C	A		E	A			D	D			
Approach Delay (s)		16.3			10.3			45.6			0.0	
Approach LOS		B			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	837	21	40	725	36	12	30	30	39	157	171
Ideal Flow (vphpl)	1400	1400	1400	1400	1400	1400	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.97			1.00	0.63	1.00	0.84	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.90	1.00	0.67	1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.95	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1134	3218		1134	2186			1443	853	1027	2352	580
Flt Permitted	0.95	1.00		0.95	1.00			0.82	1.00	0.72	1.00	1.00
Satd. Flow (perm)	1134	3218		1134	2186			1204	853	783	2352	580
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	93	996	25	48	863	43	14	36	36	46	187	204
RTOR Reduction (vph)	0	2	0	0	2	0	0	0	31	0	56	102
Lane Group Flow (vph)	93	1019	0	48	904	0	0	50	5	46	215	18
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.5	62.9		11.9	58.7			15.3	15.3	16.3	16.3	16.3
Effective Green, g (s)	14.5	62.9		11.9	58.7			15.3	15.3	16.3	16.3	16.3
Actuated g/C Ratio	0.13	0.57		0.11	0.53			0.14	0.14	0.15	0.15	0.15
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	149	1840		122	1166			167	118	116	348	85
v/s Ratio Prot	0.08	c0.32		0.04	c0.41						c0.09	
v/s Ratio Perm								0.04	0.01	0.06		0.03
v/c Ratio	0.62	0.55		0.39	0.78			0.30	0.04	0.40	0.62	0.21
Uniform Delay, d1	45.2	14.8		45.7	20.4			42.5	41.0	42.4	43.9	41.2
Progression Factor	0.87	1.08		0.89	0.71			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.1	0.8		1.7	2.7			1.0	0.1	2.2	3.2	1.2
Delay (s)	44.4	16.7		42.4	17.1			43.5	41.2	44.6	47.2	42.4
Level of Service	D	B		D	B			D	D	D	D	D
Approach Delay (s)		19.0			18.4			42.5			45.6	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	925	62	0	908	28	11
Ideal Flow (vphpl)	1100	1100	1000	1000	1000	1000
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1764			1621	810	714
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	1764			1621	810	714
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	1101	74	0	1081	33	13
RTOR Reduction (vph)	2	0	0	0	0	12
Lane Group Flow (vph)	1173	0	0	1081	33	1
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	91.2			91.2	7.5	7.5
Effective Green, g (s)	91.2			91.2	7.5	7.5
Actuated g/C Ratio	0.83			0.83	0.07	0.07
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1462			1343	55	48
v/s Ratio Prot	0.67			c0.67	c0.04	
v/s Ratio Perm						0.00
v/c Ratio	0.80			0.80	0.60	0.02
Uniform Delay, d1	4.8			4.8	49.8	47.8
Progression Factor	1.00			1.54	1.00	1.00
Incremental Delay, d2	4.7			2.6	16.4	0.2
Delay (s)	9.6			10.1	66.2	48.0
Level of Service	A			B	E	D
Approach Delay (s)	9.6			10.1	61.0	
Approach LOS	A			B	E	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	143	771	99	35	123	323	194	76	182	92
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	1.00
Flpb, ped/bikes		0.99			0.99	1.00			1.00	1.00
Frt		0.99			1.00	0.94			0.99	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5762			2834	2410			4058	1122
Flt Permitted		0.99			0.77	1.00			0.95	1.00
Satd. Flow (perm)		5762			2209	2410			4058	1122
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	168	907	116	41	145	380	228	89	214	108
RTOR Reduction (vph)	0	24	0	0	0	28	0	0	0	0
Lane Group Flow (vph)	0	1167	0	0	186	580	0	0	316	95
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		24.6			21.2	21.2			11.7	11.7
Effective Green, g (s)		26.6			24.2	24.2			14.7	14.7
Actuated g/C Ratio		0.35			0.32	0.32			0.20	0.20
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		2043			712	777			795	219
v/s Ratio Prot						c0.24			0.08	c0.08
v/s Ratio Perm		0.20			0.08					
v/c Ratio		0.57			0.26	0.75			0.40	0.43
Uniform Delay, d1		19.6			18.8	22.7			26.3	26.5
Progression Factor		1.00			0.51	1.00			1.00	1.00
Incremental Delay, d2		0.4			0.2	3.9			0.3	1.4
Delay (s)		20.0			9.8	26.6			26.6	27.9
Level of Service		B			A	C			C	C
Approach Delay (s)		20.0			9.8	26.6			26.9	
Approach LOS		B			A	C			C	

Intersection Summary			
HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	27	203	210	22	131	112	14	170	20	352
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.87		1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.93		0.85		1.00	1.00
Flt Protected		0.95	0.99		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1214	1895		2248		1188		1327	2553
Flt Permitted		0.95	0.99		1.00		1.00		0.52	0.95
Satd. Flow (perm)		1214	1895		2248		1188		720	2431
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	28	214	221	23	138	118	15	179	21	371
RTOR Reduction (vph)	0	0	12	0	1	0	10	0	0	0
Lane Group Flow (vph)	0	191	283	0	257	0	3	0	181	390
Confl. Peds. (#/hr)	25			60		200				
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		299	530		524		253		413	1073
v/s Ratio Prot		c0.16	0.15		c0.11				c0.07	0.06
v/s Ratio Perm							0.00		0.12	0.10
v/c Ratio		0.64	0.53		0.49		0.01		0.44	0.36
Uniform Delay, d1		25.3	22.9		24.9		23.3		17.3	14.3
Progression Factor		1.00	1.00		1.00		1.00		1.05	1.06
Incremental Delay, d2		10.0	3.8		3.3		0.1		2.6	0.7
Delay (s)		35.3	26.7		28.2		23.3		20.8	15.8
Level of Service		D	C		C		C		C	B
Approach Delay (s)			30.1		27.9					17.4
Approach LOS			C		C					B

Intersection Summary			
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	10	13	3	1	12	5	188	4	1	50	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.98	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1580	1347		1420		1272	2532		1540	3029	
Flt Permitted		1.00	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1618	1347		1434		1272	2532		1540	3029	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	11	12	16	4	1	15	6	229	5	1	61	6
RTOR Reduction (vph)	0	0	15	0	14	0	0	2	0	0	5	0
Lane Group Flow (vph)	0	23	1	0	6	0	6	232	0	1	62	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		0.7	0.7		0.7		0.5	3.4		0.5	3.7	
Effective Green, g (s)		0.7	0.7		0.7		0.5	3.4		0.5	3.7	
Actuated g/C Ratio		0.03	0.03		0.03		0.02	0.17		0.02	0.18	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		55	45		48		31	419		37	546	
v/s Ratio Prot							0.00	c0.09		0.00	c0.02	
v/s Ratio Perm		c0.01	0.00		0.00							
v/c Ratio		0.42	0.01		0.11		0.19	0.55		0.03	0.11	
Uniform Delay, d1		9.7	9.6		9.6		9.8	7.9		9.8	7.0	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		5.1	0.1		1.1		1.1	1.6		0.1	0.1	
Delay (s)		14.8	9.7		10.7		10.9	9.4		9.9	7.1	
Level of Service		B	A		B		B	A		A	A	
Approach Delay (s)		12.7			10.7			9.5			7.2	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	20.5	Sum of lost time (s)	15.9
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	2	3	1	1	9	2	20	5	24	47	8
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	1.00	1.00	0.97		1.00	0.97	
Flpb, ped/bikes		0.99			1.00	1.00	0.83	1.00		1.00	1.00	
Frt		0.95			1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected		0.98			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2381			1413	1230	1142	1369		1377	1376	
Flt Permitted		0.95			1.00	1.00	1.00	1.00		0.95	1.00	
Satd. Flow (perm)		2327			1448	1230	1202	1369		1377	1376	
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Adj. Flow (vph)	6	3	4	1	1	11	3	25	6	30	59	10
RTOR Reduction (vph)	0	4	0	0	0	5	0	6	0	0	3	0
Lane Group Flow (vph)	0	9	0	0	2	6	3	25	0	30	66	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.1			1.1	20.9	1.2	1.2		19.8	26.0	
Effective Green, g (s)		1.1			1.1	20.9	1.2	1.2		19.8	26.0	
Actuated g/C Ratio		0.03			0.03	0.56	0.03	0.03		0.53	0.70	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		68			42	858	38	44		734	964	
v/s Ratio Prot						0.00		c0.02		0.02	c0.05	
v/s Ratio Perm		c0.00			0.00	0.00	0.00					
v/c Ratio		0.13			0.05	0.01	0.08	0.57		0.04	0.07	
Uniform Delay, d1		17.5			17.5	3.6	17.4	17.7		4.1	1.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.9			0.5	0.0	0.9	16.7		0.0	0.0	
Delay (s)		18.4			18.0	3.6	18.3	34.4		4.1	1.8	
Level of Service		B			B	A	B	C		A	A	
Approach Delay (s)		18.4			5.8			33.0			2.5	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.11		
Actuated Cycle Length (s)	37.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	6	74	112	11	39	52
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1745	1535	840	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1745	1535	840	1134	1194
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	7	88	133	13	46	62
RTOR Reduction (vph)	0	77	0	9	0	0
Lane Group Flow (vph)	7	11	133	4	46	62
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	5.2	5.2	18.2	13.2	2.8	26.0
Effective Green, g (s)	5.2	5.2	18.2	13.2	2.8	26.0
Actuated g/C Ratio	0.13	0.13	0.44	0.32	0.07	0.63
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	143	220	678	371	77	753
v/s Ratio Prot	0.01		c0.09	0.00	c0.04	0.05
v/s Ratio Perm		c0.01		0.00		
v/c Ratio	0.05	0.05	0.20	0.01	0.60	0.08
Uniform Delay, d1	15.8	15.8	7.0	9.5	18.7	3.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	0.1	0.0	11.9	0.0
Delay (s)	16.0	15.9	7.2	9.6	30.5	3.0
Level of Service	B	B	A	A	C	A
Approach Delay (s)	15.9		7.4			14.7
Approach LOS	B		A			B

Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	41.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	25.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	2	3	2	46	27	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.67	0.67	0.67	0.67	0.67	0.67
Hourly flow rate (vph)	3	4	3	69	40	9
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	185	125	99			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	185	125	99			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	726	835	1434			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	3	4	26	46	27	22
Volume Left	3	0	3	0	0	0
Volume Right	0	4	0	0	0	9
cSH	726	835	1434	1700	1700	1700
Volume to Capacity	0.00	0.01	0.00	0.03	0.02	0.01
Queue Length 95th (ft)	0	0	0	0	0	0
Control Delay (s)	10.0	9.3	0.9	0.0	0.0	0.0
Lane LOS	A	A	A			
Approach Delay (s)	9.6		0.3		0.0	
Approach LOS	A					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	29.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	19	4	191	5	3	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.92	1.00		1.00	1.00
Flpb, ped/bikes	0.94	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1614	1402	3400		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1614	1402	3400		1711	3421
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	22	5	220	6	3	218
RTOR Reduction (vph)	0	5	1	0	0	0
Lane Group Flow (vph)	22	0	225	0	3	218
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	3.0	3.0	56.7		1.2	63.0
Effective Green, g (s)	3.0	3.0	56.7		1.2	63.0
Actuated g/C Ratio	0.04	0.04	0.74		0.02	0.83
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	63	55	2529		26	2828
v/s Ratio Prot			c0.07		0.00	c0.06
v/s Ratio Perm	c0.01	0.00				
v/c Ratio	0.35	0.00	0.09		0.12	0.08
Uniform Delay, d1	35.6	35.2	2.7		37.0	1.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.3	0.0	0.1		2.0	0.1
Delay (s)	39.0	35.2	2.7		39.0	1.3
Level of Service	D	D	A		D	A
Approach Delay (s)	38.3		2.7			1.8
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.10		
Actuated Cycle Length (s)	76.2	Sum of lost time (s)	15.3
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	48	30	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	56	35	0
Pedestrians	25			1	1	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	90	44	60			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	90	44	60			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	883	997	1512			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	19	38	24	12
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1512	1700	1700	1700
Volume to Capacity	0.00	0.00	0.02	0.01	0.01
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.0	0.0		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	19.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1	12	7	1	23	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	1	14	8	1	28	1
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	499					
pX, platoon unblocked						
vC, conflicting volume			66		127	108
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			66		127	108
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	100
cM capacity (veh/h)			1478		799	874

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	16	10	29
Volume Left	0	8	28
Volume Right	14	0	1
cSH	1700	1478	801
Volume to Capacity	0.01	0.01	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	6.5	9.7
Lane LOS		A	A
Approach Delay (s)	0.0	6.5	9.7
Approach LOS			A

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	29.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	10	68	1	13	10	51	140	0	3	149	57
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1280	1365	1129	1291	1365	1118	2515	2593		1296	2467	
Flt Permitted	0.75	1.00	1.00	0.75	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1008	1365	1129	1019	1365	1118	2515	2593		1296	2467	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	54	12	80	1	15	12	60	165	0	4	175	67
RTOR Reduction (vph)	0	0	65	0	0	10	0	0	0	0	45	0
Lane Group Flow (vph)	54	12	15	1	15	2	60	165	0	4	197	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	6.1	6.1	6.1	6.1	6.1	6.1	2.1	9.2		1.2	8.3	
Effective Green, g (s)	6.1	6.1	6.1	6.1	6.1	6.1	2.1	9.2		1.2	8.3	
Actuated g/C Ratio	0.19	0.19	0.19	0.19	0.19	0.19	0.07	0.29		0.04	0.26	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	190	258	213	193	258	211	164	740		48	635	
v/s Ratio Prot		0.01			0.01		0.02	c0.06		0.00	c0.08	
v/s Ratio Perm	c0.05		0.01	0.00		0.00						
v/c Ratio	0.28	0.05	0.07	0.01	0.06	0.01	0.37	0.22		0.08	0.31	
Uniform Delay, d1	11.2	10.7	10.7	10.6	10.7	10.6	14.4	8.8		15.0	9.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.1	0.1	0.0	0.1	0.0	1.4	0.2		0.7	0.3	
Delay (s)	12.0	10.7	10.9	10.6	10.8	10.6	15.8	8.9		15.7	9.9	
Level of Service	B	B	B	B	B	B	B	A		B	A	
Approach Delay (s)		11.3			10.7			10.8			10.0	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	32.2	Sum of lost time (s)	15.7
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	112	3	4	106	10	5	6	1	11	2	38
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.87	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1255	1621	1674		1493	1364	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.73	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1255	1241	1674		1183	1364	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	47	126	3	4	119	11	6	7	1	12	2	43
RTOR Reduction (vph)	0	0	1	0	0	5	0	1	0	0	35	0
Lane Group Flow (vph)	47	126	2	4	119	6	6	7	0	12	10	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	7.4	47.2	47.2	2.4	42.2	42.2	14.9	14.9		14.9	14.9	
Effective Green, g (s)	7.4	47.2	47.2	2.4	42.2	42.2	14.9	14.9		14.9	14.9	
Actuated g/C Ratio	0.09	0.59	0.59	0.03	0.53	0.53	0.19	0.19		0.19	0.19	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	150	1012	860	48	905	666	232	313		221	255	
v/s Ratio Prot	c0.03	c0.07		0.00	0.07			0.00			0.01	
v/s Ratio Perm			0.00			0.00	0.00			c0.01		
v/c Ratio	0.31	0.12	0.00	0.08	0.13	0.01	0.03	0.02		0.05	0.04	
Uniform Delay, d1	33.7	7.1	6.6	37.5	9.4	8.8	26.4	26.4		26.5	26.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.3	0.0	0.7	0.1	0.0	0.0	0.0		0.1	0.1	
Delay (s)	34.9	7.3	6.6	38.2	9.5	8.8	26.4	26.4		26.6	26.5	
Level of Service	C	A	A	D	A	A	C	C		C	C	
Approach Delay (s)		14.7			10.3			26.4			26.5	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	113	6	11	125	13	12	33	14	29	25	49
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1033	1540	2941			2998	1074
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00			0.95	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1033	1473	2941			2941	1074
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	28	138	7	13	152	16	15	40	17	35	30	60
RTOR Reduction (vph)	0	0	5	0	0	12	0	14	0	0	0	52
Lane Group Flow (vph)	28	138	2	13	152	4	15	43	0	0	65	8
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	0.8	6.5	6.5	0.8	5.5	5.5	4.4	4.4			3.4	3.4
Effective Green, g (s)	0.8	6.5	6.5	0.8	5.5	5.5	4.4	4.4			3.4	3.4
Actuated g/C Ratio	0.03	0.26	0.26	0.03	0.22	0.22	0.18	0.18			0.14	0.14
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	39	319	362	49	270	230	262	523			404	147
v/s Ratio Prot	c0.02	0.11		0.01	c0.13			0.01				
v/s Ratio Perm			0.00			0.00	0.01				c0.02	0.01
v/c Ratio	0.72	0.43	0.01	0.27	0.56	0.02	0.06	0.08			0.16	0.06
Uniform Delay, d1	11.8	7.6	6.7	11.7	8.5	7.5	8.4	8.5			9.4	9.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	47.4	0.9	0.0	2.9	2.7	0.0	0.1	0.1			0.2	0.2
Delay (s)	59.2	8.5	6.7	14.6	11.2	7.5	8.5	8.5			9.6	9.4
Level of Service	E	A	A	B	B	A	A	A			A	A
Approach Delay (s)		16.6			11.1			8.5			9.5	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	24.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	109	56	14	121	50	15	29	12	21	23	6
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.93	1.00	1.00	0.92	1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1327	898		1334	1126	892	1070	957	884	1070	1078	
Flt Permitted	0.40	1.00		0.61	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	560	898		850	1126	892	1070	957	884	1070	1078	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	24	131	67	17	146	60	18	35	14	25	28	7
RTOR Reduction (vph)	0	21	0	0	0	35	0	0	13	0	6	0
Lane Group Flow (vph)	24	177	0	17	146	25	18	35	1	25	29	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	14.3	14.3		13.7	13.7	18.0	1.0	3.4	3.4	4.3	6.7	
Effective Green, g (s)	14.3	14.3		13.7	13.7	18.0	1.0	3.4	3.4	4.3	6.7	
Actuated g/C Ratio	0.34	0.34		0.32	0.32	0.42	0.02	0.08	0.08	0.10	0.16	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	206	302		279	363	483	25	76	70	108	170	
v/s Ratio Prot	0.00	c0.20		0.00	c0.13	0.01	0.02	c0.04		0.02	c0.03	
v/s Ratio Perm	0.04			0.02		0.02			0.00			
v/c Ratio	0.12	0.59		0.06	0.40	0.05	0.72	0.46	0.02	0.23	0.17	
Uniform Delay, d1	9.8	11.6		9.9	11.2	7.2	20.6	18.6	18.0	17.5	15.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	2.9		0.1	0.7	0.0	67.0	4.4	0.1	1.1	0.5	
Delay (s)	10.0	14.5		10.0	11.9	7.2	87.5	23.0	18.1	18.6	15.9	
Level of Service	B	B		B	B	A	F	C	B	B	B	
Approach Delay (s)		14.0			10.5			39.3			17.1	
Approach LOS		B			B			D			B	

Intersection Summary			
HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	42.4	Sum of lost time (s)	20.0
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	25	19	11	47	1	5	17	9	0	11	6
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	4	32	24	14	60	1	6	22	12	0	14	8

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	60	14	62	28	12	22
Volume Left (vph)	4	14	0	6	0	0
Volume Right (vph)	24	0	1	0	12	8
Hadj (s)	-0.20	0.53	0.02	0.15	-0.67	-0.18
Departure Headway (s)	4.5	5.2	4.7	5.0	4.2	4.7
Degree Utilization, x	0.08	0.02	0.08	0.04	0.01	0.03
Capacity (veh/h)	777	668	744	695	826	732
Control Delay (s)	7.9	7.1	6.9	7.0	6.0	7.8
Approach Delay (s)	7.9	7.0		6.7		7.8
Approach LOS	A	A		A		A

Intersection Summary			
Delay	7.3		
Level of Service	A		
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	38	22	7	37	14	12	142	3	6	141	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.96		1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3190		1677	3238		1260	2510		1260	2370	
Flt Permitted	0.71	1.00		0.71	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1250	3190		1248	3238		1260	2510		1260	2370	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	42	46	27	8	45	17	14	171	4	7	170	86
RTOR Reduction (vph)	0	20	0	0	13	0	0	1	0	0	40	0
Lane Group Flow (vph)	42	53	0	8	49	0	14	174	0	7	216	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	23.8	23.8		23.8	23.8		3.0	47.7		3.0	47.7	
Effective Green, g (s)	23.8	23.8		23.8	23.8		3.0	47.7		3.0	47.7	
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.03	0.53		0.03	0.53	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	330	843		330	856		42	1330		42	1256	
v/s Ratio Prot		0.02			0.02		c0.01	0.07		0.01	c0.09	
v/s Ratio Perm	c0.03			0.01								
v/c Ratio	0.13	0.06		0.02	0.06		0.33	0.13		0.17	0.17	
Uniform Delay, d1	25.2	24.8		24.5	24.7		42.5	10.7		42.3	10.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.0		0.0	0.0		4.6	0.2		1.9	0.1	
Delay (s)	25.4	24.8		24.5	24.8		47.2	10.9		44.2	11.0	
Level of Service	C	C		C	C		D	B		D	B	
Approach Delay (s)		25.0			24.7			13.6			11.9	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.16		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	101	11	3	205	3	13	0	4	3	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.97		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3371		1711	3414			1681		1711	1531	
Flt Permitted	0.61	1.00		0.67	1.00			0.84		0.75	1.00	
Satd. Flow (perm)	1100	3371		1215	3414			1472		1343	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	110	12	3	223	3	14	0	4	3	0	11
RTOR Reduction (vph)	0	8	0	0	2	0	0	12	0	0	7	0
Lane Group Flow (vph)	7	114	0	3	224	0	0	6	0	3	4	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.0	9.0		9.0	9.0			10.5		10.5	10.5	
Effective Green, g (s)	9.0	9.0		9.0	9.0			10.5		10.5	10.5	
Actuated g/C Ratio	0.31	0.31		0.31	0.31			0.36		0.36	0.36	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	335	1028		370	1041			523		478	544	
v/s Ratio Prot		0.03			c0.07						0.00	
v/s Ratio Perm	0.01			0.00				c0.00		0.00		
v/c Ratio	0.02	0.11		0.01	0.22			0.01		0.01	0.01	
Uniform Delay, d1	7.2	7.4		7.1	7.6			6.1		6.1	6.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.0		0.0	0.1			0.0		0.0	0.0	
Delay (s)	7.2	7.4		7.1	7.7			6.2		6.1	6.1	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		7.4			7.7			6.2			6.1	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.11		
Actuated Cycle Length (s)	29.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	21.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	75	0	0	146	4	65	31	79	0	0	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			1.00		1.00	0.89				0.85
Flt Protected		1.00			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3417			5110		1711	3052				2694
Flt Permitted		0.95			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3262			5110		1711	3052				2694
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	2	87	0	0	170	5	76	36	92	0	0	35
RTOR Reduction (vph)	0	0	0	0	3	0	0	54	0	0	0	33
Lane Group Flow (vph)	0	89	0	0	172	0	76	74	0	0	0	2
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1531			1781		697	1244				141
v/s Ratio Prot		c0.00			c0.03		c0.04	0.02				0.00
v/s Ratio Perm		0.02										
v/c Ratio		0.06			0.10		0.11	0.06				0.01
Uniform Delay, d1		11.1			16.7		13.9	13.7				34.1
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.1		0.3	0.1				0.2
Delay (s)		11.2			16.8		14.3	13.7				34.3
Level of Service		B			B		B	B				C
Approach Delay (s)		11.2			16.8			13.9			34.3	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.10		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St. 4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	77	144	126	114	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.95	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1615	1428	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1615	1428	3319	1801		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	92	171	150	136	0	0
RTOR Reduction (vph)	13	35	0	0	0	0
Lane Group Flow (vph)	125	90	150	136	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	43.1	43.1	6.9	60.0		
Effective Green, g (s)	43.1	43.1	6.9	60.0		
Actuated g/C Ratio	0.72	0.72	0.12	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	1160	1025	381	1801		
v/s Ratio Prot	c0.08		c0.05	0.08		
v/s Ratio Perm		0.06				
v/c Ratio	0.11	0.09	0.39	0.08		
Uniform Delay, d1	2.6	2.5	24.6	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.0	0.0	0.7	0.0		
Delay (s)	2.6	2.6	25.3	0.0		
Level of Service	A	A	C	A		
Approach Delay (s)	2.6			13.3	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	20.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez 4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	69	111	4	66	3	120	111	2	5	145	69
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	6.7	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.95		1.00	1.00		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.98	1.00		0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1186	1965		1156	1267		1215	2422		1215	2253	
Flt Permitted	0.43	1.00		0.63	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	541	1965		762	1267		1215	2422		1215	2253	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	42	77	123	4	73	3	133	123	2	6	161	77
RTOR Reduction (vph)	0	82	0	0	2	0	0	1	0	0	50	0
Lane Group Flow (vph)	42	118	0	4	74	0	133	124	0	6	188	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	21.8	21.8		10.6	10.6		10.1	23.6		3.3	16.8	
Effective Green, g (s)	21.8	21.8		10.6	10.6		10.1	23.6		3.3	16.8	
Actuated g/C Ratio	0.34	0.34		0.16	0.16		0.16	0.36		0.05	0.26	
Clearance Time (s)	6.7	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	226	659		124	206		188	879		61	582	
v/s Ratio Prot	0.01	c0.06			c0.06		c0.11	0.05		0.00	c0.08	
v/s Ratio Perm	0.05			0.01								
v/c Ratio	0.19	0.18		0.03	0.36		0.71	0.14		0.10	0.32	
Uniform Delay, d1	15.2	15.3		22.9	24.2		26.0	13.9		29.4	19.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.1		0.1	1.1		11.5	0.1		0.7	0.3	
Delay (s)	15.6	15.4		23.0	25.3		37.5	14.0		30.1	19.8	
Level of Service	B	B		C	C		D	B		C	B	
Approach Delay (s)		15.4			25.2			26.1			20.1	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	23.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

23: Pennsylvania Street & I-280 SB On-Ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	88	225	128	147
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	96	245	139	160
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			515			
pX, platoon unblocked						
vC, conflicting volume	534	48			96	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	534	48			96	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			91	
cM capacity (veh/h)	432	1011			1496	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	48	48	245	139	160
Volume Left	0	0	0	139	0
Volume Right	0	0	245	0	0
cSH	1700	1700	1700	1496	1700
Volume to Capacity	0.03	0.03	0.14	0.09	0.09
Queue Length 95th (ft)	0	0	0	8	0
Control Delay (s)	0.0	0.0	0.0	7.7	0.0
Lane LOS				A	
Approach Delay (s)	0.0			3.6	
Approach LOS					

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	27.7%	ICU Level of Service	A
Analysis Period (min)	15		

25: 18th St & 280 SB Off-Ramp

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	95	33	0	84	95
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	103	36	0	91	103
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	36				88	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	36				88	36
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	90
cM capacity (veh/h)	1573				904	1029

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	52	52	36	195
Volume Left	0	0	0	91
Volume Right	0	0	0	103
cSH	1700	1700	1700	966
Volume to Capacity	0.03	0.03	0.02	0.20
Queue Length 95th (ft)	0	0	0	19
Control Delay (s)	0.0	0.0	0.0	9.7
Lane LOS				A
Approach Delay (s)	0.0		0.0	9.7
Approach LOS				A

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp
9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	63	116	33	53	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	68	126	36	58	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	93				236	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	93				236	36
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	100
cM capacity (veh/h)	1499				698	1029

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	111	84	36	58	0
Volume Left	68	0	0	0	0
Volume Right	0	0	0	58	0
cSH	1499	1700	1700	1700	1700
Volume to Capacity	0.05	0.05	0.02	0.03	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	4.8	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.7		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	15.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	6	4	3	8	11	10	156	18	10	158	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.93		1.00	0.98		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1542			1502		1540	3030		1540	3056	
Flt Permitted		0.92			0.95		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1444			1439		1540	3030		1540	3056	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	7	4	3	9	12	11	170	20	11	172	9
RTOR Reduction (vph)	0	4	0	0	12	0	0	5	0	0	2	0
Lane Group Flow (vph)	0	15	0	0	12	0	11	185	0	11	179	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		3.1			3.1		1.3	58.9		3.0	60.6	
Effective Green, g (s)		3.1			3.1		1.3	58.9		3.0	60.6	
Actuated g/C Ratio		0.04			0.04		0.02	0.73		0.04	0.76	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		55			55		24	2225		57	2309	
v/s Ratio Prot							c0.01	c0.06		c0.01	0.06	
v/s Ratio Perm		c0.01			0.01							
v/c Ratio		0.28			0.23		0.46	0.08		0.19	0.08	
Uniform Delay, d1		37.5			37.4		39.1	3.0		37.4	2.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.7			2.1		5.0	0.1		0.6	0.1	
Delay (s)		40.2			39.5		44.1	3.1		38.0	2.6	
Level of Service		D			D		D	A		D	A	
Approach Delay (s)		40.2			39.5			5.3			4.6	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.10		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	23.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	190	28	101	0	0	147
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	207	30	110	0	0	160

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	103	103	30	55	55	160
Volume Left (vph)	103	103	0	0	0	0
Volume Right (vph)	0	0	30	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.7	5.7	3.2	5.3	5.3	5.1
Degree Utilization, x	0.16	0.16	0.03	0.08	0.08	0.22
Capacity (veh/h)	599	602	1121	649	648	680
Control Delay (s)	8.6	8.6	5.1	7.6	7.6	9.5
Approach Delay (s)	8.2			7.6		9.5
Approach LOS	A			A		A

Intersection Summary			
Delay	8.5		
Level of Service	A		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	75	74	0	0	52	60	10	153	4	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	80	0	0	57	65	11	166	4	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	162	122	94	88
Volume Left (vph)	82	0	11	0
Volume Right (vph)	0	65	0	4
Hadj (s)	0.13	-0.29	0.09	0.00
Departure Headway (s)	4.6	4.3	5.3	5.2
Degree Utilization, x	0.21	0.14	0.14	0.13
Capacity (veh/h)	748	797	652	663
Control Delay (s)	8.9	8.0	7.9	7.7
Approach Delay (s)	8.9	8.0	7.8	
Approach LOS	A	A	A	

Intersection Summary			
Delay	8.2		
Level of Service	A		
Intersection Capacity Utilization	26.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	17	37	7	27	5	39	161	2	0	190	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.93			0.98		1.00	1.00			0.97	
Flpb, ped/bikes		0.98			0.99		1.00	1.00			1.00	
Frt		0.93			0.98		1.00	1.00			0.98	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1190			1532		1540	2258			2168	
Flt Permitted		0.92			0.95		0.95	1.00			1.00	
Satd. Flow (perm)		1102			1470		1540	2258			2168	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	18	39	7	28	5	41	169	2	0	200	24
RTOR Reduction (vph)	0	36	0	0	5	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	36	0	0	35	0	41	171	0	0	221	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.7			7.7		5.5	72.4			61.8	
Effective Green, g (s)		7.7			7.7		5.5	72.4			61.8	
Actuated g/C Ratio		0.09			0.09		0.06	0.80			0.68	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		93			125		93	1808			1482	
v/s Ratio Prot							c0.03	0.08			c0.10	
v/s Ratio Perm		c0.03			0.02							
v/c Ratio		0.39			0.28		0.44	0.09			0.15	
Uniform Delay, d1		39.1			38.8		41.0	1.9			5.0	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		2.7			1.2		3.3	0.1			0.2	
Delay (s)		41.8			40.0		44.3	2.0			5.2	
Level of Service		D			D		D	A			A	
Approach Delay (s)		41.8			40.0			10.2			5.2	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	90.4	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	156	0	0	120	144	50	77	187	37	0	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1039	1540	1621	1204	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1039	1540	1621	1204	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	97	164	0	0	126	152	53	81	197	39	0	116
RTOR Reduction (vph)	0	0	0	0	0	92	0	0	171	0	0	107
Lane Group Flow (vph)	97	164	0	0	126	60	53	81	26	39	0	9
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	8.4	42.7			29.3	29.3	9.8	9.8	9.8	6.0		6.0
Effective Green, g (s)	8.4	42.7			29.3	29.3	9.8	9.8	9.8	6.0		6.0
Actuated g/C Ratio	0.11	0.57			0.39	0.39	0.13	0.13	0.13	0.08		0.08
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	173	1764			1210	408	202	213	158	124		97
v/s Ratio Prot	c0.06	0.05			0.04		0.03	c0.05		c0.03		0.01
v/s Ratio Perm						c0.06			0.02			
v/c Ratio	0.56	0.09			0.10	0.15	0.26	0.38	0.16	0.31		0.10
Uniform Delay, d1	31.3	7.2			14.3	14.6	29.1	29.6	28.7	32.3		31.7
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	4.1	0.1			0.2	0.8	0.7	1.1	0.5	1.5		0.4
Delay (s)	35.4	7.3			14.5	15.3	29.8	30.7	29.2	33.8		32.2
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		17.7			14.9			29.7			32.6	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	74.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	25	32	2	34	5	33	12	2	1	13	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.94			0.98		1.00	0.98		1.00	0.91	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3165			1769		1711	1765		1711	1633	
Flt Permitted		0.91			0.99		0.73	1.00		0.75	1.00	
Satd. Flow (perm)		2918			1762		1320	1765		1346	1633	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	27	35	2	37	5	36	13	2	1	14	23
RTOR Reduction (vph)	0	20	0	0	3	0	0	1	0	0	13	0
Lane Group Flow (vph)	0	63	0	0	41	0	36	14	0	1	24	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Effective Green, g (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Actuated g/C Ratio		0.42			0.42		0.42	0.42		0.42	0.42	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		1215			734		550	735		560	680	
v/s Ratio Prot								0.01			0.01	
v/s Ratio Perm		0.02			c0.02		c0.03			0.00		
v/c Ratio		0.05			0.06		0.07	0.02		0.00	0.03	
Uniform Delay, d1		8.3			8.4		8.4	8.2		8.2	8.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.1		0.2	0.0		0.0	0.1	
Delay (s)		8.4			8.5		8.6	8.3		8.2	8.4	
Level of Service		A			A		A	A		A	A	
Approach Delay (s)		8.4			8.5			8.5			8.4	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.06		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

EXISTING 2015 (NO PROJECT)
WITH SF GIANTS GAME AT AT&T PARK
WEEKDAY LATE EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	406	140	8	29	439	109	107	594	76	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.90			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.99		1.00	0.97			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (prot)	4480	3036		2987	2920			5461	1236			
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (perm)	4480	3036		2987	2920			5461	1236			
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	489	169	10	35	529	131	129	716	92	0	0	0
RTOR Reduction (vph)	0	3	0	0	20	0	0	0	70	0	0	0
Lane Group Flow (vph)	489	176	0	35	640	0	0	845	22	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	28.5	60.0		4.5	36.0			26.6	26.6			
Effective Green, g (s)	28.5	60.0		4.5	36.0			26.6	26.6			
Actuated g/C Ratio	0.26	0.55		0.04	0.33			0.24	0.24			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	1160	1656		122	955			1320	298			
v/s Ratio Prot	c0.11	0.06		0.01	c0.22							
v/s Ratio Perm								0.15	0.02			
v/c Ratio	0.42	0.11		0.29	0.67			0.64	0.07			
Uniform Delay, d1	33.9	12.1		51.2	31.9			37.4	32.2			
Progression Factor	1.00	1.00		1.23	0.29			1.29	37.37			
Incremental Delay, d2	0.2	0.1		0.4	0.6			1.0	0.1			
Delay (s)	34.1	12.2		63.4	9.7			49.2	1203.2			
Level of Service	C	B		E	A			D	F			
Approach Delay (s)		28.3			12.4			162.5			0.0	
Approach LOS		C			B			F			A	

Intersection Summary			
HCM 2000 Control Delay	78.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	489	41	56	473	17	13	102	22	43	173	436
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.97		1.00	0.98			1.00	0.62	1.00	0.70	0.46
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.97	1.00	0.70	1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85	1.00	0.92	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4239		1296	2523			1568	842	1077	1885	562
Flt Permitted	0.95	1.00		0.95	1.00			0.84	1.00	0.65	1.00	1.00
Satd. Flow (perm)	1540	4239		1296	2523			1317	842	732	1885	562
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	104	582	49	67	563	20	15	121	26	51	206	519
RTOR Reduction (vph)	0	5	0	0	1	0	0	0	21	0	203	203
Lane Group Flow (vph)	104	626	0	67	582	0	0	136	5	51	263	56
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	12.5	65.1		9.9	60.9			25.1	25.1	26.1	26.1	26.1
Effective Green, g (s)	12.5	65.1		9.9	60.9			25.1	25.1	26.1	26.1	26.1
Actuated g/C Ratio	0.10	0.54		0.08	0.51			0.21	0.21	0.22	0.22	0.22
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	160	2299		106	1280			275	176	159	409	122
v/s Ratio Prot	c0.07	0.15		c0.05	c0.23						c0.14	
v/s Ratio Perm								0.10	0.01	0.07		0.10
v/c Ratio	0.65	0.27		0.63	0.45			0.49	0.03	0.32	0.64	0.46
Uniform Delay, d1	51.6	14.7		53.3	18.9			41.9	37.8	39.5	42.7	40.8
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.1	0.3		11.7	0.3			1.4	0.1	1.2	3.4	2.8
Delay (s)	60.7	15.0		65.0	19.2			43.3	37.8	40.7	46.1	43.6
Level of Service	E	B		E	B			D	D	D	D	D
Approach Delay (s)		21.5			23.9			42.4			44.9	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	31.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	112.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

10/21/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	597	80	2	920	99	20
Ideal Flow (vphpl)	1400	1400	1000	1000	1400	1400
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2224			1620	1134	1000
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	2224			1546	1134	1000
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	711	95	2	1095	118	24
RTOR Reduction (vph)	10	0	0	0	0	16
Lane Group Flow (vph)	796	0	0	1097	118	8
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1255			872	377	332
v/s Ratio Prot	0.36				c0.10	
v/s Ratio Perm				c0.71		0.01
v/c Ratio	0.63			1.26	0.31	0.02
Uniform Delay, d1	16.3			23.9	27.3	24.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	2.5			125.4	0.5	0.0
Delay (s)	18.7			149.4	27.8	24.7
Level of Service	B			F	C	C
Approach Delay (s)	18.7			149.4	27.3	
Approach LOS	B			F	C	

Intersection Summary			
HCM 2000 Control Delay	89.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	19	302	53	13	179	395	159	85	209	116
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.98			1.00	0.97			0.98	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			0.99	0.85
Flt Protected		1.00			1.00	1.00			0.96	1.00
Satd. Flow (prot)		5746			2872	2470			4028	1122
Flt Permitted		1.00			0.90	1.00			0.96	1.00
Satd. Flow (perm)		5746			2600	2470			4028	1122
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	22	355	62	15	211	465	187	100	246	136
RTOR Reduction (vph)	0	39	0	0	0	53	0	0	0	0
Lane Group Flow (vph)	0	400	0	0	226	599	0	0	370	112
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		21.4			22.6	22.6			13.5	13.5
Effective Green, g (s)		23.4			25.6	25.6			16.5	16.5
Actuated g/C Ratio		0.31			0.34	0.34			0.22	0.22
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1792			887	843			886	246
v/s Ratio Prot						c0.24			0.09	c0.10
v/s Ratio Perm		0.07			0.09					
v/c Ratio		0.22			0.25	0.71			0.42	0.46
Uniform Delay, d1		19.1			17.8	21.5			25.1	25.4
Progression Factor		1.00			0.79	1.00			1.00	1.00
Incremental Delay, d2		0.1			0.1	2.8			0.3	1.3
Delay (s)		19.1			14.2	24.3			25.4	26.7
Level of Service		B			B	C			C	C
Approach Delay (s)		19.1			14.2	24.3			25.7	
Approach LOS		B			B	C			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	37	270	196	35	155	125	25	166	48	285
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.87		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.98		0.93		0.85		1.00	1.00
Flt Protected		0.95	0.99		1.00		1.00		0.95	0.99
Satd. Flow (prot)		1214	1869		2249		1161		1327	2542
Flt Permitted		0.95	0.99		1.00		1.00		0.47	0.91
Satd. Flow (perm)		1214	1869		2249		1161		658	2324
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	39	284	206	37	163	132	26	175	51	300
RTOR Reduction (vph)	0	0	17	0	1	0	18	0	0	0
Lane Group Flow (vph)	0	224	325	0	297	0	5	0	180	346
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		299	523		524		247		396	1043
v/s Ratio Prot		c0.18	0.17		c0.13				c0.08	0.06
v/s Ratio Perm							0.00		0.12	0.09
v/c Ratio		0.75	0.62		0.57		0.02		0.45	0.33
Uniform Delay, d1		26.1	23.5		25.4		23.3		18.1	14.1
Progression Factor		1.00	1.00		1.00		1.00		0.69	0.70
Incremental Delay, d2		15.8	5.5		4.4		0.1		2.9	0.7
Delay (s)		41.9	29.0		29.8		23.5		15.5	10.5
Level of Service		D	C		C		C		B	B
Approach Delay (s)			34.1		29.4					12.2
Approach LOS			C		C					B

Intersection Summary			
HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	1	51	181	19	319	10	378	4	4	426	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1700	1700	1700	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1545	1356		2711		1377	2748		1540	3042	
Flt Permitted		0.65	1.00		0.85		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1053	1356		2339		1377	2748		1540	3042	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	11	1	62	221	23	389	12	461	5	5	520	38
RTOR Reduction (vph)	0	0	43	0	271	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	12	19	0	362	0	12	465	0	5	553	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		14.0	14.0		14.0		0.8	15.2		0.9	15.6	
Effective Green, g (s)		14.0	14.0		14.0		0.8	15.2		0.9	15.6	
Actuated g/C Ratio		0.30	0.30		0.30		0.02	0.33		0.02	0.34	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		320	412		711		23	908		30	1031	
v/s Ratio Prot							0.01	c0.17		0.00	c0.18	
v/s Ratio Perm		0.01	0.01		c0.15							
v/c Ratio		0.04	0.05		0.51		0.52	0.51		0.17	0.54	
Uniform Delay, d1		11.3	11.3		13.2		22.4	12.4		22.2	12.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0	0.0		0.6		9.5	0.5		1.0	0.5	
Delay (s)		11.3	11.3		13.8		31.9	12.9		23.1	12.8	
Level of Service		B	B		B		C	B		C	B	
Approach Delay (s)		11.3			13.8			13.4			12.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	46.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	14	20	5	11	44	4	28	6	40	71	12
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	1.00	1.00	0.99		1.00	0.97	
Flpb, ped/bikes		0.99			1.00	1.00	0.84	1.00		1.00	1.00	
Frt		0.94			1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected		0.98			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2372			1428	1227	1160	1389		1377	1378	
Flt Permitted		0.95			1.00	1.00	1.00	1.00		0.95	1.00	
Satd. Flow (perm)		2304			1449	1227	1221	1389		1377	1378	
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Adj. Flow (vph)	22	18	25	6	14	56	5	35	8	51	90	15
RTOR Reduction (vph)	0	23	0	0	0	27	0	7	0	0	5	0
Lane Group Flow (vph)	0	42	0	0	20	29	5	36	0	51	100	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		2.3			2.3	18.7	2.4	2.4		16.4	23.8	
Effective Green, g (s)		2.3			2.3	18.7	2.4	2.4		16.4	23.8	
Actuated g/C Ratio		0.06			0.06	0.52	0.07	0.07		0.45	0.66	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		146			92	805	81	92		625	908	
v/s Ratio Prot						0.02		c0.03		0.04	c0.07	
v/s Ratio Perm		c0.02			0.01	0.01	0.00					
v/c Ratio		0.28			0.22	0.04	0.06	0.39		0.08	0.11	
Uniform Delay, d1		16.1			16.0	4.3	15.8	16.1		5.6	2.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1			1.2	0.0	0.3	2.7		0.0	0.1	
Delay (s)		17.2			17.2	4.3	16.1	18.8		5.6	2.3	
Level of Service		B			B	A	B	B		A	A	
Approach Delay (s)		17.2			7.7			18.5			3.4	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	36.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	15	89	491	12	38	95
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.97	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1740	1535	849	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1740	1535	849	1134	1194
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	18	106	585	14	45	113
RTOR Reduction (vph)	0	98	0	3	0	0
Lane Group Flow (vph)	18	8	585	11	45	113
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	5.7	5.7	48.3	43.3	5.3	58.6
Effective Green, g (s)	5.7	5.7	48.3	43.3	5.3	58.6
Actuated g/C Ratio	0.08	0.08	0.65	0.58	0.07	0.79
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	86	133	997	551	80	941
v/s Ratio Prot	c0.02		c0.38	0.01	c0.04	0.09
v/s Ratio Perm		0.00		0.01		
v/c Ratio	0.21	0.06	0.59	0.02	0.56	0.12
Uniform Delay, d1	32.2	31.8	7.4	6.5	33.4	1.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.2	0.9	0.0	8.8	0.1
Delay (s)	33.4	32.0	8.2	6.6	42.1	1.9
Level of Service	C	C	A	A	D	A
Approach Delay (s)	32.2		8.2			13.4
Approach LOS	C		A			B

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	74.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	2	4	4	21	334	84
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.67	0.67	0.67	0.67	0.67	0.67
Hourly flow rate (vph)	3	6	6	31	499	125
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	689	412	674			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	689	412	674			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	349	545	878			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	3	6	16	21	332	292
Volume Left	3	0	6	0	0	0
Volume Right	0	6	0	0	0	125
cSH	349	545	878	1700	1700	1700
Volume to Capacity	0.01	0.01	0.01	0.01	0.20	0.17
Queue Length 95th (ft)	1	1	1	0	0	0
Control Delay (s)	15.4	11.7	3.4	0.0	0.0	0.0
Lane LOS	C	B	A			
Approach Delay (s)	12.9		1.5		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	31.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	79	33	203	7	5	383
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.94	1.00		1.00	1.00
Flpb, ped/bikes	0.91	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1558	1439	3400		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1558	1439	3400		1711	3421
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	91	38	233	8	6	440
RTOR Reduction (vph)	0	34	1	0	0	0
Lane Group Flow (vph)	91	4	240	0	6	440
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	12.4	12.4	90.9		1.4	97.4
Effective Green, g (s)	12.4	12.4	90.9		1.4	97.4
Actuated g/C Ratio	0.10	0.10	0.76		0.01	0.81
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	160	148	2575		19	2776
v/s Ratio Prot			0.07		0.00	c0.13
v/s Ratio Perm	c0.06	0.00				
v/c Ratio	0.57	0.03	0.09		0.32	0.16
Uniform Delay, d1	51.3	48.4	3.8		58.8	2.4
Progression Factor	1.00	1.00	1.03		1.00	1.00
Incremental Delay, d2	4.6	0.1	0.1		9.3	0.1
Delay (s)	55.8	48.4	4.0		68.2	2.6
Level of Service	E	D	A		E	A
Approach Delay (s)	53.7		4.0			3.4
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	25	338	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	29	398	0
Pedestrians	25			1	1	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	438	225	423			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	438	225	423			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	536	763	1111			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	10	20	265	133
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1111	1700	1700	1700
Volume to Capacity	0.00	0.00	0.01	0.16	0.08
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.0	0.0		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	22.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	0	13	1	1	28	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	0	16	1	1	34	0
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	499					
pX, platoon unblocked						
vC, conflicting volume			66		111	108
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			66		111	108
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			1478		818	875

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	16	2	34
Volume Left	0	1	34
Volume Right	16	0	0
cSH	1700	1478	818
Volume to Capacity	0.01	0.00	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	3.7	9.6
Lane LOS		A	A
Approach Delay (s)	0.0	3.7	9.6
Approach LOS			A

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	29.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	48	10	72	7	17	5	70	157	0	3	318	141
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.95	1.00	1.00	0.93	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.96	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1243	1365	1108	1278	1365	1074	2515	2593		1296	2457	
Flt Permitted	0.74	1.00	1.00	0.75	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	974	1365	1108	1008	1365	1074	2515	2593		1296	2457	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	56	12	85	8	20	6	82	185	0	4	374	166
RTOR Reduction (vph)	0	0	76	0	0	5	0	0	0	0	24	0
Lane Group Flow (vph)	56	12	9	8	20	1	82	185	0	4	516	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	12.5	12.5	12.5	12.5	12.5	12.5	8.0	90.4		1.4	83.8	
Effective Green, g (s)	12.5	12.5	12.5	12.5	12.5	12.5	8.0	90.4		1.4	83.8	
Actuated g/C Ratio	0.10	0.10	0.10	0.10	0.10	0.10	0.07	0.75		0.01	0.70	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	101	142	115	105	142	111	167	1953		15	1715	
v/s Ratio Prot		0.01			0.01		c0.03	0.07		0.00	c0.21	
v/s Ratio Perm	c0.06		0.01	0.01		0.00						
v/c Ratio	0.55	0.08	0.08	0.08	0.14	0.01	0.49	0.09		0.27	0.30	
Uniform Delay, d1	51.1	48.6	48.5	48.5	48.9	48.2	54.0	3.9		58.8	6.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.06	0.80	
Incremental Delay, d2	6.4	0.3	0.3	0.3	0.5	0.0	2.3	0.1		9.3	0.1	
Delay (s)	57.5	48.8	48.8	48.8	49.3	48.2	56.3	4.0		71.7	5.6	
Level of Service	E	D	D	D	D	D	E	A		E	A	
Approach Delay (s)		52.0			49.0			20.1			6.1	
Approach LOS		D			D			C			A	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	104	2	3	210	14	4	6	1	25	2	64
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.87	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1261	1621	1674		1498	1361	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.71	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1261	1209	1674		1187	1361	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	49	117	2	3	236	16	4	7	1	28	2	72
RTOR Reduction (vph)	0	0	1	0	0	8	0	1	0	0	59	0
Lane Group Flow (vph)	49	117	1	3	236	8	4	7	0	28	15	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	7.1	44.8	44.8	2.3	40.0	40.0	14.3	14.3		14.3	14.3	
Effective Green, g (s)	7.1	44.8	44.8	2.3	40.0	40.0	14.3	14.3		14.3	14.3	
Actuated g/C Ratio	0.09	0.59	0.59	0.03	0.52	0.52	0.19	0.19		0.19	0.19	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	150	1000	850	48	893	660	226	313		222	254	
v/s Ratio Prot	c0.03	c0.07		0.00	c0.14			0.00			0.01	
v/s Ratio Perm			0.00			0.01	0.00			c0.02		
v/c Ratio	0.33	0.12	0.00	0.06	0.26	0.01	0.02	0.02		0.13	0.06	
Uniform Delay, d1	32.4	7.0	6.5	36.0	10.1	8.7	25.3	25.3		25.8	25.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.2	0.0	0.5	0.2	0.0	0.0	0.0		0.3	0.1	
Delay (s)	33.7	7.3	6.5	36.6	10.2	8.7	25.4	25.4		26.1	25.6	
Level of Service	C	A	A	D	B	A	C	C		C	C	
Approach Delay (s)		15.0			10.4			25.4			25.8	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	76.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	119	6	11	259	8	12	33	14	16	25	40
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.98	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1049	1540	2941			3019	1074
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00			0.93	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1049	1473	2941			2857	1074
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	15	145	7	13	316	10	15	40	17	20	30	49
RTOR Reduction (vph)	0	0	4	0	0	6	0	15	0	0	0	44
Lane Group Flow (vph)	15	145	3	13	316	4	15	42	0	0	50	5
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	0.7	13.5	13.5	0.5	12.3	12.3	4.4	4.4			3.4	3.4
Effective Green, g (s)	0.7	13.5	13.5	0.5	12.3	12.3	4.4	4.4			3.4	3.4
Actuated g/C Ratio	0.02	0.43	0.43	0.02	0.39	0.39	0.14	0.14			0.11	0.11
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	27	522	592	24	475	410	206	412			309	116
v/s Ratio Prot	c0.01	0.12		0.01	c0.26			0.01				
v/s Ratio Perm			0.00			0.00	0.01				c0.02	0.00
v/c Ratio	0.56	0.28	0.01	0.54	0.67	0.01	0.07	0.10			0.16	0.05
Uniform Delay, d1	15.2	5.8	5.1	15.3	7.9	5.8	11.7	11.8			12.7	12.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	22.5	0.3	0.0	22.7	3.5	0.0	0.2	0.1			0.2	0.2
Delay (s)	37.7	6.1	5.1	38.0	11.4	5.8	11.9	11.9			13.0	12.7
Level of Service	D	A	A	D	B	A	B	B			B	B
Approach Delay (s)		8.9			12.2			11.9			12.8	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	31.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	106	59	25	159	126	19	44	9	22	51	13
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.94	1.00	1.00	0.95	1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1328	893		1333	1126	897	1070	957	908	1070	1079	
Flt Permitted	0.34	1.00		0.60	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	482	893		849	1126	897	1070	957	908	1070	1079	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	18	128	71	30	192	152	23	53	11	27	61	16
RTOR Reduction (vph)	0	26	0	0	0	87	0	0	9	0	11	0
Lane Group Flow (vph)	18	173	0	30	192	65	23	53	2	27	66	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	12.5	12.5		13.8	13.8	20.3	0.9	6.9	6.9	6.5	12.5	
Effective Green, g (s)	12.5	12.5		13.8	13.8	20.3	0.9	6.9	6.9	6.5	12.5	
Actuated g/C Ratio	0.26	0.26		0.29	0.29	0.43	0.02	0.14	0.14	0.14	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	135	234		263	325	475	20	138	131	145	282	
v/s Ratio Prot	0.00	c0.19		0.00	c0.17	0.02	0.02	c0.06		0.03	c0.06	
v/s Ratio Perm	0.03			0.03		0.05			0.00			
v/c Ratio	0.13	0.74		0.11	0.59	0.14	1.15	0.38	0.01	0.19	0.23	
Uniform Delay, d1	13.5	16.1		12.5	14.5	8.4	23.4	18.5	17.5	18.3	13.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	11.9		0.2	2.9	0.1	252.2	1.8	0.0	0.6	0.4	
Delay (s)	13.9	28.0		12.7	17.4	8.5	275.6	20.3	17.5	18.9	14.3	
Level of Service	B	C		B	B	A	F	C	B	B	B	
Approach Delay (s)		26.8			13.4			87.4			15.5	
Approach LOS		C			B			F			B	

Intersection Summary			
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	47.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	43.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥		↰	↱			↰	↱		✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	36	10	205	154	12	5	17	13	2	10	6
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	3	46	13	263	197	15	6	22	17	3	13	8

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	62	263	213	28	17	23
Volume Left (vph)	3	263	0	6	0	3
Volume Right (vph)	13	0	15	0	17	8
Hadj (s)	-0.08	0.53	-0.02	0.15	-0.67	-0.14
Departure Headway (s)	5.1	5.3	4.7	5.9	5.1	5.6
Degree Utilization, x	0.09	0.39	0.28	0.05	0.02	0.04
Capacity (veh/h)	690	668	747	563	645	592
Control Delay (s)	8.6	10.4	8.4	8.0	7.0	8.8
Approach Delay (s)	8.6	9.5		7.7		8.8
Approach LOS	A	A		A		A

Intersection Summary			
Delay	9.2		
Level of Service	A		
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↱		↰	↰↱		↰	↰↱		↰	↰↱	
Volume (vph)	37	36	17	13	145	7	21	183	6	6	188	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.97	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.99		1.00	1.00		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1665	3220		1673	3391		1260	2506		1260	2283	
Flt Permitted	0.64	1.00		0.71	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1115	3220		1257	3391		1260	2506		1260	2283	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	45	43	20	16	175	8	25	220	7	7	227	245
RTOR Reduction (vph)	0	14	0	0	4	0	0	2	0	0	152	0
Lane Group Flow (vph)	45	49	0	16	179	0	25	225	0	7	320	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	331	956		373	1007		212	999		187	865	
v/s Ratio Prot		0.02			c0.05		0.02	c0.09		0.01	c0.14	
v/s Ratio Perm	0.04			0.01								
v/c Ratio	0.14	0.05		0.04	0.18		0.12	0.22		0.04	0.37	
Uniform Delay, d1	25.8	25.1		25.0	26.1		35.2	19.8		36.4	22.4	
Progression Factor	1.00	1.00		1.00	1.00		0.87	0.76		1.00	1.00	
Incremental Delay, d2	0.9	0.1		0.2	0.4		0.7	0.3		0.4	1.2	
Delay (s)	26.6	25.2		25.2	26.5		31.2	15.4		36.8	23.6	
Level of Service	C	C		C	C		C	B		D	C	
Approach Delay (s)		25.8			26.4			17.0			23.8	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	22.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	86	11	3	455	3	13	0	4	3	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			0.97		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3363		1711	3418			1681		1711	1531	
Flt Permitted	0.47	1.00		0.69	1.00			0.80		0.75	1.00	
Satd. Flow (perm)	846	3363		1235	3418			1406		1343	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	93	12	3	495	3	14	0	4	3	0	11
RTOR Reduction (vph)	0	7	0	0	1	0	0	13	0	0	8	0
Lane Group Flow (vph)	7	98	0	3	497	0	0	5	0	3	3	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.9	10.9		10.9	10.9			7.8		7.8	7.8	
Effective Green, g (s)	10.9	10.9		10.9	10.9			7.8		7.8	7.8	
Actuated g/C Ratio	0.38	0.38		0.38	0.38			0.27		0.27	0.27	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	321	1277		469	1298			382		364	416	
v/s Ratio Prot		0.03			c0.15						0.00	
v/s Ratio Perm	0.01			0.00				c0.00		0.00		
v/c Ratio	0.02	0.08		0.01	0.38			0.01		0.01	0.01	
Uniform Delay, d1	5.6	5.7		5.5	6.5			7.6		7.6	7.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.0		0.0	0.2			0.0		0.0	0.0	
Delay (s)	5.6	5.7		5.5	6.6			7.6		7.6	7.6	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		5.7			6.6			7.6			7.6	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	28.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	28.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	43	0	0	395	4	70	31	84	0	0	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			1.00		1.00	0.89				0.85
Flt Protected		1.00			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3415			5124		1711	3046				2694
Flt Permitted		0.95			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3250			5124		1711	3046				2694
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	2	50	0	0	459	5	81	36	98	0	0	35
RTOR Reduction (vph)	0	0	0	0	1	0	0	58	0	0	0	33
Lane Group Flow (vph)	0	52	0	0	463	0	81	76	0	0	0	2
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1526			1786		697	1242				141
v/s Ratio Prot		c0.00			c0.09		c0.05	0.02				0.00
v/s Ratio Perm		0.01										
v/c Ratio		0.03			0.26		0.12	0.06				0.01
Uniform Delay, d1		11.0			17.7		14.0	13.7				34.1
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.0			0.4		0.3	0.1				0.2
Delay (s)		11.0			18.1		14.3	13.8				34.3
Level of Service		B			B		B	B				C
Approach Delay (s)		11.0			18.1			14.0			34.3	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.
4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	45	196	366	128	0	0
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	*0.85	*0.85	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.91	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1081	1008	2620	1422		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1081	1008	2620	1422		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	54	233	436	152	0	0
RTOR Reduction (vph)	39	59	0	0	0	0
Lane Group Flow (vph)	108	81	436	152	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	34.9	34.9	15.1	60.0		
Effective Green, g (s)	34.9	34.9	15.1	60.0		
Actuated g/C Ratio	0.58	0.58	0.25	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	628	586	659	1422		
v/s Ratio Prot	c0.10		c0.17	0.11		
v/s Ratio Perm		0.08				
v/c Ratio	0.17	0.14	0.66	0.11		
Uniform Delay, d1	5.8	5.7	20.2	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.1	0.1	2.5	0.0		
Delay (s)	6.0	5.8	22.7	0.0		
Level of Service	A	A	C	A		
Approach Delay (s)	5.9			16.8	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	42	85	6	191	1	105	85	5	0	126	263
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5			5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95			0.95	
Frpb, ped/bikes	1.00	0.91		1.00	1.00		1.00	0.99			0.91	
Flpb, ped/bikes	0.97	1.00		0.90	1.00		1.00	1.00			1.00	
Frt	1.00	0.90		1.00	1.00		1.00	0.99			0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1183	1866		1096	1278		1215	2390			1998	
Flt Permitted	0.36	1.00		0.66	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	452	1866		764	1278		1215	2390			1998	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	26	47	94	7	212	1	117	94	6	0	140	292
RTOR Reduction (vph)	0	66	0	0	0	0	0	2	0	0	168	0
Lane Group Flow (vph)	26	75	0	7	213	0	117	98	0	0	264	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.1	36.1		25.1	25.1		16.7	73.1			50.9	
Effective Green, g (s)	36.1	36.1		25.1	25.1		16.7	73.1			50.9	
Actuated g/C Ratio	0.30	0.30		0.21	0.21		0.14	0.61			0.42	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5			5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	170	561		159	267		169	1455			847	
v/s Ratio Prot	0.01	c0.04			c0.17		c0.10	0.04			c0.13	
v/s Ratio Perm	0.04			0.01								
v/c Ratio	0.15	0.13		0.04	0.80		0.69	0.07			0.31	
Uniform Delay, d1	30.7	30.6		37.9	45.0		49.2	9.6			22.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.4	0.1		0.1	15.2		11.6	0.1			1.0	
Delay (s)	31.1	30.7		38.0	60.2		60.8	9.6			23.9	
Level of Service	C	C		D	E		E	A			C	
Approach Delay (s)		30.7			59.5			37.2			23.9	
Approach LOS		C			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	35.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

23: Pennsylvania Street & I-280 SB On-Ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	82	464	171	142
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	89	504	186	154
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			564			
pX, platoon unblocked						
vC, conflicting volume	615	45			89	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	615	45			89	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			88	
cM capacity (veh/h)	371	1016			1504	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	45	45	504	186	154
Volume Left	0	0	0	186	0
Volume Right	0	0	504	0	0
cSH	1700	1700	1700	1504	1700
Volume to Capacity	0.03	0.03	0.30	0.12	0.09
Queue Length 95th (ft)	0	0	0	11	0
Control Delay (s)	0.0	0.0	0.0	7.7	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.2	
Approach LOS					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

25: 18th St & 280 SB Off-Ramp

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	99	79	0	95	112
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	108	86	0	103	122
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	86				140	86
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	86				140	86
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				88	87
cM capacity (veh/h)	1508				839	956

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	54	54	86	225
Volume Left	0	0	0	103
Volume Right	0	0	0	122
cSH	1700	1700	1700	898
Volume to Capacity	0.03	0.03	0.05	0.25
Queue Length 95th (ft)	0	0	0	25
Control Delay (s)	0.0	0.0	0.0	10.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.3
Approach LOS				B

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	91	103	79	273	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	112	86	297	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	383				340	86
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	383				340	86
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				100	100
cM capacity (veh/h)	1172				577	956

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	136	75	86	297	0
Volume Left	99	0	0	0	0
Volume Right	0	0	0	297	0
cSH	1172	1700	1700	1700	1700
Volume to Capacity	0.08	0.04	0.05	0.17	0.00
Queue Length 95th (ft)	7	0	0	0	0
Control Delay (s)	6.3	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	4.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	9	6	89	34	14	26	138	15	10	286	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.99		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1536			1548		1540	3035		1540	3050	
Flt Permitted		0.88			0.79		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1383			1255		1540	3035		1540	3050	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	10	7	97	37	15	28	150	16	11	311	21
RTOR Reduction (vph)	0	6	0	0	3	0	0	4	0	0	3	0
Lane Group Flow (vph)	0	24	0	0	146	0	28	162	0	11	329	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		19.2			19.2		4.8	81.9		3.7	80.8	
Effective Green, g (s)		19.2			19.2		4.8	81.9		3.7	80.8	
Actuated g/C Ratio		0.16			0.16		0.04	0.68		0.03	0.67	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		221			200		61	2071		47	2053	
v/s Ratio Prot							c0.02	0.05		0.01	c0.11	
v/s Ratio Perm		0.02			c0.12							
v/c Ratio		0.11			0.73		0.46	0.08		0.23	0.16	
Uniform Delay, d1		43.1			47.9		56.3	6.4		56.8	7.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			12.4		2.0	0.1		0.9	0.2	
Delay (s)		43.3			60.4		58.3	6.5		57.7	7.3	
Level of Service		D			E		E	A		E	A	
Approach Delay (s)		43.3			60.4			13.9			9.0	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	310	12	75	0	0	116
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	337	13	82	0	0	126

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	168	168	13	41	41	126
Volume Left (vph)	168	168	0	0	0	0
Volume Right (vph)	0	0	13	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.6	5.6	3.2	5.6	5.6	5.3
Degree Utilization, x	0.26	0.26	0.01	0.06	0.06	0.19
Capacity (veh/h)	619	624	1121	605	604	639
Control Delay (s)	9.4	9.4	5.0	7.8	7.8	9.6
Approach Delay (s)	9.2			7.8		9.6
Approach LOS	A			A		A

Intersection Summary			
Delay	9.1		
Level of Service	A		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	40	72	0	0	135	55	10	91	9	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	78	0	0	147	60	11	99	10	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	122	207	60	59
Volume Left (vph)	43	0	11	0
Volume Right (vph)	0	60	0	10
Hadj (s)	0.11	-0.14	0.12	-0.08
Departure Headway (s)	4.5	4.2	5.4	5.2
Degree Utilization, x	0.15	0.24	0.09	0.08
Capacity (veh/h)	765	820	633	656
Control Delay (s)	8.4	8.6	7.7	7.4
Approach Delay (s)	8.4	8.6	7.6	
Approach LOS	A	A	A	

Intersection Summary			
Delay	8.2		
Level of Service	A		
Intersection Capacity Utilization	29.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	16	41	13	82	1	32	110	1	0	376	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.91			1.00		1.00	1.00			0.96	
Flpb, ped/bikes		0.99			0.99		1.00	1.00			1.00	
Frt		0.92			1.00		1.00	1.00			0.98	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1155			1581		1540	2259			2134	
Flt Permitted		0.96			0.96		0.95	1.00			1.00	
Satd. Flow (perm)		1118			1522		1540	2259			2134	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	9	17	43	14	86	1	34	116	1	0	396	54
RTOR Reduction (vph)	0	38	0	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	31	0	0	101	0	34	117	0	0	447	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		13.2			13.2		5.7	96.5			85.7	
Effective Green, g (s)		13.2			13.2		5.7	96.5			85.7	
Actuated g/C Ratio		0.11			0.11		0.05	0.80			0.71	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		122			167		73	1816			1524	
v/s Ratio Prot							c0.02	0.05			c0.21	
v/s Ratio Perm		0.03			c0.07							
v/c Ratio		0.25			0.60		0.47	0.06			0.29	
Uniform Delay, d1		48.9			50.9		55.7	2.4			6.2	
Progression Factor		1.00			1.00		1.01	0.56			1.00	
Incremental Delay, d2		1.1			6.1		4.6	0.1			0.5	
Delay (s)		50.0			57.0		60.8	1.4			6.7	
Level of Service		D			E		E	A			A	
Approach Delay (s)		50.0			57.0			14.8			6.7	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	122	0	0	139	423	24	65	143	32	0	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1035	1540	1621	1199	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1035	1540	1621	1199	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	61	128	0	0	146	445	25	68	151	34	0	249
RTOR Reduction (vph)	0	0	0	0	0	255	0	0	133	0	0	223
Lane Group Flow (vph)	61	128	0	0	146	190	25	68	18	34	0	26
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	5.7	43.3			32.6	32.6	9.2	9.2	9.2	8.0		8.0
Effective Green, g (s)	5.7	43.3			32.6	32.6	9.2	9.2	9.2	8.0		8.0
Actuated g/C Ratio	0.07	0.57			0.43	0.43	0.12	0.12	0.12	0.10		0.10
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	114	1742			1312	441	185	194	144	161		126
v/s Ratio Prot	c0.04	0.04			0.05		0.02	c0.04		c0.02		0.02
v/s Ratio Perm						c0.18			0.02			
v/c Ratio	0.54	0.07			0.11	0.43	0.14	0.35	0.13	0.21		0.21
Uniform Delay, d1	34.1	7.5			13.2	15.4	30.1	30.9	30.1	31.4		31.3
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	4.8	0.1			0.2	3.0	0.3	1.1	0.4	0.7		0.8
Delay (s)	38.9	7.6			13.4	18.5	30.4	32.0	30.5	32.0		32.2
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		17.7			17.2			30.9			32.1	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	18	50	0	18	3	24	17	1	1	45	186
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.91			0.98		1.00	0.99		1.00	0.88	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3095			1769		1711	1786		1711	1583	
Flt Permitted		0.92			1.00		0.59	1.00		0.75	1.00	
Satd. Flow (perm)		2872			1769		1057	1786		1341	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	20	54	0	20	3	26	18	1	1	49	202
RTOR Reduction (vph)	0	32	0	0	2	0	0	1	0	0	118	0
Lane Group Flow (vph)	0	64	0	0	21	0	26	18	0	1	133	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Effective Green, g (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Actuated g/C Ratio		0.42			0.42		0.42	0.42		0.42	0.42	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		1196			737		440	744		558	659	
v/s Ratio Prot					0.01			0.01			c0.08	
v/s Ratio Perm		c0.02					0.02			0.00		
v/c Ratio		0.05			0.03		0.06	0.02		0.00	0.20	
Uniform Delay, d1		8.4			8.3		8.4	8.3		8.2	8.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.1		0.3	0.1		0.0	0.7	
Delay (s)		8.4			8.3		8.6	8.3		8.2	9.6	
Level of Service		A			A		A	A		A	A	
Approach Delay (s)		8.4			8.3			8.5			9.6	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	34.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

EXISTING 2015 (NO PROJECT)
NO SF GIANTS GAME AT AT&T PARK
SATURDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	637	670	58	133	569	78	43	483	154	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.89			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.99		1.00	0.98			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3018		2987	2982			5514	1233			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3018		2987	2982			5514	1233			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	708	744	64	148	632	87	48	537	171	0	0	0
RTOR Reduction (vph)	0	4	0	0	8	0	0	0	140	0	0	0
Lane Group Flow (vph)	708	804	0	148	711	0	0	585	31	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	25.6	60.4		10.8	45.6			19.9	19.9			
Effective Green, g (s)	25.6	60.4		10.8	45.6			19.9	19.9			
Actuated g/C Ratio	0.23	0.55		0.10	0.41			0.18	0.18			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	1042	1657		293	1236			997	223			
v/s Ratio Prot	c0.16	0.27		0.05	c0.24							
v/s Ratio Perm								0.11	0.03			
v/c Ratio	0.68	0.49		0.51	0.58			0.59	0.14			
Uniform Delay, d1	38.5	15.2		47.1	24.8			41.3	37.8			
Progression Factor	0.58	0.25		1.36	0.25			1.12	3.29			
Incremental Delay, d2	1.6	0.9		0.4	0.2			0.8	0.3			
Delay (s)	23.7	4.7		64.2	6.3			47.1	124.7			
Level of Service	C	A		E	A			D	F			
Approach Delay (s)		13.6			16.2			64.7			0.0	
Approach LOS		B			B			E			A	

Intersection Summary			
HCM 2000 Control Delay	26.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	1277	79	51	517	44	7	49	28	60	207	97
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.98		1.00	0.95			1.00	0.63	1.00	0.98	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.96	1.00	0.67	1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85	1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4288		1296	2437			1539	852	1033	2863	580
Flt Permitted	0.95	1.00		0.95	1.00			0.94	1.00	0.72	1.00	1.00
Satd. Flow (perm)	1540	4288		1296	2437			1452	852	781	2863	580
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	162	1359	84	54	550	47	7	52	30	64	220	103
RTOR Reduction (vph)	0	4	0	0	4	0	0	0	26	0	3	79
Lane Group Flow (vph)	162	1439	0	54	593	0	0	59	4	64	227	14
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	17.5	66.0		8.9	55.8			15.2	15.2	16.2	16.2	16.2
Effective Green, g (s)	17.5	66.0		8.9	55.8			15.2	15.2	16.2	16.2	16.2
Actuated g/C Ratio	0.16	0.60		0.08	0.51			0.14	0.14	0.15	0.15	0.15
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	245	2572		104	1236			200	117	115	421	85
v/s Ratio Prot	0.11	c0.34		0.04	c0.24						0.08	
v/s Ratio Perm								0.04	0.00	c0.08		0.02
v/c Ratio	0.66	0.56		0.52	0.48			0.29	0.04	0.56	0.54	0.16
Uniform Delay, d1	43.5	13.2		48.5	17.6			42.6	41.1	43.6	43.4	41.0
Progression Factor	0.90	1.29		0.84	0.51			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.1	0.7		3.6	0.2			0.8	0.1	5.7	1.3	0.9
Delay (s)	44.4	17.8		44.2	9.2			43.4	41.2	49.3	44.8	41.9
Level of Service	D	B		D	A			D	D	D	D	D
Approach Delay (s)		20.5			12.1			42.7			44.8	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1458	80	3	618	30	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3052			3078	1540	1357
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	3052			2922	1540	1357
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1602	88	3	679	33	55
RTOR Reduction (vph)	1	0	0	0	0	21
Lane Group Flow (vph)	1689	0	0	682	33	35
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	91.2			91.2	7.5	7.5
Effective Green, g (s)	91.2			91.2	7.5	7.5
Actuated g/C Ratio	0.83			0.83	0.07	0.07
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2530			2422	105	92
v/s Ratio Prot	c0.55				0.02	
v/s Ratio Perm				0.23		c0.03
v/c Ratio	0.67			0.28	0.31	0.38
Uniform Delay, d1	3.6			2.1	48.8	49.0
Progression Factor	1.00			0.55	1.00	1.00
Incremental Delay, d2	1.4			0.1	1.7	2.6
Delay (s)	5.0			1.2	50.5	51.6
Level of Service	A			A	D	D
Approach Delay (s)	5.0			1.2	51.2	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	262	1267	145	34	172	356	188	134	443	262
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.97	1.00
Flpb, ped/bikes		0.99			0.99	1.00			1.00	1.00
Frt		0.99			1.00	0.95			0.98	0.85
Flt Protected		0.99			0.99	1.00			0.96	1.00
Satd. Flow (prot)		5770			2846	2429			3976	1122
Flt Permitted		0.99			0.83	1.00			0.96	1.00
Satd. Flow (perm)		5770			2373	2429			3976	1122
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	270	1306	149	35	177	367	194	138	457	270
RTOR Reduction (vph)	0	22	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	1703	0	0	212	555	0	0	665	200
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		22.4			20.4	20.4			14.7	14.7
Effective Green, g (s)		24.4			23.4	23.4			17.7	17.7
Actuated g/C Ratio		0.33			0.31	0.31			0.24	0.24
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1877			740	757			938	264
v/s Ratio Prot						c0.23			0.17	c0.18
v/s Ratio Perm		0.30			0.09					
v/c Ratio		0.91			0.29	0.73			0.71	0.76
Uniform Delay, d1		24.2			19.5	23.0			26.3	26.7
Progression Factor		1.00			0.71	1.00			1.00	1.00
Incremental Delay, d2		6.8			0.2	3.7			2.5	11.7
Delay (s)		31.0			14.0	26.7			28.8	38.4
Level of Service		C			B	C			C	D
Approach Delay (s)		31.0			14.0	26.7			31.0	
Approach LOS		C			B	C			C	

Intersection Summary			
HCM 2000 Control Delay	29.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	51	301	276	49	155	105	14	231	55	466
Ideal Flow (vphpl)	1400	1400	1400	1400	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.88		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.98		0.94		0.85		1.00	1.00
Flt Protected		0.95	0.99		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1700	2621		2297		1161		1327	2547
Flt Permitted		0.95	0.99		1.00		1.00		0.44	0.91
Satd. Flow (perm)		1700	2621		2297		1161		621	2321
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	63	372	341	60	191	130	17	285	68	575
RTOR Reduction (vph)	0	0	19	0	1	0	12	0	0	0
Lane Group Flow (vph)	0	331	486	0	322	0	3	0	292	636
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		419	733		535		247		386	1043
v/s Ratio Prot		c0.19	0.19		0.14				c0.13	0.10
v/s Ratio Perm							0.00		c0.20	0.16
v/c Ratio		0.79	0.66		0.60		0.01		0.76	0.61
Uniform Delay, d1		26.4	23.9		25.6		23.3		20.1	16.4
Progression Factor		1.00	1.00		1.00		1.00		0.88	0.89
Incremental Delay, d2		14.1	4.7		5.0		0.1		10.1	2.0
Delay (s)		40.5	28.5		30.6		23.4		27.9	16.7
Level of Service		D	C		C		C		C	B
Approach Delay (s)			33.3		30.3					20.2
Approach LOS			C		C					C

Intersection Summary			
HCM 2000 Control Delay	27.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	2	39	8	4	14	9	321	2	7	72	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.93		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1550	1350		1464		1272	2541		1540	3032	
Flt Permitted		1.00	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1614	1350		1486		1272	2541		1540	3032	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	10	2	40	8	4	14	9	331	2	7	74	7
RTOR Reduction (vph)	0	0	37	0	13	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	12	3	0	13	0	9	332	0	7	76	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		1.9	1.9		1.9		0.6	9.0		0.6	9.3	
Effective Green, g (s)		1.9	1.9		1.9		0.6	9.0		0.6	9.3	
Actuated g/C Ratio		0.07	0.07		0.07		0.02	0.33		0.02	0.34	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		111	93		103		27	834		33	1029	
v/s Ratio Prot							0.01	c0.13		0.00	c0.03	
v/s Ratio Perm		0.01	0.00		c0.01							
v/c Ratio		0.11	0.03		0.13		0.33	0.40		0.21	0.07	
Uniform Delay, d1		12.0	11.9		12.0		13.2	7.1		13.2	6.1	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4	0.1		0.6		2.6	0.3		1.2	0.0	
Delay (s)		12.4	12.0		12.5		15.8	7.4		14.3	6.2	
Level of Service		B	B		B		B	A		B	A	
Approach Delay (s)		12.1			12.5			7.6			6.8	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	27.4	Sum of lost time (s)	15.9
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	5	7	2	2	16	5	29	1	44	59	10
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	1.00	1.00	1.00		1.00	0.97	
Flpb, ped/bikes		0.99			1.00	1.00	0.83	1.00		1.00	1.00	
Frt		0.95			1.00	0.85	1.00	1.00		1.00	0.98	
Flt Protected		0.98			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2372			1413	1230	1148	1438		1377	1379	
Flt Permitted		0.95			1.00	1.00	1.00	1.00		0.95	1.00	
Satd. Flow (perm)		2306			1448	1230	1208	1438		1377	1379	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	8	6	8	2	2	18	6	33	1	51	68	11
RTOR Reduction (vph)	0	8	0	0	0	8	0	1	0	0	3	0
Lane Group Flow (vph)	0	14	0	0	4	10	6	33	0	51	76	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.1			1.1	20.5	1.2	1.2		19.4	25.6	
Effective Green, g (s)		1.1			1.1	20.5	1.2	1.2		19.4	25.6	
Actuated g/C Ratio		0.03			0.03	0.56	0.03	0.03		0.53	0.70	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		69			43	854	39	47		727	961	
v/s Ratio Prot						0.01		c0.02		0.04	c0.05	
v/s Ratio Perm		c0.01			0.00	0.00	0.00					
v/c Ratio		0.21			0.09	0.01	0.15	0.70		0.07	0.08	
Uniform Delay, d1		17.4			17.3	3.6	17.3	17.6		4.2	1.8	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.5			0.9	0.0	1.8	38.1		0.0	0.0	
Delay (s)		18.9			18.3	3.6	19.1	55.6		4.2	1.8	
Level of Service		B			B	A	B	E		A	A	
Approach Delay (s)		18.9			6.3			50.2			2.8	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	36.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	20	88	184	25	39	76
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1744	1535	846	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1744	1535	846	1134	1194
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	23	101	211	29	45	87
RTOR Reduction (vph)	0	89	0	17	0	0
Lane Group Flow (vph)	23	12	211	12	45	87
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	5.9	5.9	25.2	20.2	3.1	33.3
Effective Green, g (s)	5.9	5.9	25.2	20.2	3.1	33.3
Actuated g/C Ratio	0.12	0.12	0.51	0.41	0.06	0.68
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	135	209	786	433	71	808
v/s Ratio Prot	c0.02		c0.14	0.01	c0.04	0.07
v/s Ratio Perm		0.01		0.01		
v/c Ratio	0.17	0.06	0.27	0.03	0.63	0.11
Uniform Delay, d1	19.5	19.2	6.8	8.6	22.5	2.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.1	0.2	0.0	17.0	0.1
Delay (s)	20.1	19.3	7.0	8.7	39.5	2.8
Level of Service	C	B	A	A	D	A
Approach Delay (s)	19.4		7.2			15.3
Approach LOS	B		A			B

Intersection Summary			
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	49.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	1	7	57	33	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	4	1	8	68	39	4
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	192	121	93			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	192	121	93			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	99			
cM capacity (veh/h)	717	839	1442			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	4	1	31	45	26	17
Volume Left	4	0	8	0	0	0
Volume Right	0	1	0	0	0	4
cSH	717	839	1442	1700	1700	1700
Volume to Capacity	0.00	0.00	0.01	0.03	0.02	0.01
Queue Length 95th (ft)	0	0	0	0	0	0
Control Delay (s)	10.0	9.3	2.1	0.0	0.0	0.0
Lane LOS	B	A	A			
Approach Delay (s)	9.9		0.8		0.0	
Approach LOS	A					

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	29.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	10	4	287	7	2	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.85	1.00		1.00	1.00
Flpb, ped/bikes	0.94	1.00	1.00		1.00	1.00
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1613	1304	3401		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1613	1304	3401		1711	3421
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	11	4	309	8	2	243
RTOR Reduction (vph)	0	4	1	0	0	0
Lane Group Flow (vph)	11	0	316	0	2	243
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	1.4	1.4	59.1		1.2	65.4
Effective Green, g (s)	1.4	1.4	59.1		1.2	65.4
Actuated g/C Ratio	0.02	0.02	0.77		0.02	0.85
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	29	23	2610		26	2905
v/s Ratio Prot			c0.09		0.00	c0.07
v/s Ratio Perm	c0.01	0.00				
v/c Ratio	0.38	0.00	0.12		0.08	0.08
Uniform Delay, d1	37.4	37.1	2.3		37.4	0.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	8.1	0.1	0.1		1.3	0.1
Delay (s)	45.5	37.2	2.4		38.6	1.0
Level of Service	D	D	A		D	A
Approach Delay (s)	43.3		2.4			1.3
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	3.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	77.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	64	34	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	75	40	0
Pedestrians	25			1	1	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	104	46	65			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	104	46	65			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	866	993	1506			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	25	50	27	13
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1506	1700	1700	1700
Volume to Capacity	0.00	0.00	0.03	0.02	0.01
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.0	0.0		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	19.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1	20	2	2	28	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	1	25	3	3	35	1
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	499					
pX, platoon unblocked						
vC, conflicting volume			77		122	114
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			77		122	114
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			1464		807	868

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	27	5	37
Volume Left	0	3	35
Volume Right	25	0	1
cSH	1700	1464	809
Volume to Capacity	0.02	0.00	0.05
Queue Length 95th (ft)	0	0	4
Control Delay (s)	0.0	3.7	9.7
Lane LOS		A	A
Approach Delay (s)	0.0	3.7	9.7
Approach LOS			A

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	29.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰↰	↑↱		↰	↑↱	
Volume (vph)	46	18	99	1	23	6	62	242	2	1	163	71
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1280	1365	1128	1291	1365	1116	2515	2590		1296	2454	
Flt Permitted	0.74	1.00	1.00	0.74	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	997	1365	1128	1011	1365	1116	2515	2590		1296	2454	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	52	20	111	1	26	7	70	272	2	1	183	80
RTOR Reduction (vph)	0	0	92	0	0	6	0	1	0	0	59	0
Lane Group Flow (vph)	52	20	19	1	26	1	70	273	0	1	204	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	5.9	5.9	5.9	5.9	5.9	5.9	3.4	11.3		1.0	8.9	
Effective Green, g (s)	5.9	5.9	5.9	5.9	5.9	5.9	3.4	11.3		1.0	8.9	
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17	0.17	0.10	0.33		0.03	0.26	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	173	237	196	175	237	194	252	863		38	644	
v/s Ratio Prot		0.01			0.02		0.03	c0.11		0.00	c0.08	
v/s Ratio Perm	c0.05		0.02	0.00		0.00						
v/c Ratio	0.30	0.08	0.10	0.01	0.11	0.01	0.28	0.32		0.03	0.32	
Uniform Delay, d1	12.2	11.7	11.8	11.6	11.8	11.6	14.1	8.4		16.0	10.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.2	0.2	0.0	0.2	0.0	0.6	0.2		0.3	0.3	
Delay (s)	13.2	11.9	12.0	11.6	12.0	11.6	14.7	8.6		16.3	10.3	
Level of Service	B	B	B	B	B	B	B	A		B	B	
Approach Delay (s)		12.3			11.9			9.9			10.4	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	33.9	Sum of lost time (s)	15.7
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↱		↰	↑↱	
Volume (vph)	39	144	1	2	141	12	3	5	1	17	1	44
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.87	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1255	1621	1663		1493	1356	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.73	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1255	1239	1663		1185	1356	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	41	150	1	2	147	12	3	5	1	18	1	46
RTOR Reduction (vph)	0	0	0	0	0	6	0	1	0	0	37	0
Lane Group Flow (vph)	41	150	1	2	147	6	3	5	0	18	10	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	7.4	47.2	47.2	2.4	42.2	42.2	14.9	14.9		14.9	14.9	
Effective Green, g (s)	7.4	47.2	47.2	2.4	42.2	42.2	14.9	14.9		14.9	14.9	
Actuated g/C Ratio	0.09	0.59	0.59	0.03	0.53	0.53	0.19	0.19		0.19	0.19	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	150	1012	860	48	905	666	232	311		222	254	
v/s Ratio Prot	c0.03	c0.09		0.00	c0.09			0.00			0.01	
v/s Ratio Perm			0.00			0.01	0.00			c0.02		
v/c Ratio	0.27	0.15	0.00	0.04	0.16	0.01	0.01	0.02		0.08	0.04	
Uniform Delay, d1	33.5	7.2	6.6	37.4	9.6	8.8	26.3	26.3		26.7	26.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.3	0.0	0.4	0.1	0.0	0.0	0.0		0.2	0.1	
Delay (s)	34.5	7.5	6.6	37.8	9.7	8.8	26.3	26.4		26.8	26.5	
Level of Service	C	A	A	D	A	A	C	C		C	C	
Approach Delay (s)		13.3			9.9			26.3			26.6	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↱			↰↑	↱
Volume (vph)	14	151	3	5	179	4	11	42	13	21	14	39
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1044	1540	2967			2989	1074
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.95	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1044	1543	2967			2941	1074
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	16	170	3	6	201	4	12	47	15	24	16	44
RTOR Reduction (vph)	0	0	2	0	0	3	0	13	0	0	0	39
Lane Group Flow (vph)	16	170	1	6	201	1	12	49	0	0	40	5
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	0.8	10.3	10.3	0.6	9.1	9.1	4.2	4.2			3.2	3.2
Effective Green, g (s)	0.8	10.3	10.3	0.6	9.1	9.1	4.2	4.2			3.2	3.2
Actuated g/C Ratio	0.03	0.37	0.37	0.02	0.32	0.32	0.15	0.15			0.11	0.11
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	34	445	505	32	393	338	230	443			334	122
v/s Ratio Prot	c0.01	0.14		0.00	c0.17			c0.02				
v/s Ratio Perm			0.00			0.00	0.01				0.01	0.00
v/c Ratio	0.47	0.38	0.00	0.19	0.51	0.00	0.05	0.11			0.12	0.04
Uniform Delay, d1	13.4	6.6	5.6	13.5	7.7	6.4	10.2	10.3			11.2	11.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	9.9	0.5	0.0	2.8	1.1	0.0	0.1	0.1			0.2	0.1
Delay (s)	23.4	7.1	5.6	16.3	8.8	6.4	10.3	10.4			11.3	11.2
Level of Service	C	A	A	B	A	A	B	B			B	B
Approach Delay (s)		8.5			9.0			10.4			11.3	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	28.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑	↱	↰	↑	↱	↰	↑↱	
Volume (vph)	20	140	60	8	174	47	31	91	8	20	40	24
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.92	1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1329	1129		1333	1407	1101	1337	1196	1147	1337	1302	
Flt Permitted	0.36	1.00		0.61	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	501	1129		859	1407	1101	1337	1196	1147	1337	1302	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	24	165	71	9	205	55	36	107	9	24	47	28
RTOR Reduction (vph)	0	20	0	0	0	37	0	0	7	0	22	0
Lane Group Flow (vph)	24	216	0	9	205	18	36	107	2	24	53	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	12.0	12.0		12.0	12.0	15.3	3.1	9.8	9.8	3.3	10.0	
Effective Green, g (s)	12.0	12.0		12.0	12.0	15.3	3.1	9.8	9.8	3.3	10.0	
Actuated g/C Ratio	0.26	0.26		0.26	0.26	0.34	0.07	0.22	0.22	0.07	0.22	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	139	297		230	371	491	91	257	247	96	286	
v/s Ratio Prot	0.00	c0.19		0.00	c0.15	0.00	0.03	c0.09		0.02	c0.04	
v/s Ratio Perm	0.04			0.01		0.01			0.00			
v/c Ratio	0.17	0.73		0.04	0.55	0.04	0.40	0.42	0.01	0.25	0.19	
Uniform Delay, d1	14.2	15.3		12.5	14.4	10.2	20.3	15.4	14.0	19.9	14.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	8.6		0.1	1.8	0.0	2.8	1.1	0.0	1.4	0.3	
Delay (s)	14.8	23.9		12.5	16.2	10.2	23.1	16.5	14.0	21.3	14.8	
Level of Service	B	C		B	B	B	C	B	B	C	B	
Approach Delay (s)		23.0			14.9			17.9			16.3	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	45.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	39	27	26	54	7	22	24	30	5	24	7
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	2	49	34	32	68	9	28	30	38	6	30	9

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	85	33	76	58	38	45
Volume Left (vph)	3	33	0	28	0	6
Volume Right (vph)	34	0	9	0	38	9
Hadj (s)	-0.20	0.53	-0.05	0.27	-0.67	-0.05
Departure Headway (s)	4.8	5.5	4.9	5.3	4.4	5.0
Degree Utilization, x	0.11	0.05	0.10	0.08	0.05	0.06
Capacity (veh/h)	727	632	709	650	784	675
Control Delay (s)	8.4	7.5	7.2	7.6	6.4	8.4
Approach Delay (s)	8.4	7.3		7.1		8.4
Approach LOS	A	A		A		A

Intersection Summary			
Delay	7.7		
Level of Service	A		
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	42	21	11	59	13	16	247	14	12	179	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.97		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1664	3212		1677	3300		1260	2495		1260	2391	
Flt Permitted	0.70	1.00		0.71	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1227	3212		1249	3300		1260	2495		1260	2391	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	53	48	24	13	68	15	18	284	16	14	206	83
RTOR Reduction (vph)	0	18	0	0	11	0	0	3	0	0	35	0
Lane Group Flow (vph)	53	54	0	13	72	0	18	297	0	14	254	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	22.5	22.5		22.5	22.5		6.5	48.9		2.5	44.9	
Effective Green, g (s)	22.5	22.5		22.5	22.5		6.5	48.9		2.5	44.9	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.07	0.55		0.03	0.50	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	308	808		314	830		91	1364		35	1200	
v/s Ratio Prot		0.02			0.02		0.01	c0.12		0.01	c0.11	
v/s Ratio Perm	c0.04			0.01								
v/c Ratio	0.17	0.07		0.04	0.09		0.20	0.22		0.40	0.21	
Uniform Delay, d1	26.2	25.5		25.3	25.6		39.0	10.4		42.7	12.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.0		0.1	0.0		1.1	0.4		7.3	0.1	
Delay (s)	26.4	25.5		25.3	25.6		40.1	10.8		50.1	12.5	
Level of Service	C	C		C	C		D	B		D	B	
Approach Delay (s)		25.9			25.6			12.4			14.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	89.4	Sum of lost time (s)	15.5
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	132	11	2	142	1	13	0	1	2	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.99		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3382		1711	3418			1705		1711	1621	
Flt Permitted	0.75	1.00		0.75	1.00			0.85		0.75	1.00	
Satd. Flow (perm)	1359	3382		1359	3418			1514		1346	1621	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	143	12	2	154	1	14	0	1	2	1	2
RTOR Reduction (vph)	0	10	0	0	1	0	0	8	0	0	1	0
Lane Group Flow (vph)	2	145	0	2	154	0	0	7	0	2	2	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	5.3	5.3		5.3	5.3			12.9		12.9	12.9	
Effective Green, g (s)	5.3	5.3		5.3	5.3			12.9		12.9	12.9	
Actuated g/C Ratio	0.19	0.19		0.19	0.19			0.46		0.46	0.46	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	255	635		255	642			692		615	741	
v/s Ratio Prot		0.04			c0.05						0.00	
v/s Ratio Perm	0.00			0.00				c0.00		0.00		
v/c Ratio	0.01	0.23		0.01	0.24			0.01		0.00	0.00	
Uniform Delay, d1	9.3	9.7		9.3	9.7			4.2		4.2	4.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.2		0.0	0.2			0.0		0.0	0.0	
Delay (s)	9.3	9.9		9.3	9.9			4.2		4.2	4.2	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		9.9			9.9			4.2			4.2	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.08		
Actuated Cycle Length (s)	28.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	85	0	0	212	2	155	43	68	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			1.00		1.00	0.91				0.85
Flt Protected		1.00			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3420			5126		1711	3107				2694
Flt Permitted		0.95			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3265			5126		1711	3107				2694
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	1	106	0	0	265	2	194	54	85	0	0	31
RTOR Reduction (vph)	0	0	0	0	1	0	0	50	0	0	0	29
Lane Group Flow (vph)	0	107	0	0	266	0	194	89	0	0	0	2
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1533			1787		697	1267				141
v/s Ratio Prot		c0.00			c0.05		c0.11	0.03				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.07			0.15		0.28	0.07				0.01
Uniform Delay, d1		11.2			17.0		15.0	13.7				34.1
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.2		1.0	0.1				0.1
Delay (s)		11.2			17.2		16.0	13.8				34.3
Level of Service		B			B		B	B				C
Approach Delay (s)		11.2			17.2			15.1			34.3	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	32.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.
4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	86	169	153	239	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.95	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1609	1428	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1609	1428	3319	1801		
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	105	206	187	291	0	0
RTOR Reduction (vph)	18	46	0	0	0	0
Lane Group Flow (vph)	145	102	187	291	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	41.3	41.3	8.7	60.0		
Effective Green, g (s)	41.3	41.3	8.7	60.0		
Actuated g/C Ratio	0.69	0.69	0.14	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	1107	982	481	1801		
v/s Ratio Prot	0.09		c0.06	c0.16		
v/s Ratio Perm		0.07				
v/c Ratio	0.13	0.10	0.39	0.16		
Uniform Delay, d1	3.2	3.1	23.2	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.1	0.0	0.5	0.0		
Delay (s)	3.3	3.2	23.8	0.0		
Level of Service	A	A	C	A		
Approach Delay (s)	3.2			9.3	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	33	105	2	25	0	85	164	0	6	154	53
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.98	1.00		0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	1.00		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1190	1903		1160	1279		1215	2431		1215	2295	
Flt Permitted	0.40	1.00		0.83	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	496	1903		1018	1279		1215	2431		1215	2295	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	55	37	118	2	28	0	96	184	0	7	173	60
RTOR Reduction (vph)	0	87	0	0	0	0	0	0	0	0	26	0
Lane Group Flow (vph)	55	68	0	2	28	0	96	184	0	7	207	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	14.9	14.9		4.8	4.8		6.0	23.2		2.2	19.4	
Effective Green, g (s)	14.9	14.9		4.8	4.8		6.0	23.2		2.2	19.4	
Actuated g/C Ratio	0.26	0.26		0.08	0.08		0.11	0.41		0.04	0.34	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	189	500		86	108		128	996		47	786	
v/s Ratio Prot	c0.02	0.04			0.02		c0.08	0.08		0.01	c0.09	
v/s Ratio Perm	c0.05			0.00								
v/c Ratio	0.29	0.14		0.02	0.26		0.75	0.18		0.15	0.26	
Uniform Delay, d1	16.4	15.9		23.8	24.2		24.6	10.7		26.3	13.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.1		0.1	1.3		21.6	0.1		1.5	0.2	
Delay (s)	17.2	16.1		23.9	25.5		46.2	10.8		27.8	13.6	
Level of Service	B	B		C	C		D	B		C	B	
Approach Delay (s)		16.4			25.4			22.9			14.0	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	56.6	Sum of lost time (s)	21.6
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280SB On-Ramps

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	115	133	106	173
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	125	145	115	188
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			615			
pX, platoon unblocked						
vC, conflicting volume	543	62			125	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	543	62			125	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			92	
cM capacity (veh/h)	432	989			1459	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	62	62	145	115	188
Volume Left	0	0	0	115	0
Volume Right	0	0	145	0	0
cSH	1700	1700	1700	1459	1700
Volume to Capacity	0.04	0.04	0.09	0.08	0.11
Queue Length 95th (ft)	0	0	0	6	0
Control Delay (s)	0.0	0.0	0.0	7.7	0.0
Lane LOS				A	
Approach Delay (s)	0.0			2.9	
Approach LOS					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	20.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	93	56	0	117	81
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	101	61	0	127	88
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	61				111	61
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	61				111	61
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				85	91
cM capacity (veh/h)	1541				874	992

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	51	51	61	215
Volume Left	0	0	0	127
Volume Right	0	0	0	88
cSH	1700	1700	1700	918
Volume to Capacity	0.03	0.03	0.04	0.23
Queue Length 95th (ft)	0	0	0	23
Control Delay (s)	0.0	0.0	0.0	10.1
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.1
Approach LOS				B

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	65	145	56	63	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	158	61	68	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	129				281	61
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	129				281	61
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	100
cM capacity (veh/h)	1454				652	992

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	123	105	61	68	0
Volume Left	71	0	0	0	0
Volume Right	0	0	0	68	0
cSH	1454	1700	1700	1700	1700
Volume to Capacity	0.05	0.06	0.04	0.04	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	4.5	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.4		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	17	8	19	27	16	32	240	19	14	202	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.97		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1546			1541		1540	3045		1540	3029	
Flt Permitted		0.90			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1413			1376		1540	3045		1540	3029	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	18	9	21	29	17	35	261	21	15	220	27
RTOR Reduction (vph)	0	8	0	0	15	0	0	4	0	0	6	0
Lane Group Flow (vph)	0	34	0	0	52	0	35	278	0	15	241	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.4			7.4		4.5	54.9		2.7	53.1	
Effective Green, g (s)		7.4			7.4		4.5	54.9		2.7	53.1	
Actuated g/C Ratio		0.09			0.09		0.06	0.68		0.03	0.66	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		130			126		86	2084		51	2005	
v/s Ratio Prot							c0.02	c0.09		c0.01	0.08	
v/s Ratio Perm		0.02			c0.04							
v/c Ratio		0.26			0.41		0.41	0.13		0.29	0.12	
Uniform Delay, d1		33.9			34.3		36.6	4.4		37.8	5.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1			2.2		1.1	0.1		1.2	0.1	
Delay (s)		34.9			36.5		37.7	4.5		39.0	5.1	
Level of Service		C			D		D	A		D	A	
Approach Delay (s)		34.9			36.5			8.2			7.0	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	31.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	213	27	101	0	0	117
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	232	29	110	0	0	127

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	116	116	29	55	55	127
Volume Left (vph)	116	116	0	0	0	0
Volume Right (vph)	0	0	29	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.6	5.6	3.2	5.3	5.3	5.1
Degree Utilization, x	0.18	0.18	0.03	0.08	0.08	0.18
Capacity (veh/h)	609	613	1121	644	643	670
Control Delay (s)	8.7	8.7	5.1	7.6	7.6	9.2
Approach Delay (s)	8.3			7.6		9.2
Approach LOS	A			A		A

Intersection Summary			
Delay	8.4		
Level of Service	A		
Intersection Capacity Utilization	18.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	71	0	0	48	61	15	194	7	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	54	77	0	0	52	66	16	211	8	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	132	118	122	113
Volume Left (vph)	54	0	16	0
Volume Right (vph)	0	66	0	8
Hadj (s)	0.12	-0.30	0.10	-0.01
Departure Headway (s)	4.7	4.3	5.2	5.1
Degree Utilization, x	0.17	0.14	0.18	0.16
Capacity (veh/h)	718	780	665	678
Control Delay (s)	8.7	8.1	8.1	7.8
Approach Delay (s)	8.7	8.1	8.0	
Approach LOS	A	A	A	

Intersection Summary			
Delay	8.2		
Level of Service	A		
Intersection Capacity Utilization	25.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		←↑→			←↑→		↰	↑↑↱			↑↑↱	
Volume (vph)	21	17	42	4	26	1	51	243	3	0	213	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.93			1.00		1.00	1.00			0.96	
Flpb, ped/bikes		0.97			0.99		1.00	1.00			1.00	
Frt		0.93			1.00		1.00	1.00			0.98	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1178			1580		1540	2257			2134	
Flt Permitted		0.90			0.97		0.95	1.00			1.00	
Satd. Flow (perm)		1074			1539		1540	2257			2134	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	18	44	4	27	1	54	256	3	0	224	35
RTOR Reduction (vph)	0	40	0	0	1	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	44	0	0	31	0	54	259	0	0	255	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		8.7			8.7		7.8	81.0			68.1	
Effective Green, g (s)		8.7			8.7		7.8	81.0			68.1	
Actuated g/C Ratio		0.09			0.09		0.08	0.81			0.68	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		93			133		120	1828			1453	
v/s Ratio Prot							c0.04	0.11			c0.12	
v/s Ratio Perm		c0.04			0.02							
v/c Ratio		0.47			0.23		0.45	0.14			0.18	
Uniform Delay, d1		43.5			42.5		44.1	2.0			5.8	
Progression Factor		1.00			1.00		1.00	1.00			0.45	
Incremental Delay, d2		3.7			0.9		2.7	0.2			0.2	
Delay (s)		47.2			43.4		46.7	2.2			2.8	
Level of Service		D			D		D	A			A	
Approach Delay (s)		47.2			43.4			9.9			2.8	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↑↑	↱	↰	↑	↱	↰		↱
Volume (vph)	118	259	0	0	93	118	78	79	130	40	0	137
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1035	1540	1621	1201	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1035	1540	1621	1201	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	124	273	0	0	98	124	82	83	137	42	0	144
RTOR Reduction (vph)	0	0	0	0	0	79	0	0	120	0	0	129
Lane Group Flow (vph)	124	273	0	0	98	45	82	83	17	42	0	15
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	9.8	42.3			27.5	27.5	9.7	9.7	9.7	8.0		8.0
Effective Green, g (s)	9.8	42.3			27.5	27.5	9.7	9.7	9.7	8.0		8.0
Actuated g/C Ratio	0.13	0.56			0.36	0.36	0.13	0.13	0.13	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	198	1713			1114	374	196	206	153	162		126
v/s Ratio Prot	c0.08	c0.09			0.03		c0.05	0.05		c0.03		0.01
v/s Ratio Perm						0.04			0.01			
v/c Ratio	0.63	0.16			0.09	0.12	0.42	0.40	0.11	0.26		0.12
Uniform Delay, d1	31.4	8.2			16.0	16.2	30.6	30.5	29.3	31.3		30.8
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	6.1	0.2			0.2	0.7	1.4	1.3	0.3	0.9		0.4
Delay (s)	37.4	8.4			16.1	16.8	32.0	31.8	29.7	32.1		31.2
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		17.5			16.5			30.9			31.4	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	14	34	0	15	0	16	20	2	0	29	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Util. Factor		0.95			1.00		1.00	1.00			1.00	
Frt		0.92			1.00		1.00	0.99			0.94	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3103			1801		1711	1778			1697	
Flt Permitted		0.92			1.00		0.72	1.00			1.00	
Satd. Flow (perm)		2895			1801		1302	1778			1697	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	15	37	0	16	0	17	22	2	0	32	20
RTOR Reduction (vph)	0	22	0	0	0	0	0	1	0	0	12	0
Lane Group Flow (vph)	0	45	0	0	16	0	17	23	0	0	40	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0			20.0		20.0	20.0			20.0	
Effective Green, g (s)		20.0			20.0		20.0	20.0			20.0	
Actuated g/C Ratio		0.42			0.42		0.42	0.42			0.42	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		1206			750		542	740			707	
v/s Ratio Prot					0.01			0.01			c0.02	
v/s Ratio Perm		c0.02					0.01					
v/c Ratio		0.04			0.02		0.03	0.03			0.06	
Uniform Delay, d1		8.3			8.2		8.3	8.3			8.4	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.1			0.1		0.1	0.1			0.2	
Delay (s)		8.4			8.3		8.4	8.4			8.5	
Level of Service		A			A		A	A			A	
Approach Delay (s)		8.4			8.3			8.4			8.5	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.05		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	21.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

EXISTING 2015 (NO PROJECT)
WITH SF GIANTS GAME AT AT&T PARK
SATURDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	462	634	95	176	575	87	26	419	83	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.89			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.98		1.00	0.98			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	2979		2987	2974			5531	1231			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	2979		2987	2974			5531	1231			
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	570	783	117	217	710	107	32	517	102	0	0	0
RTOR Reduction (vph)	0	8	0	0	9	0	0	0	85	0	0	0
Lane Group Flow (vph)	570	892	0	217	808	0	0	549	17	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	22.8	59.8		13.2	50.2			18.1	18.1			
Effective Green, g (s)	22.8	59.8		13.2	50.2			18.1	18.1			
Actuated g/C Ratio	0.21	0.54		0.12	0.46			0.16	0.16			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	928	1619		358	1357			910	202			
v/s Ratio Prot	0.13	c0.30		0.07	c0.27							
v/s Ratio Perm								0.10	0.01			
v/c Ratio	0.61	0.55		0.61	0.60			0.60	0.08			
Uniform Delay, d1	39.6	16.4		45.9	22.3			42.6	38.9			
Progression Factor	1.00	1.00		1.36	0.23			1.08	8.40			
Incremental Delay, d2	1.2	1.4		0.9	0.2			1.0	0.2			
Delay (s)	40.8	17.7		63.1	5.4			47.1	327.0			
Level of Service	D	B		E	A			D	F			
Approach Delay (s)		26.7			17.5			91.0			0.0	
Approach LOS		C			B			F			A	

Intersection Summary			
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	972	45	50	492	59	11	72	40	179	368	241
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.98		1.00	0.93			1.00	0.62	1.00	0.93	0.46
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.97	1.00	0.68	1.00	1.00
Frt	1.00	0.99		1.00	0.98			1.00	0.85	1.00	0.98	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4319		1296	2376			1559	843	1043	2686	563
Flt Permitted	0.95	1.00		0.95	1.00			0.92	1.00	0.70	1.00	1.00
Satd. Flow (perm)	1540	4319		1296	2376			1438	843	764	2686	563
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	123	1105	51	57	559	67	12	82	45	203	418	274
RTOR Reduction (vph)	0	3	0	0	7	0	0	0	31	0	11	143
Lane Group Flow (vph)	123	1153	0	57	619	0	0	94	14	203	470	68
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	13.5	52.0		10.3	47.2			37.8	37.8	38.8	38.8	38.8
Effective Green, g (s)	13.5	52.0		10.3	47.2			37.8	37.8	38.8	38.8	38.8
Actuated g/C Ratio	0.11	0.43		0.09	0.39			0.31	0.31	0.32	0.32	0.32
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	173	1871		111	934			452	265	247	868	182
v/s Ratio Prot	0.08	c0.27		0.04	c0.26						0.18	
v/s Ratio Perm								0.07	0.02	c0.27		0.12
v/c Ratio	0.71	0.62		0.51	0.66			0.21	0.05	0.82	0.54	0.37
Uniform Delay, d1	51.4	26.3		52.5	29.9			30.1	28.6	37.4	33.3	31.3
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.9	1.5		4.0	1.8			0.2	0.1	19.3	0.7	1.3
Delay (s)	64.3	27.8		56.4	31.7			30.4	28.7	56.7	34.0	32.6
Level of Service	E	C		E	C			C	C	E	C	C
Approach Delay (s)		31.3			33.7			29.8			38.8	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	34.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1088	105	0	744	48	37
Ideal Flow (vphpl)	1000	1000	1000	1000	1000	1000
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1597			1621	810	714
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	1597			1621	810	714
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1196	115	0	818	53	41
RTOR Reduction (vph)	4	0	0	0	0	35
Lane Group Flow (vph)	1307	0	0	818	53	6
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	83.8			83.8	14.9	14.9
Effective Green, g (s)	83.8			83.8	14.9	14.9
Actuated g/C Ratio	0.76			0.76	0.14	0.14
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1216			1234	109	96
v/s Ratio Prot	c0.82			0.50	c0.07	
v/s Ratio Perm						0.01
v/c Ratio	1.08			0.66	0.49	0.06
Uniform Delay, d1	13.1			6.3	44.0	41.4
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	48.6			1.4	3.4	0.3
Delay (s)	61.7			7.7	47.4	41.7
Level of Service	E			A	D	D
Approach Delay (s)	61.7			7.7	44.9	
Approach LOS	E			A	D	

Intersection Summary			
HCM 2000 Control Delay	41.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	31	352	98	28	284	654	209	193	562	249
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.97			1.00	0.97			0.99	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.97			1.00	0.96			1.00	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5634			2870	2501			4086	1122
Flt Permitted		1.00			0.78	1.00			0.95	1.00
Satd. Flow (perm)		5634			2244	2501			4086	1122
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	33	371	103	29	299	688	220	203	592	262
RTOR Reduction (vph)	0	70	0	0	0	32	0	0	0	0
Lane Group Flow (vph)	0	437	0	0	328	876	0	0	821	236
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		13.3			23.3	23.3			20.9	20.9
Effective Green, g (s)		15.3			26.3	26.3			23.9	23.9
Actuated g/C Ratio		0.20			0.35	0.35			0.32	0.32
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1149			786	877			1302	357
v/s Ratio Prot						c0.35			0.20	c0.21
v/s Ratio Perm		0.08			0.15					
v/c Ratio		0.38			0.42	1.00			0.63	0.66
Uniform Delay, d1		25.8			18.5	24.3			21.8	22.1
Progression Factor		1.00			0.91	1.00			1.00	1.00
Incremental Delay, d2		0.2			0.1	29.7			1.0	4.5
Delay (s)		26.0			16.9	54.1			22.8	26.6
Level of Service		C			B	D			C	C
Approach Delay (s)		26.0			16.9	54.1			23.6	
Approach LOS		C			B	D			C	

Intersection Summary			
HCM 2000 Control Delay	33.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp
4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	70	392	558	56	242	215	40	322	61	495
Ideal Flow (vphpl)	1400	1400	1400	1400	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.87		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.93		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	0.99
Satd. Flow (prot)		1700	2661		2224		1161		1327	2546
Flt Permitted		0.95	1.00		1.00		1.00		0.29	0.89
Satd. Flow (perm)		1700	2661		2224		1161		401	2277
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	74	417	594	60	257	229	43	343	65	527
RTOR Reduction (vph)	0	0	13	0	1	0	31	0	0	0
Lane Group Flow (vph)	0	449	683	0	489	0	8	0	349	586
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		419	745		518		247		328	1031
v/s Ratio Prot		c0.26	0.26		0.22				c0.18	0.09
v/s Ratio Perm							0.01		c0.28	0.15
v/c Ratio		1.07	0.92		0.94		0.03		1.06	0.57
Uniform Delay, d1		28.2	26.2		28.3		23.4		24.1	16.0
Progression Factor		1.00	1.00		1.00		1.00		0.84	0.91
Incremental Delay, d2		64.4	18.0		27.9		0.3		51.5	1.0
Delay (s)		92.6	44.1		56.2		23.6		71.9	15.6
Level of Service		F	D		E		C		E	B
Approach Delay (s)			63.2		53.8					36.6
Approach LOS			E		D					D

Intersection Summary			
HCM 2000 Control Delay	51.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	28	55	0	3	3	20	401	25	99	132	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1700	1700	1700	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	0.99	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.93		1.00	0.99		1.00	0.97	
Flt Protected		0.98	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1567	1346		1485		1377	2700		1540	2981	
Flt Permitted		0.84	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1353	1346		1485		1377	2700		1540	2981	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	29	31	62	0	3	3	22	451	28	111	148	31
RTOR Reduction (vph)	0	0	57	0	3	0	0	2	0	0	5	0
Lane Group Flow (vph)	0	60	5	0	3	0	22	477	0	111	174	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm		NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		9.3	9.3		9.3		4.6	79.7		15.1	90.5	
Effective Green, g (s)		9.3	9.3		9.3		4.6	79.7		15.1	90.5	
Actuated g/C Ratio		0.08	0.08		0.08		0.04	0.66		0.13	0.75	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		104	104		115		52	1793		193	2248	
v/s Ratio Prot					0.00		0.02	c0.18		c0.07	0.06	
v/s Ratio Perm		c0.04	0.00									
v/c Ratio		0.58	0.05		0.03		0.42	0.27		0.58	0.08	
Uniform Delay, d1		53.5	51.2		51.2		56.4	8.2		49.4	3.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		7.5	0.2		0.1		2.0	0.4		2.6	0.0	
Delay (s)		61.0	51.4		51.3		58.4	8.6		52.0	3.9	
Level of Service		E	D		D		E	A		D	A	
Approach Delay (s)		56.1			51.3			10.8			22.3	
Approach LOS		E			D			B			C	

Intersection Summary			
HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	3	9	3	4	44	1	36	5	100	109	8
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.98			1.00	1.00	1.00	0.99		1.00	0.98	
Flpb, ped/bikes		1.00			1.00	1.00	0.84	1.00		1.00	1.00	
Frt		0.91			1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected		0.99			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2285			1417	1230	1160	1408		1377	1413	
Flt Permitted		0.95			1.00	1.00	1.00	1.00		0.95	1.00	
Satd. Flow (perm)		2204			1448	1230	1221	1408		1377	1413	
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	4	4	12	4	5	59	1	48	7	133	145	11
RTOR Reduction (vph)	0	12	0	0	0	27	0	7	0	0	2	0
Lane Group Flow (vph)	0	8	0	0	9	32	1	48	0	133	154	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		1.0			1.0	20.9	2.7	2.7		19.9	27.6	
Effective Green, g (s)		1.0			1.0	20.9	2.7	2.7		19.9	27.6	
Actuated g/C Ratio		0.03			0.03	0.54	0.07	0.07		0.52	0.72	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		57			37	825	85	98		709	1010	
v/s Ratio Prot						0.02		c0.03		c0.10	0.11	
v/s Ratio Perm		0.00			c0.01	0.01	0.00					
v/c Ratio		0.15			0.24	0.04	0.01	0.49		0.19	0.15	
Uniform Delay, d1		18.4			18.4	4.1	16.7	17.3		5.0	1.8	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.2			3.4	0.0	0.1	3.9		0.0	0.1	
Delay (s)		19.6			21.8	4.2	16.8	21.2		5.1	1.8	
Level of Service		B			C	A	B	C		A	A	
Approach Delay (s)		19.6			6.5			21.1			3.3	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	38.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.
4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	26	120	303	19	68	114
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1744	1535	851	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1744	1535	851	1134	1194
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	33	154	388	24	87	146
RTOR Reduction (vph)	0	134	0	11	0	0
Lane Group Flow (vph)	33	20	388	13	87	146
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	8.6	8.6	31.9	26.9	9.2	46.1
Effective Green, g (s)	8.6	8.6	31.9	26.9	9.2	46.1
Actuated g/C Ratio	0.13	0.13	0.49	0.42	0.14	0.71
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	150	231	756	419	161	850
v/s Ratio Prot	c0.03		c0.25	0.01	c0.08	0.12
v/s Ratio Perm		0.01		0.01		
v/c Ratio	0.22	0.09	0.51	0.03	0.54	0.17
Uniform Delay, d1	25.1	24.6	11.1	11.2	25.8	3.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.2	0.6	0.0	3.7	0.1
Delay (s)	25.8	24.8	11.7	11.2	29.5	3.1
Level of Service	C	C	B	B	C	A
Approach Delay (s)	25.0		11.7			13.0
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	64.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	39.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	3	11	83	53	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	9	5	17	126	80	18
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	286	149	148			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	286	149	148			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	623	805	1376			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	9	5	59	84	54	45
Volume Left	9	0	17	0	0	0
Volume Right	0	5	0	0	0	18
cSH	623	805	1376	1700	1700	1700
Volume to Capacity	0.01	0.01	0.01	0.05	0.03	0.03
Queue Length 95th (ft)	1	0	1	0	0	0
Control Delay (s)	10.9	9.5	2.2	0.0	0.0	0.0
Lane LOS	B	A	A			
Approach Delay (s)	10.4		0.9		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	29.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	15	10	354	17	15	279
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.91	1.00		1.00	1.00
Flpb, ped/bikes	0.91	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1558	1390	3391		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1558	1390	3391		1711	3421
Peak-hour factor, PHF	0.77	0.77	0.77	0.77	0.77	0.77
Adj. Flow (vph)	19	13	460	22	19	362
RTOR Reduction (vph)	0	12	1	0	0	0
Lane Group Flow (vph)	19	1	481	0	19	362
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	4.8	4.8	96.6		3.3	105.0
Effective Green, g (s)	4.8	4.8	96.6		3.3	105.0
Actuated g/C Ratio	0.04	0.04	0.80		0.03	0.88
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	62	55	2729		47	2993
v/s Ratio Prot			c0.14		c0.01	0.11
v/s Ratio Perm	c0.01	0.00				
v/c Ratio	0.31	0.01	0.18		0.40	0.12
Uniform Delay, d1	56.0	55.3	2.7		57.4	1.0
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.8	0.1	0.1		5.6	0.1
Delay (s)	58.8	55.4	2.8		63.0	1.1
Level of Service	E	E	A		E	A
Approach Delay (s)	57.4		2.8			4.2
Approach LOS	E		A			A

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	94	56	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	111	66	0
Pedestrians	25			1	1	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	147	59	91			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	147	59	91			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	814	975	1473			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	0	37	74	44	22
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1473	1700	1700	1700
Volume to Capacity	0.00	0.00	0.04	0.03	0.01
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	0.0	0.0		0.0	
Approach LOS	A				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	19.3%	ICU Level of Service	A
Analysis Period (min)	15		

12: Illinois St & 16th

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	2	56	3	2	46	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	2	62	3	2	51	2
Pedestrians	50			50	50	
Lane Width (ft)	11.0			11.0	11.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	4			4	4	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	499					
pX, platoon unblocked						
vC, conflicting volume			114		142	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			114		142	133
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		94	100
cM capacity (veh/h)			1419		785	848

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	64	5	53
Volume Left	0	3	51
Volume Right	62	0	2
cSH	1700	1419	788
Volume to Capacity	0.04	0.00	0.07
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.0	4.5	9.9
Lane LOS		A	A
Approach Delay (s)	0.0	4.5	9.9
Approach LOS			A

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	30.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰↰	↑↱		↰	↑↱	
Volume (vph)	65	41	112	1	27	20	111	286	9	8	194	91
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1274	1365	1125	1289	1365	1110	2515	2578		1296	2450	
Flt Permitted	0.74	1.00	1.00	0.72	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	986	1365	1125	983	1365	1110	2515	2578		1296	2450	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	79	50	137	1	33	24	135	349	11	10	237	111
RTOR Reduction (vph)	0	0	115	0	0	20	0	2	0	0	53	0
Lane Group Flow (vph)	79	50	22	1	33	4	135	358	0	10	295	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	21.5		1.4	16.9	
Effective Green, g (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	21.5		1.4	16.9	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.13	0.47		0.03	0.37	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	160	222	183	159	222	180	327	1202		39	898	
v/s Ratio Prot		0.04			0.02		0.05	c0.14		0.01	c0.12	
v/s Ratio Perm	c0.08		0.02	0.00		0.00						
v/c Ratio	0.49	0.23	0.12	0.01	0.15	0.02	0.41	0.30		0.26	0.33	
Uniform Delay, d1	17.6	16.8	16.5	16.2	16.6	16.2	18.4	7.6		21.8	10.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.4	0.5	0.3	0.0	0.3	0.0	0.8	0.1		3.5	0.2	
Delay (s)	20.0	17.3	16.8	16.2	16.9	16.3	19.3	7.8		25.3	10.7	
Level of Service	B	B	B	B	B	B	B	A		C	B	
Approach Delay (s)		17.8			16.6			10.9			11.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	46.1	Sum of lost time (s)	15.7
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↱		↰	↑↱	
Volume (vph)	47	188	1	1	202	25	3	5	1	28	1	56
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.87	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1260	1621	1669		1497	1357	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.72	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1260	1220	1669		1187	1357	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	53	211	1	1	227	28	3	6	1	31	1	63
RTOR Reduction (vph)	0	0	0	0	0	13	0	1	0	0	51	0
Lane Group Flow (vph)	53	211	1	1	227	15	3	6	0	31	13	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	7.2	45.0	45.0	2.4	40.2	40.2	14.3	14.3		14.3	14.3	
Effective Green, g (s)	7.2	45.0	45.0	2.4	40.2	40.2	14.3	14.3		14.3	14.3	
Actuated g/C Ratio	0.09	0.59	0.59	0.03	0.52	0.52	0.19	0.19		0.19	0.19	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	152	1000	850	50	894	660	227	311		221	253	
v/s Ratio Prot	c0.03	c0.12		0.00	c0.13			0.00			0.01	
v/s Ratio Perm			0.00			0.01	0.00			c0.03		
v/c Ratio	0.35	0.21	0.00	0.02	0.25	0.02	0.01	0.02		0.14	0.05	
Uniform Delay, d1	32.6	7.5	6.6	36.0	10.0	8.8	25.4	25.5		26.1	25.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.5	0.0	0.2	0.2	0.0	0.0	0.0		0.3	0.1	
Delay (s)	33.9	8.0	6.6	36.2	10.2	8.8	25.5	25.5		26.4	25.7	
Level of Service	C	A	A	D	B	A	C	C		C	C	
Approach Delay (s)		13.1			10.1			25.5			25.9	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	76.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↱̲			↰̲↑	↱
Volume (vph)	22	209	9	5	242	14	11	42	13	15	14	20
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1048	1540	2970			3002	1074
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00			0.95	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1048	1621	2970			2941	1074
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	28	261	11	6	302	18	14	52	16	19	18	25
RTOR Reduction (vph)	0	0	6	0	0	11	0	14	0	0	0	23
Lane Group Flow (vph)	28	261	5	6	302	7	14	54	0	0	37	2
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	1.8	14.8	14.8	0.6	12.6	12.6	4.0	4.0			3.0	3.0
Effective Green, g (s)	1.8	14.8	14.8	0.6	12.6	12.6	4.0	4.0			3.0	3.0
Actuated g/C Ratio	0.06	0.46	0.46	0.02	0.39	0.39	0.12	0.12			0.09	0.09
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	67	555	629	28	472	407	200	366			272	99
v/s Ratio Prot	c0.02	0.21		0.00	c0.25			c0.02				
v/s Ratio Perm			0.00			0.01	0.01				0.01	0.00
v/c Ratio	0.42	0.47	0.01	0.21	0.64	0.02	0.07	0.15			0.14	0.02
Uniform Delay, d1	14.8	6.1	4.8	15.7	8.1	6.1	12.6	12.7			13.5	13.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	4.2	0.6	0.0	3.8	2.8	0.0	0.1	0.2			0.2	0.1
Delay (s)	19.0	6.7	4.8	19.5	10.9	6.1	12.7	12.9			13.7	13.5
Level of Service	B	A	A	B	B	A	B	B			B	B
Approach Delay (s)		7.8			10.8			12.8			13.6	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	32.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱̲		↰	↑	↱	↰	↑	↱	↰	↱̲	
Volume (vph)	15	188	58	7	171	95	48	158	3	49	45	20
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.91	1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1321	915		1333	1126	875	1070	957	921	1070	1052	
Flt Permitted	0.43	1.00		0.53	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	604	915		748	1126	875	1070	957	921	1070	1052	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	17	219	67	8	199	110	56	184	3	57	52	23
RTOR Reduction (vph)	0	12	0	0	0	61	0	0	2	0	19	0
Lane Group Flow (vph)	17	274	0	8	199	49	56	184	1	57	56	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	26.4	26.4		26.4	26.4	32.2	12.4	19.0	19.0	5.8	12.4	
Effective Green, g (s)	26.4	26.4		26.4	26.4	32.2	12.4	19.0	19.0	5.8	12.4	
Actuated g/C Ratio	0.37	0.37		0.37	0.37	0.45	0.17	0.26	0.26	0.08	0.17	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	228	336		279	414	453	184	253	243	86	181	
v/s Ratio Prot	0.00	c0.30		0.00	c0.18	0.01	0.05	c0.19		c0.05	0.05	
v/s Ratio Perm	0.03			0.01		0.05			0.00			
v/c Ratio	0.07	0.82		0.03	0.48	0.11	0.30	0.73	0.00	0.66	0.31	
Uniform Delay, d1	14.9	20.5		14.9	17.4	11.5	25.9	24.0	19.4	32.1	26.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	14.1		0.0	0.9	0.1	0.9	10.0	0.0	17.6	1.0	
Delay (s)	15.1	34.6		15.0	18.3	11.6	26.9	34.0	19.4	49.6	26.9	
Level of Service	B	C		B	B	B	C	C	B	D	C	
Approach Delay (s)		33.5			15.9			32.2			36.7	
Approach LOS		C			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	71.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd. 4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	73	34	42	63	9	35	39	60	9	41	7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	3	81	38	47	70	10	39	43	67	10	46	8

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	122	47	80	82	67	63
Volume Left (vph)	3	47	0	39	0	10
Volume Right (vph)	38	0	10	0	67	8
Hadj (s)	-0.15	0.53	-0.05	0.27	-0.67	-0.01
Departure Headway (s)	5.1	5.7	5.1	5.5	4.6	5.3
Degree Utilization, x	0.17	0.07	0.11	0.13	0.08	0.09
Capacity (veh/h)	672	600	669	625	747	634
Control Delay (s)	9.1	8.0	7.6	8.1	6.8	8.9
Approach Delay (s)	9.1	7.7		7.5		8.9
Approach LOS	A	A		A		A

Intersection Summary			
Delay	8.2		
Level of Service	A		
Intersection Capacity Utilization	36.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St. 4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	93	75	45	9	81	15	45	298	14	21	204	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.98		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1665	3183		1680	3313		1260	2494		1260	2391	
Flt Permitted	0.68	1.00		0.66	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1191	3183		1169	3313		1260	2494		1260	2391	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	111	89	54	11	96	18	54	355	17	25	243	98
RTOR Reduction (vph)	0	47	0	0	16	0	0	2	0	0	30	0
Lane Group Flow (vph)	111	96	0	11	98	0	54	370	0	25	311	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	16.8	16.8		16.8	16.8		28.0	84.1		5.6	61.7	
Effective Green, g (s)	16.8	16.8		16.8	16.8		28.0	84.1		5.6	61.7	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.23	0.69		0.05	0.51	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	164	438		160	456		289	1719		57	1209	
v/s Ratio Prot		0.03			0.03		0.04	c0.15		c0.02	c0.13	
v/s Ratio Perm	c0.09			0.01								
v/c Ratio	0.68	0.22		0.07	0.22		0.19	0.22		0.44	0.26	
Uniform Delay, d1	50.0	46.8		45.8	46.7		37.8	6.9		56.7	17.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.5	0.3		0.2	0.2		0.3	0.3		5.3	0.1	
Delay (s)	60.6	47.0		46.0	47.0		38.2	7.2		62.0	17.2	
Level of Service	E	D		D	D		D	A		E	B	
Approach Delay (s)		52.9			46.9			11.1			20.3	
Approach LOS		D			D			B			C	

Intersection Summary			
HCM 2000 Control Delay	26.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	122.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	232	11	2	197	1	13	0	1	2	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.99		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3398		1711	3419			1705		1711	1621	
Flt Permitted	0.62	1.00		0.59	1.00			0.82		0.75	1.00	
Satd. Flow (perm)	1111	3398		1060	3419			1465		1346	1621	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	252	12	2	214	1	14	0	1	2	1	2
RTOR Reduction (vph)	0	7	0	0	1	0	0	9	0	0	1	0
Lane Group Flow (vph)	2	257	0	2	214	0	0	6	0	2	2	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	7.2	7.2		7.2	7.2			10.1		10.1	10.1	
Effective Green, g (s)	7.2	7.2		7.2	7.2			10.1		10.1	10.1	
Actuated g/C Ratio	0.26	0.26		0.26	0.26			0.37		0.37	0.37	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	293	896		279	901			541		497	599	
v/s Ratio Prot		c0.08			0.06						0.00	
v/s Ratio Perm	0.00			0.00				c0.00		0.00		
v/c Ratio	0.01	0.29		0.01	0.24			0.01		0.00	0.00	
Uniform Delay, d1	7.4	8.0		7.4	7.9			5.4		5.4	5.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.2		0.0	0.1			0.0		0.0	0.0	
Delay (s)	7.4	8.2		7.4	8.0			5.4		5.4	5.4	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		8.2			8.0			5.4			5.4	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	27.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	74	0	0	260	2	209	43	168	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			1.00		1.00	0.88				0.85
Flt Protected		1.00			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3419			5127		1711	3012				2694
Flt Permitted		0.95			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3265			5127		1711	3012				2694
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1	81	0	0	286	2	230	47	185	0	0	27
RTOR Reduction (vph)	0	0	0	0	1	0	0	110	0	0	0	26
Lane Group Flow (vph)	0	82	0	0	287	0	230	122	0	0	0	1
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1533			1787		697	1228				141
v/s Ratio Prot		c0.00			c0.06		c0.13	0.04				0.00
v/s Ratio Perm		0.02										
v/c Ratio		0.05			0.16		0.33	0.10				0.01
Uniform Delay, d1		11.1			17.1		15.4	13.9				34.1
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.2		1.3	0.2				0.1
Delay (s)		11.1			17.3		16.7	14.0				34.3
Level of Service		B			B		B	B				C
Approach Delay (s)		11.1			17.3			15.3			34.3	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	35.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.
4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	75	175	269	325	0	0
Ideal Flow (vphpl)	1000	1000	1000	1000	1000	1000
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	*0.85	*0.85	*0.60	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.94	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	748	672	1080	948		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	748	672	1080	948		
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	86	201	309	374	0	0
RTOR Reduction (vph)	36	76	0	0	0	0
Lane Group Flow (vph)	114	61	309	374	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	26.7	26.7	23.3	60.0		
Effective Green, g (s)	26.7	26.7	23.3	60.0		
Actuated g/C Ratio	0.44	0.44	0.39	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	332	299	419	948		
v/s Ratio Prot	0.15		c0.29	c0.39		
v/s Ratio Perm		0.09				
v/c Ratio	0.34	0.20	0.74	0.39		
Uniform Delay, d1	10.9	10.2	15.7	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.6	0.3	6.6	0.3		
Delay (s)	11.5	10.5	22.4	0.3		
Level of Service	B	B	C	A		
Approach Delay (s)	11.0			10.3	0.0	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	98	79	150	2	84	4	115	237	5	3	194	95
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.96	
Flpb, ped/bikes	0.95	1.00		0.92	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90		1.00	0.99		1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1157	1872		1116	1260		1215	2417		1215	2215	
Flt Permitted	0.47	1.00		0.58	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	572	1872		684	1260		1215	2417		1215	2215	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	118	95	181	2	101	5	139	286	6	4	234	114
RTOR Reduction (vph)	0	126	0	0	2	0	0	1	0	0	41	0
Lane Group Flow (vph)	118	150	0	2	104	0	139	291	0	4	307	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.5	36.5		15.3	15.3		19.1	62.3		4.9	48.1	
Effective Green, g (s)	36.5	36.5		15.3	15.3		19.1	62.3		4.9	48.1	
Actuated g/C Ratio	0.30	0.30		0.13	0.13		0.16	0.52		0.04	0.40	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	251	569		87	160		193	1254		49	887	
v/s Ratio Prot	c0.06	0.08			c0.08		c0.11	0.12		0.00	c0.14	
v/s Ratio Perm	0.08			0.00								
v/c Ratio	0.47	0.26		0.02	0.65		0.72	0.23		0.08	0.35	
Uniform Delay, d1	32.6	31.6		45.8	49.8		47.9	15.8		55.4	25.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.2		0.1	9.1		12.4	0.4		0.7	1.1	
Delay (s)	33.9	31.8		45.9	59.0		60.3	16.2		56.1	26.1	
Level of Service	C	C		D	E		E	B		E	C	
Approach Delay (s)		32.5			58.7			30.4			26.4	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	32.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	124	298	185	209
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	135	324	201	227
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			565			
pX, platoon unblocked						
vC, conflicting volume	764	67			135	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	764	67			135	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			86	
cM capacity (veh/h)	293	982			1447	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	67	67	324	201	227
Volume Left	0	0	0	201	0
Volume Right	0	0	324	0	0
cSH	1700	1700	1700	1447	1700
Volume to Capacity	0.04	0.04	0.19	0.14	0.13
Queue Length 95th (ft)	0	0	0	12	0
Control Delay (s)	0.0	0.0	0.0	7.9	0.0
Lane LOS				A	
Approach Delay (s)	0.0			3.7	
Approach LOS					

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	106	48	0	130	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	115	52	0	141	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	52				110	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	52				110	52
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				84	94
cM capacity (veh/h)	1552				876	1004

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	58	58	52	207
Volume Left	0	0	0	141
Volume Right	0	0	0	65
cSH	1700	1700	1700	912
Volume to Capacity	0.03	0.03	0.03	0.23
Queue Length 95th (ft)	0	0	0	22
Control Delay (s)	0.0	0.0	0.0	10.1
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.1
Approach LOS				B

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	22.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	69	167	48	54	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	75	182	52	59	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	111				293	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	111				293	52
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	100
cM capacity (veh/h)	1477				640	1004

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	136	121	52	59	0
Volume Left	75	0	0	0	0
Volume Right	0	0	0	59	0
cSH	1477	1700	1700	1700	1700
Volume to Capacity	0.05	0.07	0.03	0.03	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	4.4	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.3		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	17.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	11	12	11	18	27	25	312	19	24	230	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.94		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1520			1502		1540	3052		1540	3020	
Flt Permitted		0.87			0.94		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1349			1419		1540	3052		1540	3020	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	12	13	12	20	29	27	339	21	26	250	37
RTOR Reduction (vph)	0	12	0	0	27	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	27	0	0	34	0	27	358	0	26	283	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.5			7.5		4.7	89.1		8.2	92.6	
Effective Green, g (s)		7.5			7.5		4.7	89.1		8.2	92.6	
Actuated g/C Ratio		0.06			0.06		0.04	0.74		0.07	0.77	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		84			88		60	2266		105	2330	
v/s Ratio Prot							c0.02	c0.12		c0.02	0.09	
v/s Ratio Perm		0.02			c0.02							
v/c Ratio		0.32			0.38		0.45	0.16		0.25	0.12	
Uniform Delay, d1		53.8			54.0		56.4	4.5		53.0	3.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.2			2.8		1.9	0.1		0.5	0.1	
Delay (s)		56.0			56.8		58.3	4.7		53.4	3.6	
Level of Service		E			E		E	A		D	A	
Approach Delay (s)		56.0			56.8			8.4			7.7	
Approach LOS		E			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	202	9	88	0	0	99
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	220	10	96	0	0	108

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	110	110	10	48	48	108
Volume Left (vph)	110	110	0	0	0	0
Volume Right (vph)	0	0	10	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.6	5.6	3.2	5.3	5.3	5.1
Degree Utilization, x	0.17	0.17	0.01	0.07	0.07	0.15
Capacity (veh/h)	620	625	1121	653	652	678
Control Delay (s)	8.5	8.5	5.0	7.5	7.5	9.0
Approach Delay (s)	8.3			7.5		9.0
Approach LOS	A			A		A

Intersection Summary			
Delay	8.3		
Level of Service	A		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	59	0	0	42	28	6	72	7	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	64	0	0	46	30	7	78	8	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	96	76	46	47
Volume Left (vph)	32	0	7	0
Volume Right (vph)	0	30	0	8
Hadj (s)	0.10	-0.21	0.11	-0.08
Departure Headway (s)	4.3	4.0	5.0	4.8
Degree Utilization, x	0.11	0.08	0.06	0.06
Capacity (veh/h)	814	870	694	719
Control Delay (s)	7.9	7.4	7.1	6.9
Approach Delay (s)	7.9	7.4	7.0	
Approach LOS	A	A	A	

Intersection Summary			
Delay	7.4		
Level of Service	A		
Intersection Capacity Utilization	21.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	12	49	3	16	0	50	334	1	0	260	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.89			1.00		1.00	1.00			0.97	
Flpb, ped/bikes		0.98			0.98		1.00	1.00			1.00	
Frt		0.91			1.00		1.00	1.00			0.99	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1120			1584		1540	2266			2165	
Flt Permitted		0.94			0.95		0.95	1.00			1.00	
Satd. Flow (perm)		1062			1521		1540	2266			2165	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	13	52	3	17	0	53	352	1	0	274	28
RTOR Reduction (vph)	0	48	0	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	29	0	0	20	0	53	353	0	0	300	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		8.3			8.3		8.4	101.4			87.9	
Effective Green, g (s)		8.3			8.3		8.4	101.4			87.9	
Actuated g/C Ratio		0.07			0.07		0.07	0.85			0.73	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		73			105		107	1914			1585	
v/s Ratio Prot							c0.03	c0.16			0.14	
v/s Ratio Perm		c0.03			0.01							
v/c Ratio		0.39			0.19		0.50	0.18			0.19	
Uniform Delay, d1		53.4			52.7		53.8	1.7			5.0	
Progression Factor		1.00			1.00		1.02	0.70			1.00	
Incremental Delay, d2		3.5			0.9		3.5	0.2			0.3	
Delay (s)		56.9			53.6		58.3	1.4			5.2	
Level of Service		E			D		E	A			A	
Approach Delay (s)		56.9			53.6			8.8			5.2	
Approach LOS		E			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	143	0	0	96	223	83	90	160	49	0	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1033	1540	1621	1201	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1033	1540	1621	1201	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	115	151	0	0	101	235	87	95	168	52	0	168
RTOR Reduction (vph)	0	0	0	0	0	150	0	0	145	0	0	150
Lane Group Flow (vph)	115	151	0	0	101	85	87	95	23	52	0	18
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	9.5	42.3			27.8	27.8	10.5	10.5	10.5	8.3		8.3
Effective Green, g (s)	9.5	42.3			27.8	27.8	10.5	10.5	10.5	8.3		8.3
Actuated g/C Ratio	0.12	0.55			0.36	0.36	0.14	0.14	0.14	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	189	1689			1110	372	209	220	163	165		129
v/s Ratio Prot	c0.07	0.05			0.03		0.06	c0.06		c0.03		0.02
v/s Ratio Perm						c0.08			0.02			
v/c Ratio	0.61	0.09			0.09	0.23	0.42	0.43	0.14	0.32		0.14
Uniform Delay, d1	32.0	8.3			16.3	17.2	30.5	30.6	29.3	31.8		31.2
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	5.5	0.1			0.2	1.4	1.3	1.4	0.4	1.1		0.5
Delay (s)	37.5	8.4			16.5	18.6	31.8	31.9	29.7	32.9		31.7
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		21.0			18.0			30.8			32.0	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	77.1	Sum of lost time (s)	21.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	24	25	2	27	0	38	15	1	6	20	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.96			1.00		1.00	0.99		1.00	0.92	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3204			1795		1711	1785		1711	1652	
Flt Permitted		0.87			0.99		0.73	1.00		0.75	1.00	
Satd. Flow (perm)		2849			1784		1306	1785		1344	1652	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	26	27	2	29	0	41	16	1	7	22	27
RTOR Reduction (vph)	0	16	0	0	0	0	0	1	0	0	16	0
Lane Group Flow (vph)	0	78	0	0	31	0	41	16	0	7	33	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Effective Green, g (s)		20.0			20.0		20.0	20.0		20.0	20.0	
Actuated g/C Ratio		0.42			0.42		0.42	0.42		0.42	0.42	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		1187			743		544	743		560	688	
v/s Ratio Prot								0.01			0.02	
v/s Ratio Perm		c0.03			0.02		c0.03			0.01		
v/c Ratio		0.07			0.04		0.08	0.02		0.01	0.05	
Uniform Delay, d1		8.4			8.3		8.4	8.2		8.2	8.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.1		0.3	0.1		0.0	0.1	
Delay (s)		8.5			8.4		8.7	8.3		8.3	8.5	
Level of Service		A			A		A	A		A	A	
Approach Delay (s)		8.5			8.4			8.6			8.4	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.07		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	24.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

EXISTING 2015 PLUS PROJECT
BASKETBALL GAME
NO SF GIANTS GAME AT AT&T PARK
WEEKDAY PM PEAK

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	889	733	12	170	907	36	53	1070	290	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3057		2987	3023			5480	942			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3057		2987	3023			5480	942			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	916	756	12	175	935	37	55	1103	299	0	0	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	201	0	0	0
Lane Group Flow (vph)	916	767	0	175	972	0	0	1158	98	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	40.3		13.2	36.8			36.1	36.1			
Effective Green, g (s)	18.2	40.3		13.2	36.8			36.1	36.1			
Actuated g/C Ratio	0.17	0.37		0.12	0.33			0.33	0.33			
Clearance Time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1119		358	1011			1798	309			
v/s Ratio Prot	c0.20	0.25		0.06	c0.32							
v/s Ratio Perm								0.21	0.10			
v/c Ratio	1.24	0.69		0.49	0.96			0.64	0.32			
Uniform Delay, d1	45.9	29.5		45.2	35.9			31.5	27.7			
Progression Factor	1.38	1.60		1.53	1.02			0.90	2.83			
Incremental Delay, d2	111.8	1.6		0.3	8.9			0.7	0.6			
Delay (s)	175.4	48.9		69.4	45.5			29.1	79.0			
Level of Service	F	D		E	D			C	E			
Approach Delay (s)		117.7			49.1			39.4			0.0	
Approach LOS		F			D			D			A	

Intersection Summary			
HCM 2000 Control Delay	72.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	151	1521	25	24	917	19	5	69	79	34	318	304
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.64	1.00	0.86	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00	0.68	1.00	1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.96	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1296	3693		1296	2553			1587	858	1044	2442	581
Flt Permitted	0.95	1.00		0.95	1.00			0.97	1.00	0.71	1.00	1.00
Satd. Flow (perm)	1296	3693		1296	2553			1541	858	778	2442	581
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	154	1552	26	24	936	19	5	70	81	35	324	310
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	53	0	30	126
Lane Group Flow (vph)	154	1577	0	24	954	0	0	75	28	35	409	69
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.4	45.9		6.0	35.9			38.2	38.2	39.2	39.2	39.2
Effective Green, g (s)	14.4	45.9		6.0	35.9			38.2	38.2	39.2	39.2	39.2
Actuated g/C Ratio	0.13	0.42		0.05	0.33			0.35	0.35	0.36	0.36	0.36
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	169	1540		70	833			535	297	277	870	207
v/s Ratio Prot	0.12	c0.43		0.02	c0.37						c0.17	
v/s Ratio Perm								0.05	0.03	0.04		0.12
v/c Ratio	0.91	1.02		0.34	1.14			0.14	0.09	0.13	0.47	0.34
Uniform Delay, d1	47.2	32.0		50.1	37.0			24.6	24.2	23.9	27.4	25.9
Progression Factor	0.58	1.24		0.87	0.90			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.1	14.2		1.0	70.5			0.1	0.1	0.2	0.4	1.0
Delay (s)	34.6	53.9		44.8	104.0			24.8	24.4	24.1	27.8	26.8
Level of Service	C	D		D	F			C	C	C	C	C
Approach Delay (s)		52.2			102.5			24.6			27.3	
Approach LOS		D			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	60.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	119.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1689	138	0	1226	86	8
Ideal Flow (vphpl)	1850	1850	1850	1850	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2957			2998	1540	1357
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	2957			2998	1540	1357
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1759	144	0	1277	90	8
RTOR Reduction (vph)	6	0	0	0	0	5
Lane Group Flow (vph)	1897	0	0	1277	90	3
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1669			1692	512	451
v/s Ratio Prot	c0.64			0.43	c0.06	
v/s Ratio Perm						0.00
v/c Ratio	1.14			0.75	0.18	0.01
Uniform Delay, d1	23.9			18.2	26.0	24.5
Progression Factor	1.00			0.54	1.00	1.00
Incremental Delay, d2	69.5			0.9	0.7	0.0
Delay (s)	93.5			10.7	26.8	24.6
Level of Service	F			B	C	C
Approach Delay (s)	93.5			10.7	26.6	
Approach LOS	F			B	C	

Intersection Summary			
HCM 2000 Control Delay	59.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	98.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	272	1171	161	52	302	537	219	226	788	265
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		2.0			2.0	2.0			2.0	2.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	0.87
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5749			2857	2464			4090	978
Flt Permitted		0.99			0.66	1.00			0.95	1.00
Satd. Flow (perm)		5749			1899	2464			4090	978
Peak-hour factor, PHF	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93
Adj. Flow (vph)	296	1259	173	56	325	577	235	246	847	285
RTOR Reduction (vph)	0	22	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	1706	0	0	381	809	0	0	1122	256
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Perm
Protected Phases		6			4	4		7	7	
Permitted Phases	6			4						7
Actuated Green, G (s)		27.0			25.0	25.0			24.0	24.0
Effective Green, g (s)		29.0			28.0	28.0			27.0	27.0
Actuated g/C Ratio		0.32			0.31	0.31			0.30	0.30
Clearance Time (s)		4.0			5.0	5.0			5.0	5.0
Lane Grp Cap (vph)		1852			590	766			1227	293
v/s Ratio Prot						c0.33			c0.27	
v/s Ratio Perm		0.30			0.20					0.26
v/c Ratio		0.92			0.65	1.06			0.91	0.87
Uniform Delay, d1		29.4			26.7	31.0			30.4	29.9
Progression Factor		1.48			0.06	1.00			1.00	1.00
Incremental Delay, d2		6.6			0.5	48.2			12.0	28.4
Delay (s)		50.1			2.1	79.2			42.3	58.2
Level of Service		D			A	E			D	E
Approach Delay (s)		50.1			2.1	79.2			45.3	
Approach LOS		D			A	E			D	

Intersection Summary			
HCM 2000 Control Delay	49.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	111.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/27/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	16	504	568	45	338	362	24	255	129	651
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.84		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.92		0.85		1.00	1.00
Flt Protected		0.95	0.99		1.00		1.00		0.95	0.99
Satd. Flow (prot)		1313	1912		2130		1163		1327	2543
Flt Permitted		0.95	0.99		1.00		1.00		0.15	0.65
Satd. Flow (perm)		1313	1912		2130		1163		207	1667
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	17	542	611	48	363	389	26	274	139	700
RTOR Reduction (vph)	0	0	7	0	0	0	17	0	0	0
Lane Group Flow (vph)	0	478	733	0	755	0	6	0	314	799
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	5	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		22.5	22.5		23.0		23.0		42.0	42.0
Effective Green, g (s)		22.5	25.0		24.5		23.0		43.5	43.5
Actuated g/C Ratio		0.25	0.28		0.27		0.26		0.48	0.48
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		328	531		579		297		305	966
v/s Ratio Prot		0.36	c0.38		c0.35				c0.19	0.15
v/s Ratio Perm							0.01		0.31	0.25
v/c Ratio		1.46	1.38		1.42dr		0.02		1.03	0.83
Uniform Delay, d1		33.8	32.5		32.8		25.1		31.1	20.0
Progression Factor		1.00	1.00		1.00		1.00		1.08	1.12
Incremental Delay, d2		222.0	182.5		149.0		0.1		33.5	2.1
Delay (s)		255.8	215.0		181.8		25.2		67.0	24.6
Level of Service		F	F		F		C		E	C
Approach Delay (s)			231.0		177.1					36.5
Approach LOS			F		F					D

Intersection Summary			
HCM 2000 Control Delay	147.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	102.7%	ICU Level of Service	G
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	141	78	19	10	67	20	943	51	24	181	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	0.99		1.00	0.99	
Flt Protected		0.99	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1610	1353		1426		1272	2509		1540	3036	
Flt Permitted		0.97	1.00		0.93		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1567	1353		1344		1272	2509		1540	3036	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	148	82	20	11	71	21	993	54	25	191	16
RTOR Reduction (vph)	0	0	56	0	48	0	0	4	0	0	6	0
Lane Group Flow (vph)	0	166	26	0	54	0	21	1043	0	25	201	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.1	32.1		32.1		13.8	38.5		13.5	38.5	
Effective Green, g (s)		32.1	32.1		32.1		13.8	38.5		13.5	38.5	
Actuated g/C Ratio		0.32	0.32		0.32		0.14	0.38		0.14	0.38	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Grp Cap (vph)		503	434		431		175	965		207	1168	
v/s Ratio Prot							0.02	c0.42		0.02	c0.07	
v/s Ratio Perm		c0.11	0.02		0.04							
v/c Ratio		0.33	0.06		0.12		0.12	1.08		0.12	0.17	
Uniform Delay, d1		25.8	23.5		24.0		37.8	30.8		38.0	20.3	
Progression Factor		1.00	1.00		1.00		1.21	0.25		1.00	1.00	
Incremental Delay, d2		1.8	0.3		0.6		1.1	50.1		1.2	0.3	
Delay (s)		27.5	23.8		24.6		46.8	57.9		39.2	20.6	
Level of Service		C	C		C		D	E		D	C	
Approach Delay (s)		26.3			24.6			57.6			22.6	
Approach LOS		C			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	46.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	120	10	3	12	30	7	84	6	110	129	18
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.99	1.00	1.00		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00	0.84	1.00		1.00	1.00	
Frt		0.99			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2699			1436	1217	1151	1432		1377	1385	
Flt Permitted		0.92			0.91	1.00	0.82	1.00		0.95	1.00	
Satd. Flow (perm)		2485			1318	1217	989	1432		1377	1385	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	20	129	11	3	13	32	8	90	6	118	139	19
RTOR Reduction (vph)	0	8	0	0	0	16	0	4	0	0	7	0
Lane Group Flow (vph)	0	152	0	0	16	16	8	92	0	118	151	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		6.7			6.7	20.4	4.9	4.9		13.7	23.6	
Effective Green, g (s)		6.7			6.7	20.4	4.9	4.9		13.7	23.6	
Actuated g/C Ratio		0.17			0.17	0.51	0.12	0.12		0.34	0.59	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		413			219	767	120	174		468	811	
v/s Ratio Prot						0.01		c0.06		c0.09	0.11	
v/s Ratio Perm		c0.06			0.01	0.01	0.01					
v/c Ratio		0.37			0.07	0.02	0.07	0.53		0.25	0.19	
Uniform Delay, d1		14.9			14.2	5.0	15.7	16.6		9.6	3.9	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			0.1	0.0	0.2	2.9		0.3	0.1	
Delay (s)		15.5			14.3	5.0	15.9	19.5		9.9	4.0	
Level of Service		B			B	A	B	B		A	A	
Approach Delay (s)		15.5			8.1			19.2			6.5	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	40.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.
4/27/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	34	240	782	29	180	233
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1742	1535	847	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1742	1535	847	1134	1194
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	261	850	32	196	253
RTOR Reduction (vph)	0	236	0	6	0	0
Lane Group Flow (vph)	37	25	850	26	196	253
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	8.8	8.8	47.0	42.0	20.0	72.0
Effective Green, g (s)	8.8	8.8	47.0	42.0	20.0	72.0
Actuated g/C Ratio	0.10	0.10	0.52	0.46	0.22	0.79
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	109	168	794	438	249	946
v/s Ratio Prot	c0.03		c0.55	0.01	c0.17	0.21
v/s Ratio Perm		0.01		0.02		
v/c Ratio	0.34	0.15	1.07	0.06	0.79	0.27
Uniform Delay, d1	38.3	37.6	21.9	13.5	33.4	2.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.4	52.5	0.1	15.1	0.2
Delay (s)	40.1	38.0	74.4	13.5	48.5	2.6
Level of Service	D	D	E	B	D	A
Approach Delay (s)	38.3		72.2			22.6
Approach LOS	D		E			C

Intersection Summary			
HCM 2000 Control Delay	52.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	90.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	19	43	57	192	209	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.96		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.91		1.00	1.00	0.98	
Flt Protected	0.99		0.95	1.00	1.00	
Satd. Flow (prot)	1539		1678	1531	3061	
Flt Permitted	0.99		0.58	1.00	1.00	
Satd. Flow (perm)	1539		1026	1531	3061	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	21	48	63	213	232	46
RTOR Reduction (vph)	43	0	0	0	16	0
Lane Group Flow (vph)	26	0	63	213	262	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	3.6		23.3	23.3	23.3	
Effective Green, g (s)	3.6		23.3	23.3	23.3	
Actuated g/C Ratio	0.10		0.63	0.63	0.63	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	150		647	966	1932	
v/s Ratio Prot	c0.02			c0.14	0.09	
v/s Ratio Perm			0.06			
v/c Ratio	0.17		0.10	0.22	0.14	
Uniform Delay, d1	15.3		2.7	2.9	2.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.5		0.1	0.1	0.0	
Delay (s)	15.8		2.7	3.0	2.8	
Level of Service	B		A	A	A	
Approach Delay (s)	15.8			3.0	2.8	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	36.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/27/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	189	147	893	52	39	488
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00		1.00	1.00
Flpb, ped/bikes	0.93	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1584	1466	3379		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1584	1466	3379		1711	3421
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	210	163	992	58	43	542
RTOR Reduction (vph)	0	116	4	0	0	0
Lane Group Flow (vph)	210	47	1046	0	43	542
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	50.1		5.9	61.1
Effective Green, g (s)	28.7	28.7	50.1		5.9	61.1
Actuated g/C Ratio	0.29	0.29	0.50		0.06	0.61
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	454	420	1692		100	2090
v/s Ratio Prot			c0.31		c0.03	0.16
v/s Ratio Perm	c0.13	0.03				
v/c Ratio	0.46	0.11	0.62		0.43	0.26
Uniform Delay, d1	29.3	26.3	18.0		45.4	9.0
Progression Factor	1.00	1.00	1.82		1.07	1.34
Incremental Delay, d2	0.7	0.1	1.0		3.0	0.1
Delay (s)	30.1	26.4	33.9		51.4	12.1
Level of Service	C	C	C		D	B
Approach Delay (s)	28.4		33.9			15.0
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	27.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	12	22	239	192	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.96	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1540	1346		3063	2948	
Flt Permitted	0.95	1.00		0.90	1.00	
Satd. Flow (perm)	1540	1346		2771	2948	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	14	26	281	226	71
RTOR Reduction (vph)	0	14	0	0	56	0
Lane Group Flow (vph)	12	0	0	307	241	0
Confl. Peds. (#/hr)	1	1	25			25
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	1.3	1.3		10.2	10.2	
Effective Green, g (s)	1.3	1.3		10.2	10.2	
Actuated g/C Ratio	0.03	0.03		0.22	0.22	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	42	37		601	639	
v/s Ratio Prot	c0.01				0.08	
v/s Ratio Perm		0.00		c0.11		
v/c Ratio	0.29	0.01		0.51	0.38	
Uniform Delay, d1	22.4	22.2		16.2	15.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	0.1		0.7	0.4	
Delay (s)	26.1	22.3		16.9	16.1	
Level of Service	C	C		B	B	
Approach Delay (s)	24.1			16.9	16.1	
Approach LOS	C			B	B	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	47.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	37.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	8	67	49	28	5	130	44	9	5	164	122
Peak Hour Factor	0.92	0.87	0.87	0.87	0.87	0.92	0.87	0.92	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	54	9	77	56	32	5	149	48	10	5	178	133

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	54	86	56	38	208	184	133
Volume Left (vph)	54	0	56	0	149	5	0
Volume Right (vph)	0	77	0	5	10	0	133
Hadj (s)	0.53	-0.59	0.53	-0.07	0.15	0.05	-0.67
Departure Headway (s)	6.5	5.4	6.6	6.0	5.7	5.5	4.8
Degree Utilization, x	0.10	0.13	0.10	0.06	0.33	0.28	0.18
Capacity (veh/h)	510	613	502	551	609	629	721
Control Delay (s)	9.1	8.0	9.2	8.2	11.5	9.4	7.6
Approach Delay (s)	8.4		8.8		11.5	8.6	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	9.4		
Level of Service	A		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰↰	↑↱		↰	↑↱	
Volume (vph)	190	89	266	3	230	47	269	708	17	18	472	187
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1266	1365	1126	1283	1365	1099	2515	2581		1296	2464	
Flt Permitted	0.51	1.00	1.00	0.69	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	682	1365	1126	936	1365	1099	2515	2581		1296	2464	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	209	98	292	3	253	52	296	778	19	20	519	205
RTOR Reduction (vph)	0	0	191	0	0	34	0	2	0	0	42	0
Lane Group Flow (vph)	209	98	101	3	253	18	296	795	0	20	682	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	235	470	388	322	470	379	352	975		155	882	
v/s Ratio Prot		0.07			0.19		0.12	c0.31		0.02	c0.28	
v/s Ratio Perm	c0.31		0.09	0.00		0.02						
v/c Ratio	0.89	0.21	0.26	0.01	0.54	0.05	0.84	0.82		0.13	0.77	
Uniform Delay, d1	30.9	23.1	23.6	21.5	26.3	21.8	41.9	28.0		39.3	28.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.64	0.76		1.15	1.19	
Incremental Delay, d2	35.8	1.0	1.6	0.1	4.4	0.2	8.3	2.7		1.7	6.3	
Delay (s)	66.8	24.1	25.2	21.6	30.7	22.0	35.2	24.0		47.0	40.3	
Level of Service	E	C	C	C	C	C	D	C		D	D	
Approach Delay (s)		39.5			29.2			27.0			40.5	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	33.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	116.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↱		↰	↱	
Volume (vph)	102	471	8	6	647	32	33	25	34	41	3	105
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.85	1.00	0.98		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.91		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1411	1621	1706	1238	1621	1527		1491	1355	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.68	1.00		0.72	1.00	
Satd. Flow (perm)	1621	1706	1411	1621	1706	1238	1163	1527		1123	1355	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	111	512	9	7	703	35	36	27	37	45	3	114
RTOR Reduction (vph)	0	0	4	0	0	19	0	28	0	0	85	0
Lane Group Flow (vph)	111	512	5	7	703	16	36	36	0	45	32	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)			10			10			10			10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.9	47.6	47.6	2.7	39.4	39.4	21.9	21.9		21.9	21.9	
Effective Green, g (s)	10.9	47.6	47.6	2.7	39.4	39.4	21.9	21.9		21.9	21.9	
Actuated g/C Ratio	0.12	0.55	0.55	0.03	0.45	0.45	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	202	931	770	50	770	559	292	383		282	340	
v/s Ratio Prot	c0.07	c0.30		0.00	c0.41			0.02			0.02	
v/s Ratio Perm			0.00			0.01	0.03			c0.04		
v/c Ratio	0.55	0.55	0.01	0.14	0.91	0.03	0.12	0.09		0.16	0.09	
Uniform Delay, d1	35.8	12.8	9.0	41.1	22.3	13.3	25.2	25.0		25.5	25.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.0	2.3	0.0	1.3	15.1	0.0	0.2	0.1		0.3	0.1	
Delay (s)	38.9	15.2	9.0	42.4	37.4	13.3	25.4	25.2		25.7	25.2	
Level of Service	D	B	A	D	D	B	C	C		C	C	
Approach Delay (s)		19.3			36.4			25.3			25.3	
Approach LOS		B			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	87.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	123	399	18	22	683	80	49	206	70	112	61	146
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1048	1540	2962			2983	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.64	1.00			0.65	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1048	1033	2962			1992	1072
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	128	416	19	23	711	83	51	215	73	117	64	152
RTOR Reduction (vph)	0	0	6	0	0	37	0	40	0	0	0	129
Lane Group Flow (vph)	128	416	13	23	711	46	51	248	0	0	181	23
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	11.0	57.2	57.2	2.3	47.5	47.5	14.1	14.1			13.1	13.1
Effective Green, g (s)	11.0	57.2	57.2	2.3	47.5	47.5	14.1	14.1			13.1	13.1
Actuated g/C Ratio	0.13	0.66	0.66	0.03	0.55	0.55	0.16	0.16			0.15	0.15
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	154	802	910	40	666	574	168	482			301	162
v/s Ratio Prot	c0.11	0.34		0.01	c0.58			0.08				
v/s Ratio Perm			0.01			0.04	0.05				c0.09	0.02
v/c Ratio	0.83	0.52	0.01	0.57	1.07	0.08	0.30	0.51			1.02dl	0.14
Uniform Delay, d1	36.9	7.6	5.0	41.7	19.5	9.2	31.9	33.1			34.3	31.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	30.0	2.4	0.0	18.4	54.3	0.1	1.0	0.9			3.4	0.4
Delay (s)	66.9	10.0	5.1	60.1	73.9	9.3	32.9	34.0			37.7	32.3
Level of Service	E	A	A	E	E	A	C	C			D	C
Approach Delay (s)		22.8			66.9			33.9			35.2	
Approach LOS		C			E			C			D	

Intersection Summary			
HCM 2000 Control Delay	44.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	86.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	95.5%	ICU Level of Service	F
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	420	70	33	478	366	61	249	30	89	138	43
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.89	1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1337	931		1336	1126	856	1070	957	919	1070	1068	
Flt Permitted	0.18	1.00		0.28	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	251	931		389	1126	856	1070	957	919	1070	1068	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	50	447	74	35	509	389	65	265	32	95	147	46
RTOR Reduction (vph)	0	5	0	0	0	130	0	0	25	0	11	0
Lane Group Flow (vph)	50	516	0	35	509	259	65	265	7	95	182	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	55.4	55.4		54.5	54.5	61.5	9.9	25.0	25.0	7.0	22.1	
Effective Green, g (s)	55.4	55.4		54.5	54.5	61.5	9.9	25.0	25.0	7.0	22.1	
Actuated g/C Ratio	0.51	0.51		0.50	0.50	0.56	0.09	0.23	0.23	0.06	0.20	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	158	470		213	559	518	96	218	209	68	215	
v/s Ratio Prot	0.01	c0.55		0.00	c0.45	0.03	0.06	c0.28		c0.09	0.17	
v/s Ratio Perm	0.15			0.08		0.27			0.01			
v/c Ratio	0.32	1.10		0.16	0.91	0.50	0.68	1.22	0.03	1.40	0.85	
Uniform Delay, d1	18.5	27.2		25.7	25.4	14.7	48.4	42.4	33.0	51.4	42.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.2	70.5		0.4	19.0	0.8	17.3	131.4	0.1	246.3	25.1	
Delay (s)	19.6	97.6		26.0	44.4	15.5	65.6	173.7	33.0	297.6	67.2	
Level of Service	B	F		C	D	B	E	F	C	F	E	
Approach Delay (s)		90.8			31.7			141.9			143.2	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	80.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	109.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	63	136	39	45	162	2	31	116	78	11	51	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	0.98		0.98	
Flpb, ped/bikes		1.00		0.99	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	1.00			1.00	0.85		0.90	
Flt Protected		0.99		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1721		1691	1797			1779	1499		1578	
Flt Permitted		0.86		0.57	1.00			0.87	1.00		0.98	
Satd. Flow (perm)		1506		1014	1797			1562	1499		1557	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	70	151	43	50	180	2	34	129	87	12	57	239
RTOR Reduction (vph)	0	9	0	0	1	0	0	0	65	0	174	0
Lane Group Flow (vph)	0	255	0	50	181	0	0	163	22	0	134	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		15.5		15.5	15.5			13.3	13.3		13.3	
Effective Green, g (s)		15.5		15.5	15.5			13.3	13.3		13.3	
Actuated g/C Ratio		0.29		0.29	0.29			0.25	0.25		0.25	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		435		293	519			387	371		386	
v/s Ratio Prot					0.10							
v/s Ratio Perm		c0.17		0.05				c0.10	0.01		0.09	
v/c Ratio		0.59		0.17	0.35			0.42	0.06		0.35	
Uniform Delay, d1		16.3		14.2	15.1			16.9	15.4		16.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		2.0		0.3	0.4			0.7	0.1		0.5	
Delay (s)		18.3		14.5	15.5			17.7	15.4		17.1	
Level of Service		B		B	B			B	B		B	
Approach Delay (s)		18.3			15.3			16.9			17.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	53.6	Sum of lost time (s)	14.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	146	169	51	66	319	23	42	826	53	16	426	299
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1677	3275		1681	3376		1260	2491		1260	2331	
Flt Permitted	0.50	1.00		0.61	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	878	3275		1072	3376		1260	2491		1260	2331	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	155	180	54	70	339	24	45	879	56	17	453	318
RTOR Reduction (vph)	0	28	0	0	5	0	0	5	0	0	127	0
Lane Group Flow (vph)	155	206	0	70	358	0	45	930	0	17	644	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Effective Green, g (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.12	0.35		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	304	1136		371	1171		149	869		187	883	
v/s Ratio Prot		0.06			0.11		0.04	c0.37		0.01	c0.28	
v/s Ratio Perm	c0.18			0.07								
v/c Ratio	0.51	0.18		0.19	0.31		0.30	1.07		0.09	0.73	
Uniform Delay, d1	25.9	22.8		22.8	23.8		40.3	32.5		36.7	26.6	
Progression Factor	1.00	1.00		1.00	1.00		0.91	0.81		1.55	0.62	
Incremental Delay, d2	6.0	0.4		1.1	0.7		4.0	48.0		0.7	3.8	
Delay (s)	31.9	23.1		23.9	24.5		40.7	74.3		57.6	20.3	
Level of Service	C	C		C	C		D	E		E	C	
Approach Delay (s)		26.6			24.4			72.7			21.1	
Approach LOS		C			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	42.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	320	38	4	713	2	38	0	12	13	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			0.97		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3367		1711	3420			1678		1711	1531	
Flt Permitted	0.27	1.00		0.52	1.00			0.84		0.72	1.00	
Satd. Flow (perm)	494	3367		940	3420			1467		1300	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	348	41	4	775	2	41	0	13	14	0	14
RTOR Reduction (vph)	0	15	0	0	0	0	0	20	0	0	8	0
Lane Group Flow (vph)	7	374	0	4	777	0	0	34	0	14	6	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.0	24.0		24.0	24.0			26.0		26.0	26.0	
Effective Green, g (s)	24.0	24.0		24.0	24.0			26.0		26.0	26.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40			0.43		0.43	0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	197	1346		376	1368			635		563	663	
v/s Ratio Prot		0.11			c0.23						0.00	
v/s Ratio Perm	0.01			0.00				c0.02		0.01		
v/c Ratio	0.04	0.28		0.01	0.57			0.05		0.02	0.01	
Uniform Delay, d1	11.0	12.2		10.8	14.0			9.9		9.7	9.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.5		0.1	1.7			0.2		0.1	0.0	
Delay (s)	11.3	12.7		10.9	15.7			10.0		9.8	9.7	
Level of Service	B	B		B	B			B		A	A	
Approach Delay (s)		12.6			15.7			10.0			9.8	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	86	0	0	822	18	382	200	282	0	0	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				3.5
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Frt		1.00			1.00		1.00	0.91				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3399			5116		1711	3121				2694
Flt Permitted		0.88			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3021			5116		1711	3121				2694
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	13	88	0	0	839	18	390	204	288	0	0	130
RTOR Reduction (vph)	0	0	0	0	2	0	0	149	0	0	0	121
Lane Group Flow (vph)	0	101	0	0	855	0	390	343	0	0	0	9
Confl. Peds. (#/hr)												20
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		47.5			36.5		53.0	53.0				7.5
Effective Green, g (s)		47.5			36.5		53.0	53.0				7.5
Actuated g/C Ratio		0.43			0.33		0.48	0.48				0.07
Clearance Time (s)		4.5			4.5		5.0	5.0				3.5
Lane Grp Cap (vph)		1330			1697		824	1503				183
v/s Ratio Prot		c0.01			c0.17		c0.23	0.11				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.08			0.50		0.47	0.23				0.05
Uniform Delay, d1		18.4			29.5		19.1	16.6				47.9
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			1.1		1.9	0.4				0.5
Delay (s)		18.5			30.6		21.1	16.9				48.4
Level of Service		B			C		C	B				D
Approach Delay (s)		18.5			30.6			18.8			48.4	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.
4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	99	566	782	549	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.89	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1507	1426	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1507	1426	3319	1801		
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	102	584	806	566	0	0
RTOR Reduction (vph)	31	31	0	0	0	0
Lane Group Flow (vph)	322	302	806	566	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	37.4	37.4	22.6	70.0		
Effective Green, g (s)	37.4	37.4	22.6	70.0		
Actuated g/C Ratio	0.53	0.53	0.32	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	805	761	1071	1801		
v/s Ratio Prot	c0.21		c0.24	0.31		
v/s Ratio Perm		0.21				
v/c Ratio	0.40	0.40	0.75	0.31		
Uniform Delay, d1	9.7	9.6	21.2	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.3	0.3	3.0	0.1		
Delay (s)	10.0	10.0	24.2	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	10.0			14.3	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	203	135	181	7	204	13	176	589	16	17	570	169
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.93		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.98	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1188	1945		1139	1257		1215	2414		1215	2289	
Flt Permitted	0.36	1.00		0.55	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	454	1945		662	1257		1215	2414		1215	2289	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	211	141	189	7	212	14	183	614	17	18	594	176
RTOR Reduction (vph)	0	127	0	0	2	0	0	2	0	0	28	0
Lane Group Flow (vph)	211	203	0	7	224	0	183	629	0	18	742	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	32.9	32.9		21.9	21.9		17.3	46.8		4.0	33.5	
Effective Green, g (s)	32.9	32.9		21.9	21.9		17.3	46.8		4.0	33.5	
Actuated g/C Ratio	0.33	0.33		0.22	0.22		0.17	0.47		0.04	0.34	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	191	639		144	275		210	1129		48	766	
v/s Ratio Prot	c0.06	0.10			0.18		c0.15	0.26		0.01	c0.32	
v/s Ratio Perm	c0.30			0.01								
v/c Ratio	1.10	0.32		0.05	0.81		0.87	0.56		0.38	0.97	
Uniform Delay, d1	34.2	25.1		30.8	37.1		40.3	19.1		46.8	32.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.03	0.81	
Incremental Delay, d2	95.9	0.3		0.1	16.6		30.2	2.0		3.9	22.6	
Delay (s)	130.1	25.4		31.0	53.7		70.5	21.1		52.3	49.0	
Level of Service	F	C		C	D		E	C		D	D	
Approach Delay (s)		66.3			53.0			32.2			49.1	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	47.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	99.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	270	650	480	539
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	293	707	522	586
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			565			
pX, platoon unblocked						
vC, conflicting volume	1923	147			293	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1923	147			293	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			59	
cM capacity (veh/h)	35	874			1265	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	147	147	707	522	586
Volume Left	0	0	0	522	0
Volume Right	0	0	707	0	0
cSH	1700	1700	1700	1265	1700
Volume to Capacity	0.09	0.09	0.42	0.41	0.34
Queue Length 95th (ft)	0	0	0	52	0
Control Delay (s)	0.0	0.0	0.0	9.8	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.6	
Approach LOS					

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	168	129	0	151	112
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	183	140	0	164	122
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	140				232	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	140				232	140
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				78	86
cM capacity (veh/h)	1441				736	882

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	91	91	140	286
Volume Left	0	0	0	164
Volume Right	0	0	0	122
cSH	1700	1700	1700	792
Volume to Capacity	0.05	0.05	0.08	0.36
Queue Length 95th (ft)	0	0	0	41
Control Delay (s)	0.0	0.0	0.0	12.1
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.1
Approach LOS				B

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	54	265	129	58	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	59	288	140	63	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	203				402	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	203				402	140
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				100	100
cM capacity (veh/h)	1366				552	882

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	155	192	140	63	0
Volume Left	59	0	0	0	0
Volume Right	0	0	0	63	0
cSH	1366	1700	1700	1700	1700
Volume to Capacity	0.04	0.11	0.08	0.04	0.00
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	3.2	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.4		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	24.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	18	44	21	41	27	37	679	21	20	594	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.93			0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1485			1537		1540	3065		1540	3057	
Flt Permitted		0.87			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1300			1372		1540	3065		1540	3057	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	20	48	23	45	29	40	738	23	22	646	32
RTOR Reduction (vph)	0	43	0	0	20	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	46	0	0	77	0	40	760	0	22	676	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		9.6			9.6		5.1	70.8		4.4	70.1	
Effective Green, g (s)		9.6			9.6		5.1	70.8		4.4	70.1	
Actuated g/C Ratio		0.10			0.10		0.05	0.71		0.04	0.70	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		124			131		78	2170		67	2142	
v/s Ratio Prot							0.03	c0.25		0.01	c0.22	
v/s Ratio Perm		0.04			c0.06							
v/c Ratio		0.37			0.59		0.51	0.35		0.33	0.32	
Uniform Delay, d1		42.4			43.3		46.2	5.7		46.4	5.7	
Progression Factor		1.00			1.00		1.26	0.64		1.20	1.62	
Incremental Delay, d2		1.8			6.6		1.5	0.3		0.9	0.3	
Delay (s)		44.2			49.9		59.9	3.9		56.8	9.6	
Level of Service		D			D		E	A		E	A	
Approach Delay (s)		44.2			49.9			6.7			11.1	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	466	49	253	0	0	329
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	507	53	275	0	0	358

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	253	253	53	138	138	358
Volume Left (vph)	253	253	0	0	0	0
Volume Right (vph)	0	0	53	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.9	6.9	3.2	6.7	6.7	6.3
Degree Utilization, x	0.49	0.49	0.05	0.26	0.26	0.62
Capacity (veh/h)	505	506	1121	511	511	560
Control Delay (s)	15.1	15.1	5.2	10.8	10.8	19.0
Approach Delay (s)	14.1			10.8		19.0
Approach LOS	B			B		C

Intersection Summary			
Delay	14.8		
Level of Service	B		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	43	143	0	0	273	94	29	270	20	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	155	0	0	297	102	32	293	22	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	202	399	178	168
Volume Left (vph)	47	0	32	0
Volume Right (vph)	0	102	0	22
Hadj (s)	0.08	-0.12	0.12	-0.06
Departure Headway (s)	5.5	5.1	6.2	6.0
Degree Utilization, x	0.31	0.56	0.31	0.28
Capacity (veh/h)	614	686	552	567
Control Delay (s)	11.0	14.3	10.7	10.1
Approach Delay (s)	11.0	14.3	10.4	
Approach LOS	B	B	B	

Intersection Summary			
Delay	12.2		
Level of Service	B		
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	19	63	11	56	8	60	749	1	0	702	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.92			0.99		1.00	1.00			0.99	
Flpb, ped/bikes		0.98			0.99		1.00	1.00			1.00	
Frt		0.92			0.99		1.00	1.00			0.99	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1162			1546		1540	2268			2221	
Flt Permitted		0.94			0.94		0.95	1.00			1.00	
Satd. Flow (perm)		1103			1470		1540	2268			2221	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	19	20	66	12	59	8	63	788	1	0	739	37
RTOR Reduction (vph)	0	59	0	0	5	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	74	0	63	789	0	0	775	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		10.9			10.9		8.3	78.8			65.4	
Effective Green, g (s)		10.9			10.9		8.3	78.8			65.4	
Actuated g/C Ratio		0.11			0.11		0.08	0.79			0.65	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		120			160		127	1787			1452	
v/s Ratio Prot							0.04	c0.35			c0.35	
v/s Ratio Perm		0.04			c0.05							
v/c Ratio		0.38			0.46		0.50	0.44			0.53	
Uniform Delay, d1		41.4			41.8		43.8	3.4			9.2	
Progression Factor		1.00			1.00		0.80	0.39			1.52	
Incremental Delay, d2		2.1			2.1		2.2	0.6			1.2	
Delay (s)		43.5			43.9		37.5	1.9			15.2	
Level of Service		D			D		D	A			B	
Approach Delay (s)		43.5			43.9			4.6			15.2	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	352	447	0	0	223	394	239	174	339	60	0	479
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.84	1.00	1.00	0.86	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1008	1540	1621	1188	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1008	1540	1621	1188	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	371	471	0	0	235	415	252	183	357	63	0	504
RTOR Reduction (vph)	0	0	0	0	0	270	0	0	206	0	0	402
Lane Group Flow (vph)	371	471	0	0	235	145	252	183	151	63	0	102
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	18.1	41.2			18.1	18.1	19.0	19.0	19.0	11.5		11.5
Effective Green, g (s)	18.1	41.2			18.1	18.1	19.0	19.0	19.0	11.5		11.5
Actuated g/C Ratio	0.21	0.47			0.21	0.21	0.22	0.22	0.22	0.13		0.13
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	317	1446			635	208	333	351	257	201		158
v/s Ratio Prot	c0.24	0.15			0.08		c0.16	0.11		0.04		c0.08
v/s Ratio Perm						c0.14			0.13			
v/c Ratio	1.17	0.33			0.37	0.70	0.76	0.52	0.59	0.31		0.64
Uniform Delay, d1	34.8	14.6			29.9	32.3	32.2	30.3	30.8	34.5		36.2
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	105.1	0.6			1.7	17.7	9.4	1.4	3.4	0.9		8.7
Delay (s)	139.9	15.2			31.6	50.0	41.6	31.7	34.2	35.4		44.8
Level of Service	F	B			C	D	D	C	C	D		D
Approach Delay (s)		70.1			43.3			36.0			43.8	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	49.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	87.7	Sum of lost time (s)	21.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	55	117	5	58	23	132	99	2	8	104	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.96		1.00	1.00		1.00	0.94	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3128			1731		1711	1796		1711	1701	
Flt Permitted		0.86			0.98		0.64	1.00		0.69	1.00	
Satd. Flow (perm)		2726			1707		1160	1796		1235	1701	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	75	60	127	5	63	25	143	108	2	9	113	66
RTOR Reduction (vph)	0	75	0	0	15	0	0	1	0	0	39	0
Lane Group Flow (vph)	0	187	0	0	78	0	143	109	0	9	140	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		19.5			19.5		19.5	19.5		19.5	19.5	
Effective Green, g (s)		19.5			19.5		19.5	19.5		19.5	19.5	
Actuated g/C Ratio		0.41			0.41		0.41	0.41		0.41	0.41	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		1107			693		471	729		501	691	
v/s Ratio Prot								0.06			0.08	
v/s Ratio Perm		c0.07			0.05		c0.12			0.01		
v/c Ratio		0.17			0.11		0.30	0.15		0.02	0.20	
Uniform Delay, d1		9.1			8.9		9.7	9.0		8.5	9.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.3		1.7	0.4		0.1	0.7	
Delay (s)		9.4			9.2		11.3	9.4		8.6	9.9	
Level of Service		A			A		B	A		A	A	
Approach Delay (s)		9.4			9.2			10.5			9.8	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	9.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

EXISTING 2015 PLUS PROJECT WITH M-TR-11C
BASKETBALL GAME
NO SF GIANTS GAME AT AT&T PARK
WEEKDAY PM PEAK

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	889	733	12	168	908	36	53	1070	290	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3057		2987	3023			5480	942			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3057		2987	3023			5480	942			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	916	756	12	173	936	37	55	1103	299	0	0	0
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	201	0	0	0
Lane Group Flow (vph)	916	767	0	173	973	0	0	1158	98	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	40.3		13.2	36.8			36.1	36.1			
Effective Green, g (s)	18.2	40.3		13.2	36.8			36.1	36.1			
Actuated g/C Ratio	0.17	0.37		0.12	0.33			0.33	0.33			
Clearance Time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1119		358	1011			1798	309			
v/s Ratio Prot	c0.20	0.25		0.06	c0.32							
v/s Ratio Perm								0.21	0.10			
v/c Ratio	1.24	0.69		0.48	0.96			0.64	0.32			
Uniform Delay, d1	45.9	29.5		45.2	35.9			31.5	27.7			
Progression Factor	1.38	1.60		1.52	1.02			0.90	2.83			
Incremental Delay, d2	111.8	1.6		0.3	9.0			0.7	0.6			
Delay (s)	175.4	48.9		69.2	45.6			29.1	79.0			
Level of Service	F	D		E	D			C	E			
Approach Delay (s)		117.7			49.2			39.4			0.0	
Approach LOS		F			D			D			A	

Intersection Summary			
HCM 2000 Control Delay	72.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	151	1521	25	24	918	19	5	69	79	34	315	304
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.64	1.00	0.86	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00	0.68	1.00	1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.96	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1296	3693		1296	2553			1586	858	1044	2439	581
Flt Permitted	0.95	1.00		0.95	1.00			0.97	1.00	0.71	1.00	1.00
Satd. Flow (perm)	1296	3693		1296	2553			1541	858	778	2439	581
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	154	1552	26	24	937	19	5	70	81	35	321	310
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	53	0	30	126
Lane Group Flow (vph)	154	1577	0	24	955	0	0	75	28	35	406	69
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.4	45.9		6.0	35.9			38.2	38.2	39.2	39.2	39.2
Effective Green, g (s)	14.4	45.9		6.0	35.9			38.2	38.2	39.2	39.2	39.2
Actuated g/C Ratio	0.13	0.42		0.05	0.33			0.35	0.35	0.36	0.36	0.36
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	169	1540		70	833			535	297	277	869	207
v/s Ratio Prot	0.12	c0.43		0.02	c0.37						c0.17	
v/s Ratio Perm								0.05	0.03	0.04		0.12
v/c Ratio	0.91	1.02		0.34	1.15			0.14	0.09	0.13	0.47	0.34
Uniform Delay, d1	47.2	32.0		50.1	37.0			24.6	24.2	23.9	27.3	25.9
Progression Factor	0.58	1.24		0.87	0.90			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.1	14.2		1.0	71.0			0.1	0.1	0.2	0.4	1.0
Delay (s)	34.6	53.9		44.8	104.4			24.8	24.4	24.1	27.7	26.8
Level of Service	C	D		D	F			C	C	C	C	C
Approach Delay (s)		52.2			103.0			24.6			27.3	
Approach LOS		D			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	60.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	119.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1689	138	0	1227	86	8
Ideal Flow (vphpl)	1850	1850	1850	1850	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2957			2998	1540	1357
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	2957			2998	1540	1357
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1759	144	0	1278	90	8
RTOR Reduction (vph)	6	0	0	0	0	5
Lane Group Flow (vph)	1897	0	0	1278	90	3
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1669			1692	512	451
v/s Ratio Prot	c0.64			0.43	c0.06	
v/s Ratio Perm						0.00
v/c Ratio	1.14			0.76	0.18	0.01
Uniform Delay, d1	23.9			18.2	26.0	24.5
Progression Factor	1.00			0.54	1.00	1.00
Incremental Delay, d2	69.5			0.9	0.7	0.0
Delay (s)	93.5			10.7	26.8	24.6
Level of Service	F			B	C	C
Approach Delay (s)	93.5			10.7	26.6	
Approach LOS	F			B	C	

Intersection Summary			
HCM 2000 Control Delay	59.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	98.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

9/18/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	272	1171	161	52	302	537	219	224	791	265
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		2.0			2.0	2.0			2.0	2.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	0.87
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5749			2857	2464			4090	978
Flt Permitted		0.99			0.66	1.00			0.95	1.00
Satd. Flow (perm)		5749			1899	2464			4090	978
Peak-hour factor, PHF	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93
Adj. Flow (vph)	296	1259	173	56	325	577	235	243	851	285
RTOR Reduction (vph)	0	22	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	1706	0	0	381	809	0	0	1123	256
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Perm
Protected Phases		6			4	4		7	7	
Permitted Phases	6			4						7
Actuated Green, G (s)		27.0			25.0	25.0			24.0	24.0
Effective Green, g (s)		29.0			28.0	28.0			27.0	27.0
Actuated g/C Ratio		0.32			0.31	0.31			0.30	0.30
Clearance Time (s)		4.0			5.0	5.0			5.0	5.0
Lane Grp Cap (vph)		1852			590	766			1227	293
v/s Ratio Prot						c0.33			c0.27	
v/s Ratio Perm		0.30			0.20					0.26
v/c Ratio		0.92			0.65	1.06			0.92	0.87
Uniform Delay, d1		29.4			26.7	31.0			30.4	29.9
Progression Factor		1.48			0.06	1.00			1.00	1.00
Incremental Delay, d2		6.6			0.5	48.2			12.0	28.4
Delay (s)		50.1			2.1	79.2			42.4	58.2
Level of Service		D			A	E			D	E
Approach Delay (s)		50.1			2.1	79.2			45.4	
Approach LOS		D			A	E			D	

Intersection Summary			
HCM 2000 Control Delay	49.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	111.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

9/18/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	16	504	568	45	338	362	24	255	129	649
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.84		0.98		1.00	1.00
Flpb, ped/bikes		0.93	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.92		0.85		1.00	1.00
Flt Protected		0.95	0.99		1.00		1.00		0.95	0.99
Satd. Flow (prot)		1226	1912		2130		1163		1327	2543
Flt Permitted		0.95	0.99		1.00		1.00		0.15	0.65
Satd. Flow (perm)		1226	1912		2130		1163		207	1667
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	17	542	611	48	363	389	26	274	139	698
RTOR Reduction (vph)	0	0	7	0	0	0	17	0	0	0
Lane Group Flow (vph)	0	478	733	0	755	0	6	0	314	797
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	5	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Perm	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases		2	2		8			7	7	4
Permitted Phases	2						8	4	4	
Actuated Green, G (s)		22.5	22.5		23.0		23.0		42.0	42.0
Effective Green, g (s)		22.5	25.0		24.5		23.0		43.5	43.5
Actuated g/C Ratio		0.25	0.28		0.27		0.26		0.48	0.48
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		306	531		579		297		305	966
v/s Ratio Prot			0.38		c0.35				c0.19	0.15
v/s Ratio Perm		0.39					0.01		0.31	0.25
v/c Ratio		1.56	1.38		1.42dr		0.02		1.03	0.83
Uniform Delay, d1		33.8	32.5		32.8		25.1		31.1	20.0
Progression Factor		1.00	1.00		1.00		1.00		1.08	1.12
Incremental Delay, d2		268.3	182.5		149.0		0.1		33.4	2.1
Delay (s)		302.1	215.0		181.8		25.2		67.0	24.5
Level of Service		F	F		F		C		E	C
Approach Delay (s)			249.2		177.1					36.5
Approach LOS			F		F					D

Intersection Summary			
HCM 2000 Control Delay	155.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	102.7%	ICU Level of Service	G
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	141	78	19	10	67	20	943	51	24	179	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	0.99		1.00	0.99	
Flt Protected		0.99	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1610	1353		1426		1272	2509		1540	3038	
Flt Permitted		0.97	1.00		0.93		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1567	1353		1344		1272	2509		1540	3038	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	148	82	20	11	71	21	993	54	25	188	15
RTOR Reduction (vph)	0	0	56	0	48	0	0	4	0	0	6	0
Lane Group Flow (vph)	0	166	26	0	54	0	21	1043	0	25	197	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4	4		8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		32.1	32.1		32.1		13.8	38.5		13.5	38.5	
Effective Green, g (s)		32.1	32.1		32.1		13.8	38.5		13.5	38.5	
Actuated g/C Ratio		0.32	0.32		0.32		0.14	0.38		0.14	0.38	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Grp Cap (vph)		503	434		431		175	965		207	1169	
v/s Ratio Prot							0.02	c0.42		0.02	c0.06	
v/s Ratio Perm		c0.11	0.02		0.04							
v/c Ratio		0.33	0.06		0.12		0.12	1.08		0.12	0.17	
Uniform Delay, d1		25.8	23.5		24.0		37.8	30.8		38.0	20.2	
Progression Factor		1.00	1.00		1.00		1.21	0.25		1.00	1.00	
Incremental Delay, d2		1.8	0.3		0.6		1.1	50.1		1.2	0.3	
Delay (s)		27.5	23.8		24.6		46.8	57.9		39.2	20.5	
Level of Service		C	C		C		D	E		D	C	
Approach Delay (s)		26.3			24.6			57.6			22.6	
Approach LOS		C			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	46.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	120	10	3	11	30	7	84	6	110	129	15
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.99	1.00	1.00		1.00	0.98	
Flpb, ped/bikes		1.00			1.00	1.00	0.84	1.00		1.00	1.00	
Frt		0.99			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2699			1435	1217	1150	1432		1377	1394	
Flt Permitted		0.92			0.90	1.00	0.82	1.00		0.95	1.00	
Satd. Flow (perm)		2485			1310	1217	989	1432		1377	1394	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	20	129	11	3	12	32	8	90	6	118	139	16
RTOR Reduction (vph)	0	8	0	0	0	16	0	4	0	0	6	0
Lane Group Flow (vph)	0	152	0	0	15	16	8	92	0	118	149	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		6.7			6.7	20.4	4.9	4.9		13.7	23.6	
Effective Green, g (s)		6.7			6.7	20.4	4.9	4.9		13.7	23.6	
Actuated g/C Ratio		0.17			0.17	0.51	0.12	0.12		0.34	0.59	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		413			217	767	120	174		468	816	
v/s Ratio Prot						0.01		c0.06		c0.09	0.11	
v/s Ratio Perm		c0.06			0.01	0.01	0.01					
v/c Ratio		0.37			0.07	0.02	0.07	0.53		0.25	0.18	
Uniform Delay, d1		14.9			14.2	5.0	15.7	16.6		9.6	3.9	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			0.1	0.0	0.2	2.9		0.3	0.1	
Delay (s)		15.5			14.3	5.0	15.9	19.5		9.9	4.0	
Level of Service		B			B	A	B	B		A	A	
Approach Delay (s)		15.5			8.0			19.2			6.5	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	40.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	34	240	782	29	173	233
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1742	1535	847	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1742	1535	847	1134	1194
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	261	850	32	188	253
RTOR Reduction (vph)	0	236	0	6	0	0
Lane Group Flow (vph)	37	25	850	26	188	253
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	8.8	8.8	47.0	42.0	20.0	72.0
Effective Green, g (s)	8.8	8.8	47.0	42.0	20.0	72.0
Actuated g/C Ratio	0.10	0.10	0.52	0.46	0.22	0.79
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	109	168	794	438	249	946
v/s Ratio Prot	c0.03		c0.55	0.01	c0.17	0.21
v/s Ratio Perm		0.01		0.02		
v/c Ratio	0.34	0.15	1.07	0.06	0.76	0.27
Uniform Delay, d1	38.3	37.6	21.9	13.5	33.1	2.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.4	52.5	0.1	12.2	0.2
Delay (s)	40.1	38.0	74.4	13.5	45.3	2.6
Level of Service	D	D	E	B	D	A
Approach Delay (s)	38.3		72.2			20.8
Approach LOS	D		E			C

Intersection Summary			
HCM 2000 Control Delay	52.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	90.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	19	43	57	192	209	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.96		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.91		1.00	1.00	0.98	
Flt Protected	0.99		0.95	1.00	1.00	
Satd. Flow (prot)	1539		1678	1531	3061	
Flt Permitted	0.99		0.58	1.00	1.00	
Satd. Flow (perm)	1539		1026	1531	3061	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	21	48	63	213	232	46
RTOR Reduction (vph)	43	0	0	0	16	0
Lane Group Flow (vph)	26	0	63	213	262	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	3.6		23.3	23.3	23.3	
Effective Green, g (s)	3.6		23.3	23.3	23.3	
Actuated g/C Ratio	0.10		0.63	0.63	0.63	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	150		647	966	1932	
v/s Ratio Prot	c0.02			c0.14	0.09	
v/s Ratio Perm			0.06			
v/c Ratio	0.17		0.10	0.22	0.14	
Uniform Delay, d1	15.3		2.7	2.9	2.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.5		0.1	0.1	0.0	
Delay (s)	15.8		2.7	3.0	2.8	
Level of Service	B		A	A	A	
Approach Delay (s)	15.8			3.0	2.8	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	36.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	189	147	893	52	39	487
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00		1.00	1.00
Flpb, ped/bikes	0.93	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1584	1466	3379		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1584	1466	3379		1711	3421
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	210	163	992	58	43	541
RTOR Reduction (vph)	0	116	4	0	0	0
Lane Group Flow (vph)	210	47	1046	0	43	541
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	50.1		5.9	61.1
Effective Green, g (s)	28.7	28.7	50.1		5.9	61.1
Actuated g/C Ratio	0.29	0.29	0.50		0.06	0.61
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	454	420	1692		100	2090
v/s Ratio Prot			c0.31		c0.03	0.16
v/s Ratio Perm	c0.13	0.03				
v/c Ratio	0.46	0.11	0.62		0.43	0.26
Uniform Delay, d1	29.3	26.3	18.0		45.4	9.0
Progression Factor	1.00	1.00	1.82		1.06	1.34
Incremental Delay, d2	0.7	0.1	1.0		3.0	0.1
Delay (s)	30.1	26.4	33.9		51.2	12.1
Level of Service	C	C	C		D	B
Approach Delay (s)	28.4		33.9			15.0
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	27.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	12	22	239	192	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.96	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1540	1346		3063	2948	
Flt Permitted	0.95	1.00		0.90	1.00	
Satd. Flow (perm)	1540	1346		2771	2948	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	14	26	281	226	71
RTOR Reduction (vph)	0	14	0	0	56	0
Lane Group Flow (vph)	12	0	0	307	241	0
Confl. Peds. (#/hr)	1	1	25			25
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	1.3	1.3		10.2	10.2	
Effective Green, g (s)	1.3	1.3		10.2	10.2	
Actuated g/C Ratio	0.03	0.03		0.22	0.22	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	42	37		601	639	
v/s Ratio Prot	c0.01				0.08	
v/s Ratio Perm		0.00		c0.11		
v/c Ratio	0.29	0.01		0.51	0.38	
Uniform Delay, d1	22.4	22.2		16.2	15.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	0.1		0.7	0.4	
Delay (s)	26.1	22.3		16.9	16.1	
Level of Service	C	C		B	B	
Approach Delay (s)	24.1			16.9	16.1	
Approach LOS	C			B	B	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	47.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	37.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	8	67	49	28	5	130	44	9	5	164	122
Peak Hour Factor	0.92	0.87	0.87	0.87	0.87	0.92	0.87	0.92	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	54	9	77	56	32	5	149	48	10	5	178	133

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	54	86	56	38	208	184	133
Volume Left (vph)	54	0	56	0	149	5	0
Volume Right (vph)	0	77	0	5	10	0	133
Hadj (s)	0.53	-0.59	0.53	-0.07	0.15	0.05	-0.67
Departure Headway (s)	6.5	5.4	6.6	6.0	5.7	5.5	4.8
Degree Utilization, x	0.10	0.13	0.10	0.06	0.33	0.28	0.18
Capacity (veh/h)	510	613	502	551	609	629	721
Control Delay (s)	9.1	8.0	9.2	8.2	11.5	9.4	7.6
Approach Delay (s)	8.4		8.8		11.5	8.6	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	9.4		
Level of Service	A		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	89	269	3	230	47	268	708	17	18	472	186
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1266	1365	1126	1283	1365	1099	2515	2581		1296	2464	
Flt Permitted	0.51	1.00	1.00	0.69	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	682	1365	1126	936	1365	1099	2515	2581		1296	2464	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	209	98	296	3	253	52	295	778	19	20	519	204
RTOR Reduction (vph)	0	0	194	0	0	34	0	2	0	0	42	0
Lane Group Flow (vph)	209	98	102	3	253	18	295	795	0	20	681	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	235	470	388	322	470	379	352	975		155	882	
v/s Ratio Prot		0.07			0.19		0.12	c0.31		0.02	c0.28	
v/s Ratio Perm	c0.31		0.09	0.00		0.02						
v/c Ratio	0.89	0.21	0.26	0.01	0.54	0.05	0.84	0.82		0.13	0.77	
Uniform Delay, d1	30.9	23.1	23.6	21.5	26.3	21.8	41.9	28.0		39.3	28.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.64	0.76		1.15	1.19	
Incremental Delay, d2	35.8	1.0	1.6	0.1	4.4	0.2	8.2	2.7		1.7	6.3	
Delay (s)	66.8	24.1	25.2	21.6	30.7	22.0	35.0	24.0		47.0	40.3	
Level of Service	E	C	C	C	C	C	D	C		D	D	
Approach Delay (s)		39.4			29.2			27.0			40.5	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	33.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	116.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	102	473	8	6	645	32	33	25	34	41	3	105
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.85	1.00	0.98		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.91		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1411	1621	1706	1238	1621	1527		1491	1355	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.68	1.00		0.72	1.00	
Satd. Flow (perm)	1621	1706	1411	1621	1706	1238	1163	1527		1123	1355	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	111	514	9	7	701	35	36	27	37	45	3	114
RTOR Reduction (vph)	0	0	4	0	0	19	0	28	0	0	85	0
Lane Group Flow (vph)	111	514	5	7	701	16	36	36	0	45	32	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)			10			10			10			10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.9	47.6	47.6	2.7	39.4	39.4	21.9	21.9		21.9	21.9	
Effective Green, g (s)	10.9	47.6	47.6	2.7	39.4	39.4	21.9	21.9		21.9	21.9	
Actuated g/C Ratio	0.12	0.55	0.55	0.03	0.45	0.45	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	202	931	770	50	770	559	292	383		282	340	
v/s Ratio Prot	c0.07	c0.30		0.00	c0.41			0.02			0.02	
v/s Ratio Perm			0.00			0.01	0.03			c0.04		
v/c Ratio	0.55	0.55	0.01	0.14	0.91	0.03	0.12	0.09		0.16	0.09	
Uniform Delay, d1	35.8	12.9	9.0	41.1	22.3	13.3	25.2	25.0		25.5	25.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.0	2.4	0.0	1.3	14.9	0.0	0.2	0.1		0.3	0.1	
Delay (s)	38.9	15.2	9.0	42.4	37.1	13.3	25.4	25.2		25.7	25.2	
Level of Service	D	B	A	D	D	B	C	C		C	C	
Approach Delay (s)		19.3			36.0			25.3			25.3	
Approach LOS		B			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	87.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	85.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	121	402	14	21	683	79	49	203	70	112	54	146
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1049	1540	2960			2978	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.64	1.00			0.66	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1049	1041	2960			2024	1072
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	126	419	15	22	711	82	51	211	73	117	56	152
RTOR Reduction (vph)	0	0	5	0	0	37	0	41	0	0	0	130
Lane Group Flow (vph)	126	419	10	22	711	45	51	243	0	0	173	22
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	11.0	57.2	57.2	2.3	47.5	47.5	13.7	13.7			12.7	12.7
Effective Green, g (s)	11.0	57.2	57.2	2.3	47.5	47.5	13.7	13.7			12.7	12.7
Actuated g/C Ratio	0.13	0.66	0.66	0.03	0.55	0.55	0.16	0.16			0.15	0.15
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	155	806	914	41	669	578	165	470			298	157
v/s Ratio Prot	c0.10	0.34		0.01	c0.58			0.08				
v/s Ratio Perm			0.01			0.04	0.05				c0.09	0.02
v/c Ratio	0.81	0.52	0.01	0.54	1.06	0.08	0.31	0.52			1.04dl	0.14
Uniform Delay, d1	36.6	7.4	4.9	41.4	19.4	9.1	32.1	33.2			34.3	32.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	26.7	2.4	0.0	12.8	52.7	0.1	1.1	1.0			2.9	0.4
Delay (s)	63.3	9.8	4.9	54.3	72.0	9.1	33.1	34.2			37.1	32.4
Level of Service	E	A	A	D	E	A	C	C			D	C
Approach Delay (s)		21.7			65.2			34.0			34.9	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	43.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	86.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	417	70	33	478	366	61	249	30	89	138	43
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.89	1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1337	931		1336	1126	856	1070	957	919	1070	1068	
Flt Permitted	0.18	1.00		0.28	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	251	931		394	1126	856	1070	957	919	1070	1068	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	50	444	74	35	509	389	65	265	32	95	147	46
RTOR Reduction (vph)	0	5	0	0	0	130	0	0	25	0	11	0
Lane Group Flow (vph)	50	513	0	35	509	259	65	265	7	95	182	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	55.4	55.4		54.5	54.5	61.5	9.9	25.0	25.0	7.0	22.1	
Effective Green, g (s)	55.4	55.4		54.5	54.5	61.5	9.9	25.0	25.0	7.0	22.1	
Actuated g/C Ratio	0.51	0.51		0.50	0.50	0.56	0.09	0.23	0.23	0.06	0.20	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	158	470		215	559	518	96	218	209	68	215	
v/s Ratio Prot	0.01	c0.55		0.00	c0.45	0.03	0.06	c0.28		c0.09	0.17	
v/s Ratio Perm	0.15			0.08		0.27			0.01			
v/c Ratio	0.32	1.09		0.16	0.91	0.50	0.68	1.22	0.03	1.40	0.85	
Uniform Delay, d1	18.5	27.2		25.5	25.4	14.7	48.4	42.4	33.0	51.4	42.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.2	68.3		0.4	19.0	0.8	17.3	131.4	0.1	246.3	25.1	
Delay (s)	19.6	95.4		25.8	44.4	15.5	65.6	173.7	33.0	297.6	67.2	
Level of Service	B	F		C	D	B	E	F	C	F	E	
Approach Delay (s)		88.8			31.6			141.9			143.2	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	80.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	109.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	63	136	39	45	162	2	31	116	78	11	51	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	0.98		0.98	
Flpb, ped/bikes		1.00		0.99	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	1.00			1.00	0.85		0.90	
Flt Protected		0.99		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1721		1691	1797			1779	1499		1578	
Flt Permitted		0.86		0.57	1.00			0.87	1.00		0.98	
Satd. Flow (perm)		1506		1014	1797			1562	1499		1557	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	70	151	43	50	180	2	34	129	87	12	57	239
RTOR Reduction (vph)	0	9	0	0	1	0	0	0	65	0	174	0
Lane Group Flow (vph)	0	255	0	50	181	0	0	163	22	0	134	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		15.5		15.5	15.5			13.3	13.3		13.3	
Effective Green, g (s)		15.5		15.5	15.5			13.3	13.3		13.3	
Actuated g/C Ratio		0.29		0.29	0.29			0.25	0.25		0.25	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		435		293	519			387	371		386	
v/s Ratio Prot					0.10							
v/s Ratio Perm		c0.17		0.05				c0.10	0.01		0.09	
v/c Ratio		0.59		0.17	0.35			0.42	0.06		0.35	
Uniform Delay, d1		16.3		14.2	15.1			16.9	15.4		16.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		2.0		0.3	0.4			0.7	0.1		0.5	
Delay (s)		18.3		14.5	15.5			17.7	15.4		17.1	
Level of Service		B		B	B			B	B		B	
Approach Delay (s)		18.3			15.3			16.9			17.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	53.6	Sum of lost time (s)	14.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	146	169	51	66	319	23	40	825	53	16	429	299
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1677	3275		1681	3376		1260	2491		1260	2332	
Flt Permitted	0.50	1.00		0.61	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	878	3275		1072	3376		1260	2491		1260	2332	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	155	180	54	70	339	24	43	878	56	17	456	318
RTOR Reduction (vph)	0	28	0	0	5	0	0	5	0	0	126	0
Lane Group Flow (vph)	155	206	0	70	358	0	43	929	0	17	648	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Effective Green, g (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.12	0.35		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	304	1136		371	1171		149	869		187	883	
v/s Ratio Prot		0.06			0.11		0.03	c0.37		0.01	c0.28	
v/s Ratio Perm	c0.18			0.07								
v/c Ratio	0.51	0.18		0.19	0.31		0.29	1.07		0.09	0.73	
Uniform Delay, d1	25.9	22.8		22.8	23.8		40.2	32.5		36.7	26.7	
Progression Factor	1.00	1.00		1.00	1.00		0.78	0.80		1.55	0.62	
Incremental Delay, d2	6.0	0.4		1.1	0.7		4.7	50.6		0.7	3.9	
Delay (s)	31.9	23.1		23.9	24.5		36.3	76.5		57.6	20.5	
Level of Service	C	C		C	C		D	E		E	C	
Approach Delay (s)		26.6			24.4			74.7			21.3	
Approach LOS		C			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	42.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	107.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	320	38	4	711	2	38	0	12	13	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			0.97		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3367		1711	3420			1678		1711	1531	
Flt Permitted	0.28	1.00		0.52	1.00			0.84		0.72	1.00	
Satd. Flow (perm)	496	3367		940	3420			1467		1300	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	348	41	4	773	2	41	0	13	14	0	14
RTOR Reduction (vph)	0	15	0	0	0	0	0	20	0	0	8	0
Lane Group Flow (vph)	7	374	0	4	775	0	0	34	0	14	6	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.0	24.0		24.0	24.0			26.0		26.0	26.0	
Effective Green, g (s)	24.0	24.0		24.0	24.0			26.0		26.0	26.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40			0.43		0.43	0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	198	1346		376	1368			635		563	663	
v/s Ratio Prot		0.11			c0.23						0.00	
v/s Ratio Perm	0.01			0.00				c0.02		0.01		
v/c Ratio	0.04	0.28		0.01	0.57			0.05		0.02	0.01	
Uniform Delay, d1	11.0	12.2		10.8	14.0			9.9		9.7	9.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.5		0.1	1.7			0.2		0.1	0.0	
Delay (s)	11.3	12.7		10.9	15.7			10.0		9.8	9.7	
Level of Service	B	B		B	B			B		A	A	
Approach Delay (s)		12.6			15.6			10.0			9.8	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	86	0	0	822	16	382	189	282	0	0	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				3.5
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Frt		1.00			1.00		1.00	0.91				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3399			5117		1711	3114				2694
Flt Permitted		0.88			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3021			5117		1711	3114				2694
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	13	88	0	0	839	16	390	193	288	0	0	130
RTOR Reduction (vph)	0	0	0	0	2	0	0	149	0	0	0	121
Lane Group Flow (vph)	0	101	0	0	853	0	390	332	0	0	0	9
Confl. Peds. (#/hr)												20
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		47.5			36.5		53.0	53.0				7.5
Effective Green, g (s)		47.5			36.5		53.0	53.0				7.5
Actuated g/C Ratio		0.43			0.33		0.48	0.48				0.07
Clearance Time (s)		4.5			4.5		5.0	5.0				3.5
Lane Grp Cap (vph)		1330			1697		824	1500				183
v/s Ratio Prot		c0.01			c0.17		c0.23	0.11				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.08			0.50		0.47	0.22				0.05
Uniform Delay, d1		18.4			29.5		19.1	16.5				47.9
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			1.1		1.9	0.3				0.5
Delay (s)		18.5			30.5		21.1	16.9				48.4
Level of Service		B			C		C	B				D
Approach Delay (s)		18.5			30.5			18.8			48.4	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	25.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱	↱	↰↰	↑		
Volume (vph)	99	566	782	549	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.89	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1507	1426	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1507	1426	3319	1801		
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	102	584	806	566	0	0
RTOR Reduction (vph)	31	31	0	0	0	0
Lane Group Flow (vph)	322	302	806	566	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	37.4	37.4	22.6	70.0		
Effective Green, g (s)	37.4	37.4	22.6	70.0		
Actuated g/C Ratio	0.53	0.53	0.32	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	805	761	1071	1801		
v/s Ratio Prot	c0.21		c0.24	0.31		
v/s Ratio Perm		0.21				
v/c Ratio	0.40	0.40	0.75	0.31		
Uniform Delay, d1	9.7	9.6	21.2	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.3	0.3	3.0	0.1		
Delay (s)	10.0	10.0	24.2	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	10.0			14.3	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↱		↰	↑↑↱		↰	↑↑↱	
Volume (vph)	212	138	181	7	204	13	176	588	16	17	570	169
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.93		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.98	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1188	1948		1139	1257		1215	2414		1215	2289	
Flt Permitted	0.36	1.00		0.55	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	454	1948		660	1257		1215	2414		1215	2289	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	221	144	189	7	212	14	183	612	17	18	594	176
RTOR Reduction (vph)	0	127	0	0	2	0	0	2	0	0	28	0
Lane Group Flow (vph)	221	206	0	7	224	0	183	627	0	18	742	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	32.9	32.9		21.9	21.9		17.3	46.8		4.0	33.5	
Effective Green, g (s)	32.9	32.9		21.9	21.9		17.3	46.8		4.0	33.5	
Actuated g/C Ratio	0.33	0.33		0.22	0.22		0.17	0.47		0.04	0.34	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	191	640		144	275		210	1129		48	766	
v/s Ratio Prot	c0.07	0.11			0.18		c0.15	0.26		0.01	c0.32	
v/s Ratio Perm	c0.31			0.01								
v/c Ratio	1.16	0.32		0.05	0.81		0.87	0.56		0.38	0.97	
Uniform Delay, d1	34.2	25.2		30.8	37.1		40.3	19.1		46.8	32.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.69	0.61	
Incremental Delay, d2	113.8	0.3		0.1	16.6		30.2	2.0		4.3	23.8	
Delay (s)	148.0	25.5		31.0	53.7		70.5	21.1		36.8	43.9	
Level of Service	F	C		C	D		E	C		D	D	
Approach Delay (s)		74.3			53.0			32.2			43.7	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	47.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	270	650	480	532
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	293	707	522	578
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			544			
pX, platoon unblocked						
vC, conflicting volume	1915	147			293	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1915	147			293	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			59	
cM capacity (veh/h)	35	874			1265	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	147	147	707	522	578
Volume Left	0	0	0	522	0
Volume Right	0	0	707	0	0
cSH	1700	1700	1700	1265	1700
Volume to Capacity	0.09	0.09	0.42	0.41	0.34
Queue Length 95th (ft)	0	0	0	52	0
Control Delay (s)	0.0	0.0	0.0	9.8	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.7	
Approach LOS					

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	169	129	0	163	112
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	184	140	0	177	122
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	140				232	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	140				232	140
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				76	86
cM capacity (veh/h)	1441				736	882

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	92	92	140	299
Volume Left	0	0	0	177
Volume Right	0	0	0	122
cSH	1700	1700	1700	789
Volume to Capacity	0.05	0.05	0.08	0.38
Queue Length 95th (ft)	0	0	0	44
Control Delay (s)	0.0	0.0	0.0	12.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.3
Approach LOS				B

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	54	277	129	58	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	59	301	140	63	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	203				408	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	203				408	140
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				100	100
cM capacity (veh/h)	1366				547	882

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	159	201	140	63	0
Volume Left	59	0	0	0	0
Volume Right	0	0	0	63	0
cSH	1366	1700	1700	1700	1700
Volume to Capacity	0.04	0.12	0.08	0.04	0.00
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	3.1	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.4		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	24.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	20	44	21	41	27	37	676	33	23	594	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.93			0.96		1.00	0.99		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1488			1537		1540	3058		1540	3057	
Flt Permitted		0.87			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1306			1365		1540	3058		1540	3057	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	22	48	23	45	29	40	735	36	25	646	32
RTOR Reduction (vph)	0	43	0	0	20	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	48	0	0	77	0	40	769	0	25	676	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		9.6			9.6		5.1	70.8		4.4	70.1	
Effective Green, g (s)		9.6			9.6		5.1	70.8		4.4	70.1	
Actuated g/C Ratio		0.10			0.10		0.05	0.71		0.04	0.70	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		125			131		78	2165		67	2142	
v/s Ratio Prot							0.03	c0.25		0.02	c0.22	
v/s Ratio Perm		0.04			c0.06							
v/c Ratio		0.38			0.59		0.51	0.36		0.37	0.32	
Uniform Delay, d1		42.4			43.3		46.2	5.7		46.5	5.7	
Progression Factor		1.00			1.00		1.26	0.63		1.22	1.63	
Incremental Delay, d2		1.9			6.6		1.5	0.3		1.1	0.3	
Delay (s)		44.3			49.9		59.9	3.9		57.6	9.7	
Level of Service		D			D		E	A		E	A	
Approach Delay (s)		44.3			49.9			6.7			11.4	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp
9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	466	49	253	0	0	329
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	507	53	275	0	0	358

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	253	253	53	138	138	358
Volume Left (vph)	253	253	0	0	0	0
Volume Right (vph)	0	0	53	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.9	6.9	3.2	6.7	6.7	6.3
Degree Utilization, x	0.49	0.49	0.05	0.26	0.26	0.62
Capacity (veh/h)	505	506	1121	511	511	560
Control Delay (s)	15.1	15.1	5.2	10.8	10.8	19.0
Approach Delay (s)	14.1			10.8		19.0
Approach LOS	B			B		C

Intersection Summary			
Delay	14.8		
Level of Service	B		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	43	143	0	0	273	94	29	377	20	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	155	0	0	297	102	32	410	22	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	202	399	236	227
Volume Left (vph)	47	0	32	0
Volume Right (vph)	0	102	0	22
Hadj (s)	0.08	-0.12	0.10	-0.03
Departure Headway (s)	5.9	5.4	6.3	6.1
Degree Utilization, x	0.33	0.59	0.41	0.38
Capacity (veh/h)	580	649	553	564
Control Delay (s)	11.7	15.9	12.3	11.7
Approach Delay (s)	11.7	15.9	12.0	
Approach LOS	B	C	B	

Intersection Summary			
Delay	13.4		
Level of Service	B		
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	19	63	11	56	8	60	757	1	0	702	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.92			0.99		1.00	1.00			0.99	
Flpb, ped/bikes		0.98			0.99		1.00	1.00			1.00	
Frt		0.92			0.99		1.00	1.00			0.99	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1162			1546		1540	2268			2221	
Flt Permitted		0.94			0.94		0.95	1.00			1.00	
Satd. Flow (perm)		1103			1470		1540	2268			2221	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	19	20	66	12	59	8	63	797	1	0	739	37
RTOR Reduction (vph)	0	59	0	0	5	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	74	0	63	798	0	0	775	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		10.9			10.9		8.3	78.8			65.4	
Effective Green, g (s)		10.9			10.9		8.3	78.8			65.4	
Actuated g/C Ratio		0.11			0.11		0.08	0.79			0.65	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		120			160		127	1787			1452	
v/s Ratio Prot							0.04	c0.35			c0.35	
v/s Ratio Perm		0.04			c0.05							
v/c Ratio		0.38			0.46		0.50	0.45			0.53	
Uniform Delay, d1		41.4			41.8		43.8	3.5			9.2	
Progression Factor		1.00			1.00		0.81	0.40			1.52	
Incremental Delay, d2		2.1			2.1		2.2	0.6			1.2	
Delay (s)		43.5			43.9		37.7	2.0			15.2	
Level of Service		D			D		D	A			B	
Approach Delay (s)		43.5			43.9			4.6			15.2	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	352	449	0	0	223	394	239	174	349	60	0	479
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.84	1.00	1.00	0.86	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1008	1540	1621	1188	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1008	1540	1621	1188	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	371	473	0	0	235	415	252	183	367	63	0	504
RTOR Reduction (vph)	0	0	0	0	0	270	0	0	206	0	0	402
Lane Group Flow (vph)	371	473	0	0	235	145	252	183	161	63	0	102
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	18.1	41.2			18.1	18.1	19.0	19.0	19.0	11.5		11.5
Effective Green, g (s)	18.1	41.2			18.1	18.1	19.0	19.0	19.0	11.5		11.5
Actuated g/C Ratio	0.21	0.47			0.21	0.21	0.22	0.22	0.22	0.13		0.13
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	317	1446			635	208	333	351	257	201		158
v/s Ratio Prot	c0.24	0.15			0.08		c0.16	0.11		0.04		c0.08
v/s Ratio Perm						c0.14			0.14			
v/c Ratio	1.17	0.33			0.37	0.70	0.76	0.52	0.63	0.31		0.64
Uniform Delay, d1	34.8	14.6			29.9	32.3	32.2	30.3	31.1	34.5		36.2
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	105.1	0.6			1.7	17.7	9.4	1.4	4.7	0.9		8.7
Delay (s)	139.9	15.2			31.6	50.0	41.6	31.7	35.8	35.4		44.8
Level of Service	F	B			C	D	D	C	D	D		D
Approach Delay (s)		70.0			43.3			36.7			43.8	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	49.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	87.7	Sum of lost time (s)	21.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	55	117	5	58	23	132	99	2	8	104	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.96		1.00	1.00		1.00	0.94	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3129			1731		1711	1796		1711	1701	
Flt Permitted		0.86			0.98		0.64	1.00		0.69	1.00	
Satd. Flow (perm)		2717			1707		1160	1796		1235	1701	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	78	60	127	5	63	25	143	108	2	9	113	66
RTOR Reduction (vph)	0	75	0	0	15	0	0	1	0	0	39	0
Lane Group Flow (vph)	0	190	0	0	78	0	143	109	0	9	140	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		19.5			19.5		19.5	19.5		19.5	19.5	
Effective Green, g (s)		19.5			19.5		19.5	19.5		19.5	19.5	
Actuated g/C Ratio		0.41			0.41		0.41	0.41		0.41	0.41	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		1103			693		471	729		501	691	
v/s Ratio Prot								0.06			0.08	
v/s Ratio Perm		c0.07			0.05		c0.12			0.01		
v/c Ratio		0.17			0.11		0.30	0.15		0.02	0.20	
Uniform Delay, d1		9.1			8.9		9.7	9.0		8.5	9.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.3		1.7	0.4		0.1	0.7	
Delay (s)		9.4			9.2		11.3	9.4		8.6	9.9	
Level of Service		A			A		B	A		A	A	
Approach Delay (s)		9.4			9.2			10.5			9.8	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	9.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Existing 2015 plus Project
Basketball Game
With SF Giants Game at AT&T Park
Weekday PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	783	704	102	323	632	48	12	710	163	0	0	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Lane Util. Factor	0.94	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.93		1.00	0.96			1.00	0.47			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.98		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	3656	2370		2515	2469			4651	547			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	3656	2370		2515	2469			4651	547			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	807	726	105	333	652	49	12	732	168	0	0	0
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	126	0	0	0
Lane Group Flow (vph)	807	821	0	333	701	0	0	744	42	0	0	0
Confl. Peds. (#/hr)			1700			1700	1700		1700			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	20.7	40.2		21.7	42.7			27.7	27.7			
Effective Green, g (s)	20.7	40.2		21.7	42.7			27.7	27.7			
Actuated g/C Ratio	0.19	0.37		0.20	0.39			0.25	0.25			
Clearance Time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	687	866		496	958			1171	137			
v/s Ratio Prot	c0.22	c0.35		0.13	c0.28							
v/s Ratio Perm								0.16	0.08			
v/c Ratio	1.17	0.95		0.67	0.73			0.64	0.31			
Uniform Delay, d1	44.6	33.9		40.9	28.8			36.7	33.4			
Progression Factor	1.21	1.34		1.58	1.19			0.84	2.42			
Incremental Delay, d2	84.1	9.1		1.1	0.9			1.0	1.1			
Delay (s)	138.1	54.5		65.5	35.1			31.9	81.9			
Level of Service	F	D		E	D			C	F			
Approach Delay (s)		95.7			44.9			41.1			0.0	
Approach LOS		F			D			D			A	

Intersection Summary			
HCM 2000 Control Delay	67.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	1358	33	34	586	24	7	131	109	122	459	452
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	*0.80		1.00	*0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.64	1.00	0.86	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00	0.71	1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.96	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1296	3234		1296	2516			1602	858	1088	2423	581
Flt Permitted	0.95	1.00		0.95	1.00			0.96	1.00	0.67	1.00	1.00
Satd. Flow (perm)	1296	3234		1296	2516			1545	858	764	2423	581
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	131	1386	34	35	598	24	7	134	111	124	468	461
RTOR Reduction (vph)	0	2	0	0	3	0	0	0	72	0	32	184
Lane Group Flow (vph)	131	1418	0	35	619	0	0	141	39	124	611	102
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Effective Green, g (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Actuated g/C Ratio	0.13	0.39		0.08	0.33			0.35	0.35	0.36	0.36	0.36
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	169	1264		104	821			536	297	272	863	207
v/s Ratio Prot	0.10	c0.44		0.03	c0.25						c0.25	
v/s Ratio Perm								0.09	0.04	0.16		0.18
v/c Ratio	0.78	1.12		0.34	0.75			0.26	0.13	0.46	0.71	0.49
Uniform Delay, d1	46.2	33.5		47.8	33.1			25.8	24.5	27.2	30.5	27.6
Progression Factor	0.63	0.91		0.95	0.91			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	56.0		1.3	2.7			0.3	0.2	1.2	2.7	1.8
Delay (s)	31.2	86.5		46.6	32.7			26.1	24.7	28.4	33.1	29.5
Level of Service	C	F		D	C			C	C	C	C	C
Approach Delay (s)		81.8			33.5			25.5			31.6	
Approach LOS		F			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	53.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	134.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1494	151	3	1042	77	25
Ideal Flow (vphpl)	1700	1700	1400	1400	1700	1700
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2709			2269	1377	1214
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	2709			2157	1377	1214
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1556	157	3	1085	80	26
RTOR Reduction (vph)	7	0	0	0	0	14
Lane Group Flow (vph)	1706	0	0	1088	80	12
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1529			1217	458	403
v/s Ratio Prot	c0.63				c0.06	
v/s Ratio Perm				0.50		0.01
v/c Ratio	1.12			0.89	0.17	0.03
Uniform Delay, d1	23.9			21.1	26.0	24.7
Progression Factor	1.00			0.84	1.00	1.00
Incremental Delay, d2	61.7			7.3	0.8	0.1
Delay (s)	85.6			24.9	26.8	24.9
Level of Service	F			C	C	C
Approach Delay (s)	85.6			24.9	26.3	
Approach LOS	F			C	C	

Intersection Summary			
HCM 2000 Control Delay	60.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/27/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	88	794	99	22	227	661	205	289	821	261
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		2.0			2.0	2.0			2.0	2.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.97			1.00	0.87
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			1.00	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5795			2871	2501			4094	978
Flt Permitted		1.00			0.74	1.00			0.95	1.00
Satd. Flow (perm)		5795			2124	2501			4094	978
Peak-hour factor, PHF	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93
Adj. Flow (vph)	96	854	106	24	244	711	220	314	883	281
RTOR Reduction (vph)	0	22	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	1034	0	0	268	925	0	0	1225	253
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Perm
Protected Phases		6			4	4		7	7	
Permitted Phases	6			4						7
Actuated Green, G (s)		27.0			25.0	25.0			24.0	24.0
Effective Green, g (s)		29.0			28.0	28.0			27.0	27.0
Actuated g/C Ratio		0.32			0.31	0.31			0.30	0.30
Clearance Time (s)		4.0			5.0	5.0			5.0	5.0
Lane Grp Cap (vph)		1867			660	778			1228	293
v/s Ratio Prot						c0.37			c0.30	
v/s Ratio Perm		0.18			0.13					0.26
v/c Ratio		0.55			0.41	1.19			1.00	0.86
Uniform Delay, d1		25.2			24.4	31.0			31.5	29.8
Progression Factor		1.66			0.15	1.00			1.00	1.00
Incremental Delay, d2		0.6			0.2	97.6			25.1	27.0
Delay (s)		42.3			3.9	128.6			56.6	56.8
Level of Service		D			A	F			E	E
Approach Delay (s)		42.3			3.9	128.6			56.6	
Approach LOS		D			A	F			E	

Intersection Summary			
HCM 2000 Control Delay	66.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	28	419	683	63	221	322	64	211	145	682
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.81		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.91		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1313	1910		2041		1163		1327	2550
Flt Permitted		0.95	1.00		1.00		1.00		0.23	0.89
Satd. Flow (perm)		1313	1910		2041		1163		326	2269
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	30	451	734	68	238	346	69	227	156	733
RTOR Reduction (vph)	0	0	9	0	1	0	46	0	0	0
Lane Group Flow (vph)	0	436	838	0	590	0	16	0	328	788
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	5	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		22.5	22.5		23.0		23.0		42.0	42.0
Effective Green, g (s)		22.5	25.0		24.5		23.0		43.5	43.5
Actuated g/C Ratio		0.25	0.28		0.27		0.26		0.48	0.48
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		328	530		555		297		341	1148
v/s Ratio Prot		0.33	c0.44		c0.29				c0.18	0.13
v/s Ratio Perm							0.01		0.29	0.21
v/c Ratio		1.33	1.58		1.32dr		0.05		0.96	0.69
Uniform Delay, d1		33.8	32.5		32.8		25.3		27.9	18.0
Progression Factor		1.00	1.00		1.00		1.00		1.03	1.10
Incremental Delay, d2		167.7	270.1		56.2		0.3		8.1	0.3
Delay (s)		201.5	302.6		89.0		25.6		36.8	20.2
Level of Service		F	F		F		C		D	C
Approach Delay (s)			268.3		82.9					25.0
Approach LOS			F		F					C

Intersection Summary			
HCM 2000 Control Delay	139.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	58	89	1	1	3	23	849	56	135	188	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.92		1.00	0.99		1.00	0.98	
Flt Protected		0.98	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1584	1353		1450		1272	2502		1540	2994	
Flt Permitted		0.91	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1473	1353		1431		1272	2502		1540	2994	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	34	61	94	1	1	3	24	894	59	142	198	36
RTOR Reduction (vph)	0	0	64	0	2	0	0	5	0	0	15	0
Lane Group Flow (vph)	0	95	30	0	3	0	24	948	0	142	219	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.1	32.1		32.1		14.8	38.5		13.5	37.5	
Effective Green, g (s)		32.1	32.1		32.1		14.8	38.5		13.5	37.5	
Actuated g/C Ratio		0.32	0.32		0.32		0.15	0.38		0.14	0.38	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Grp Cap (vph)		472	434		459		188	963		207	1122	
v/s Ratio Prot							0.02	c0.38		c0.09	0.07	
v/s Ratio Perm		c0.06	0.02		0.00							
v/c Ratio		0.20	0.07		0.01		0.13	0.98		0.69	0.20	
Uniform Delay, d1		24.6	23.6		23.1		37.0	30.5		41.2	21.1	
Progression Factor		1.00	1.00		1.00		1.55	0.40		1.00	1.00	
Incremental Delay, d2		1.0	0.3		0.0		1.1	22.4		17.0	0.4	
Delay (s)		25.6	23.9		23.1		58.5	34.6		58.2	21.5	
Level of Service		C	C		C		E	C		E	C	
Approach Delay (s)		24.7			23.1			35.2			35.3	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	33.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	16	23	2	12	44	44	255	16	147	150	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.99	1.00	1.00		1.00	0.95	
Flpb, ped/bikes		0.99			1.00	1.00	0.83	1.00		1.00	1.00	
Frt		0.95			1.00	0.85	1.00	0.99		1.00	0.97	
Flt Protected		0.98			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2811			1609	1364	1275	1603		1540	1500	
Flt Permitted		0.91			0.94	1.00	0.63	1.00		0.95	1.00	
Satd. Flow (perm)		2628			1519	1364	849	1603		1540	1500	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	35	17	25	2	13	47	47	274	17	158	161	38
RTOR Reduction (vph)	0	23	0	0	0	31	0	3	0	0	9	0
Lane Group Flow (vph)	0	54	0	0	15	16	47	288	0	158	190	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		3.7			3.7	15.0	14.7	14.7		11.3	31.0	
Effective Green, g (s)		3.7			3.7	15.0	14.7	14.7		11.3	31.0	
Actuated g/C Ratio		0.08			0.08	0.34	0.33	0.33		0.25	0.69	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		217			125	610	279	527		389	1040	
v/s Ratio Prot						0.01		c0.18		c0.10	0.13	
v/s Ratio Perm		c0.02			0.01	0.01	0.06					
v/c Ratio		0.25			0.12	0.03	0.17	0.55		0.41	0.18	
Uniform Delay, d1		19.2			19.0	10.0	10.7	12.3		13.9	2.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			0.4	0.0	0.3	1.2		0.7	0.1	
Delay (s)		19.8			19.4	10.0	10.9	13.4		14.6	2.5	
Level of Service		B			B	A	B	B		B	A	
Approach Delay (s)		19.8			12.3			13.1			7.8	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	44.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/27/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	47	281	934	37	188	234
Ideal Flow (vphpl)	1900	1900	1400	1400	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1540	2364	1791	988	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1540	2364	1791	988	1134	1194
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	305	1015	40	204	254
RTOR Reduction (vph)	0	276	0	6	0	0
Lane Group Flow (vph)	51	29	1015	34	204	254
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	8.6	8.6	47.0	42.0	20.0	72.0
Effective Green, g (s)	8.6	8.6	47.0	42.0	20.0	72.0
Actuated g/C Ratio	0.09	0.09	0.52	0.46	0.22	0.79
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	146	224	929	512	250	948
v/s Ratio Prot	c0.03		c0.57	0.01	c0.18	0.21
v/s Ratio Perm		0.01		0.02		
v/c Ratio	0.35	0.13	1.09	0.07	0.82	0.27
Uniform Delay, d1	38.4	37.6	21.8	13.5	33.6	2.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.3	58.1	0.1	18.2	0.2
Delay (s)	39.8	37.8	79.9	13.5	51.8	2.6
Level of Service	D	D	E	B	D	A
Approach Delay (s)	38.1		77.3			24.5
Approach LOS	D		E			C

Intersection Summary			
HCM 2000 Control Delay	56.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	90.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	22	37	78	234	219	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.96		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.92		1.00	1.00	0.97	
Flt Protected	0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1555		1679	1531	3054	
Flt Permitted	0.98		0.56	1.00	1.00	
Satd. Flow (perm)	1555		993	1531	3054	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	26	44	92	275	258	55
RTOR Reduction (vph)	40	0	0	0	18	0
Lane Group Flow (vph)	30	0	92	275	295	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	3.7		24.7	24.7	24.7	
Effective Green, g (s)	3.7		24.7	24.7	24.7	
Actuated g/C Ratio	0.10		0.64	0.64	0.64	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	149		638	984	1964	
v/s Ratio Prot	c0.02			c0.18	0.10	
v/s Ratio Perm			0.09			
v/c Ratio	0.20		0.14	0.28	0.15	
Uniform Delay, d1	16.0		2.7	3.0	2.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.7		0.1	0.2	0.0	
Delay (s)	16.7		2.8	3.1	2.7	
Level of Service	B		A	A	A	
Approach Delay (s)	16.7			3.1	2.7	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	38.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/27/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	223	130	874	94	66	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	0.99		1.00	1.00
Flpb, ped/bikes	0.93	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1584	1466	3347		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1584	1466	3347		1711	3421
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	248	144	971	104	73	556
RTOR Reduction (vph)	0	103	8	0	0	0
Lane Group Flow (vph)	248	41	1067	0	73	556
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	48.1		7.9	61.1
Effective Green, g (s)	28.7	28.7	48.1		7.9	61.1
Actuated g/C Ratio	0.29	0.29	0.48		0.08	0.61
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	454	420	1609		135	2090
v/s Ratio Prot			c0.32		c0.04	0.16
v/s Ratio Perm	c0.16	0.03				
v/c Ratio	0.55	0.10	0.66		0.54	0.27
Uniform Delay, d1	30.1	26.2	19.8		44.3	9.0
Progression Factor	1.00	1.00	1.69		1.04	0.93
Incremental Delay, d2	1.3	0.1	1.3		4.4	0.1
Delay (s)	31.5	26.3	34.7		50.3	8.5
Level of Service	C	C	C		D	A
Approach Delay (s)	29.6		34.7			13.3
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	27.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	12	22	302	196	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.96	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1540	1346		3066	2950	
Flt Permitted	0.95	1.00		0.91	1.00	
Satd. Flow (perm)	1540	1346		2806	2950	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	14	26	355	231	71
RTOR Reduction (vph)	0	14	0	0	50	0
Lane Group Flow (vph)	12	0	0	381	252	0
Confl. Peds. (#/hr)	1	1	25			25
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	1.3	1.3		11.6	11.6	
Effective Green, g (s)	1.3	1.3		11.6	11.6	
Actuated g/C Ratio	0.03	0.03		0.24	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	41	36		672	707	
v/s Ratio Prot	c0.01				0.09	
v/s Ratio Perm		0.00		c0.14		
v/c Ratio	0.29	0.01		0.57	0.36	
Uniform Delay, d1	23.1	22.9		16.2	15.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.9	0.1		1.1	0.3	
Delay (s)	27.0	23.0		17.3	15.6	
Level of Service	C	C		B	B	
Approach Delay (s)	24.9			17.3	15.6	
Approach LOS	C			B	B	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	48.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	70	10	90	50	29	5	169	62	8	5	164	122
Peak Hour Factor	0.92	0.84	0.84	0.84	0.84	0.92	0.84	0.92	0.84	0.92	0.92	0.92
Hourly flow rate (vph)	76	12	107	60	35	5	201	67	10	5	178	133

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	76	119	60	40	278	184	133
Volume Left (vph)	76	0	60	0	201	5	0
Volume Right (vph)	0	107	0	5	10	0	133
Hadj (s)	0.53	-0.60	0.53	-0.06	0.16	0.05	-0.67
Departure Headway (s)	6.8	5.7	7.0	6.4	5.9	5.8	5.1
Degree Utilization, x	0.14	0.19	0.12	0.07	0.46	0.30	0.19
Capacity (veh/h)	489	584	471	512	587	591	671
Control Delay (s)	9.8	8.8	9.7	8.7	13.8	10.0	8.1
Approach Delay (s)	9.2		9.3		13.8	9.2	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	10.7		
Level of Service	B		
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰↰	↑↑↱		↰	↑↑↱	
Volume (vph)	208	116	271	6	243	71	328	688	34	19	428	276
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1267	1365	1126	1283	1365	1099	2515	2569		1296	2414	
Flt Permitted	0.49	1.00	1.00	0.68	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	657	1365	1126	913	1365	1099	2515	2569		1296	2414	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	229	127	298	7	267	78	360	756	37	21	470	303
RTOR Reduction (vph)	0	0	195	0	0	51	0	4	0	0	105	0
Lane Group Flow (vph)	229	127	103	7	267	27	360	789	0	21	668	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	226	470	388	314	470	379	352	971		155	864	
v/s Ratio Prot		0.09			0.20		c0.14	c0.31		0.02	c0.28	
v/s Ratio Perm	c0.35		0.09	0.01		0.02						
v/c Ratio	1.01	0.27	0.26	0.02	0.57	0.07	1.02	0.81		0.14	0.77	
Uniform Delay, d1	32.8	23.7	23.6	21.6	26.7	22.0	43.0	27.9		39.4	28.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.78	0.77		1.13	1.19	
Incremental Delay, d2	63.3	1.4	1.7	0.1	4.9	0.4	29.3	1.9		1.7	6.4	
Delay (s)	96.1	25.1	25.3	21.7	31.6	22.4	62.9	23.3		46.0	40.2	
Level of Service	F	C	C	C	C	C	E	C		D	D	
Approach Delay (s)		50.0			29.3			35.6			40.4	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	39.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	117.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↱		↰	↱	
Volume (vph)	129	524	7	6	789	52	26	24	24	48	4	132
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.84	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.91	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1224	1621	1578		1479	1351	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.64	1.00		0.72	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1224	1083	1578		1126	1351	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	139	563	8	6	848	56	28	26	26	52	4	142
RTOR Reduction (vph)	0	0	4	0	0	33	0	19	0	0	104	0
Lane Group Flow (vph)	139	563	4	6	848	23	28	33	0	52	42	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	15.0	51.0	51.0	3.0	39.0	39.0	25.0	25.0		25.0	25.0	
Effective Green, g (s)	15.0	51.0	51.0	3.0	39.0	39.0	25.0	25.0		25.0	25.0	
Actuated g/C Ratio	0.16	0.54	0.54	0.03	0.41	0.41	0.27	0.27		0.27	0.27	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	258	925	786	51	707	507	288	419		299	359	
v/s Ratio Prot	c0.09	c0.33		0.00	c0.50			0.02			0.03	
v/s Ratio Perm			0.00			0.02	0.03			c0.05		
v/c Ratio	0.54	0.61	0.01	0.12	1.20	0.05	0.10	0.08		0.17	0.12	
Uniform Delay, d1	36.3	14.7	9.9	44.2	27.5	16.4	26.0	25.9		26.6	26.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.2	3.0	0.0	1.0	103.1	0.0	0.1	0.1		0.3	0.1	
Delay (s)	38.5	17.7	9.9	45.2	130.6	16.4	26.1	25.9		26.8	26.3	
Level of Service	D	B	A	D	F	B	C	C		C	C	
Approach Delay (s)		21.6			123.0			26.0			26.4	
Approach LOS		C			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	70.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	94.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	452	19	23	818	106	49	160	78	130	63	165
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1048	1540	2928			2979	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.61	1.00			0.64	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1048	988	2928			1958	1072
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	146	471	20	24	852	110	51	167	81	135	66	172
RTOR Reduction (vph)	0	0	6	0	0	21	0	58	0	0	0	146
Lane Group Flow (vph)	146	471	14	24	852	89	51	190	0	0	201	26
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	8.0	70.5	70.5	2.3	63.8	63.8	16.7	16.7			15.7	15.7
Effective Green, g (s)	8.0	70.5	70.5	2.3	63.8	63.8	16.7	16.7			15.7	15.7
Actuated g/C Ratio	0.08	0.69	0.69	0.02	0.62	0.62	0.16	0.16			0.15	0.15
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	94	835	947	34	756	652	160	477			299	164
v/s Ratio Prot	c0.12	0.39		0.02	c0.70			0.06				
v/s Ratio Perm			0.01			0.08	0.05				c0.10	0.02
v/c Ratio	1.55	0.56	0.01	0.71	1.13	0.14	0.32	0.40			1.09dl	0.16
Uniform Delay, d1	47.2	8.2	5.0	49.8	19.4	8.0	37.9	38.4			41.0	37.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	294.4	0.9	0.0	49.8	73.6	0.1	1.2	0.5			5.8	0.5
Delay (s)	341.6	9.0	5.1	99.6	92.9	8.1	39.0	39.0			46.8	38.1
Level of Service	F	A	A	F	F	A	D	D			D	D
Approach Delay (s)		85.1			83.6			39.0			42.8	
Approach LOS		F			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	71.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	102.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	107.0%	ICU Level of Service	G
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	469	84	36	552	443	43	357	34	107	130	38
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.90	1.00	1.00	0.96	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1337	929		1337	1126	859	1070	957	922	1070	1072	
Flt Permitted	0.09	1.00		0.14	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	125	929		192	1126	859	1070	957	922	1070	1072	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	43	499	89	38	587	471	46	380	36	114	138	40
RTOR Reduction (vph)	0	6	0	0	0	104	0	0	26	0	10	0
Lane Group Flow (vph)	43	582	0	38	587	367	46	380	10	114	168	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	48.1	48.1		48.1	48.1	57.1	10.7	29.2	29.2	9.0	27.5	
Effective Green, g (s)	48.1	48.1		48.1	48.1	57.1	10.7	29.2	29.2	9.0	27.5	
Actuated g/C Ratio	0.44	0.44		0.44	0.44	0.52	0.10	0.27	0.27	0.08	0.25	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	87	409		114	495	488	104	255	246	88	269	
v/s Ratio Prot	0.01	c0.63		0.01	c0.52	0.06	0.04	c0.40		c0.11	0.16	
v/s Ratio Perm	0.20			0.14		0.36			0.01			
v/c Ratio	0.49	1.42		0.33	1.19	0.75	0.44	1.49	0.04	1.30	0.63	
Uniform Delay, d1	25.7	30.6		40.2	30.6	20.5	46.4	40.0	29.6	50.1	36.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.4	204.6		1.7	102.6	6.4	3.0	240.3	0.1	194.3	4.5	
Delay (s)	30.0	235.1		41.9	133.1	26.9	49.4	280.3	29.7	244.4	40.8	
Level of Service	C	F		D	F	C	D	F	C	F	D	
Approach Delay (s)		221.1			84.3			237.8			120.3	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	151.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.46		
Actuated Cycle Length (s)	109.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	303	86	75	181	18	55	132	70	19	118	202
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	0.98		0.98	
Flpb, ped/bikes		1.00		0.99	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	0.99			1.00	0.85		0.92	
Flt Protected		0.99		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1720		1695	1769			1771	1493		1621	
Flt Permitted		0.88		0.38	1.00			0.69	1.00		0.98	
Satd. Flow (perm)		1531		671	1769			1237	1493		1585	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	108	337	96	83	201	20	61	147	78	21	131	224
RTOR Reduction (vph)	0	8	0	0	4	0	0	0	56	0	69	0
Lane Group Flow (vph)	0	533	0	83	217	0	0	208	22	0	307	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		32.0		32.0	32.0			21.9	21.9		21.9	
Effective Green, g (s)		32.0		32.0	32.0			21.9	21.9		21.9	
Actuated g/C Ratio		0.41		0.41	0.41			0.28	0.28		0.28	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		627		274	724			346	418		444	
v/s Ratio Prot					0.12							
v/s Ratio Perm		c0.35		0.12				0.17	0.01		c0.19	
v/c Ratio		0.85		0.30	0.30			0.60	0.05		0.69	
Uniform Delay, d1		20.9		15.5	15.5			24.3	20.5		25.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		10.7		0.6	0.2			2.9	0.1		4.6	
Delay (s)		31.6		16.2	15.7			27.3	20.6		29.7	
Level of Service		C		B	B			C	C		C	
Approach Delay (s)		31.6			15.9			25.4			29.7	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	26.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	78.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	88.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	256	429	42	57	346	35	41	760	34	22	396	287
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1300	1300	1300	1300	1300	1300
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1502	3010		1514	3006		1170	2321		1170	2161	
Flt Permitted	0.46	1.00		0.39	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	731	3010		619	3006		1170	2321		1170	2161	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	272	456	45	61	368	37	44	809	36	23	421	305
RTOR Reduction (vph)	0	7	0	0	8	0	0	3	0	0	130	0
Lane Group Flow (vph)	272	494	0	61	397	0	44	842	0	23	596	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Effective Green, g (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.12	0.35		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	253	1044		214	1043		139	810		174	819	
v/s Ratio Prot		0.16			0.13		0.04	c0.36		0.02	c0.28	
v/s Ratio Perm	c0.37			0.10								
v/c Ratio	1.08	0.47		0.29	0.38		0.32	1.04		0.13	0.73	
Uniform Delay, d1	32.6	25.5		23.7	24.6		40.3	32.5		36.9	26.6	
Progression Factor	1.00	1.00		1.00	1.00		0.91	0.80		1.45	0.72	
Incremental Delay, d2	78.0	1.5		3.3	1.1		4.2	37.4		1.1	4.1	
Delay (s)	110.6	27.0		27.0	25.6		41.0	63.5		54.9	23.2	
Level of Service	F	C		C	C		D	E		D	C	
Approach Delay (s)		56.4			25.8			62.4			24.2	
Approach LOS		E			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	44.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	112.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1086	28	2	707	2	38	0	8	13	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor		0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes		1.00		1.00	1.00			0.99		1.00	0.96	
Flpb, ped/bikes		1.00		1.00	1.00			0.99		0.98	1.00	
Frt		1.00		1.00	1.00			0.98		1.00	0.85	
Flt Protected		1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)		3404		1704	3419			1653		1682	1477	
Flt Permitted		1.00		0.15	1.00			0.83		0.72	1.00	
Satd. Flow (perm)		3404		266	3419			1421		1283	1477	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1180	30	2	768	2	41	0	9	14	0	14
RTOR Reduction (vph)	0	3	0	0	1	0	0	22	0	0	9	0
Lane Group Flow (vph)	0	1207	0	2	769	0	0	28	0	14	5	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		27.0		27.0	27.0			23.0		23.0	23.0	
Effective Green, g (s)		27.0		27.0	27.0			23.0		23.0	23.0	
Actuated g/C Ratio		0.45		0.45	0.45			0.38		0.38	0.38	
Clearance Time (s)		5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)		1531		119	1538			544		491	566	
v/s Ratio Prot		c0.35			0.23						0.00	
v/s Ratio Perm				0.01				c0.02		0.01		
v/c Ratio		0.79		0.02	0.50			0.05		0.03	0.01	
Uniform Delay, d1		14.1		9.1	11.7			11.6		11.5	11.4	
Progression Factor		1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2		4.2		0.3	1.2			0.2		0.1	0.0	
Delay (s)		18.3		9.4	12.9			11.8		11.6	11.5	
Level of Service		B		A	B			B		B	B	
Approach Delay (s)		18.3			12.9			11.8			11.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	93	0	0	877	18	467	165	785	0	0	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frpb, ped/bikes		1.00			1.00		1.00	0.98				1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Frt		1.00			1.00		1.00	0.88				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3398			5113		1711	2941				2694
Flt Permitted		0.87			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2980			5113		1711	2941				2694
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	14	97	0	0	914	19	486	172	818	0	0	132
RTOR Reduction (vph)	0	0	0	0	3	0	0	436	0	0	0	126
Lane Group Flow (vph)	0	111	0	0	930	0	486	554	0	0	0	6
Confl. Peds. (#/hr)	20					20	1		10			
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		38.5			29.5		42.0	42.0				4.0
Effective Green, g (s)		38.5			29.5		42.0	42.0				4.0
Actuated g/C Ratio		0.43			0.33		0.47	0.47				0.04
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1293			1675		798	1372				119
v/s Ratio Prot		c0.00			c0.18		c0.28	0.19				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.09			0.56		0.61	0.40				0.05
Uniform Delay, d1		15.3			24.9		17.9	15.8				41.2
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			1.3		3.4	0.9				0.8
Delay (s)		15.4			26.2		21.3	16.7				42.0
Level of Service		B			C		C	B				D
Approach Delay (s)		15.4			26.2			18.2			42.0	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.
4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	106	616	773	698	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.98	0.97	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.89	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1499	1417	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1499	1417	3319	1801		
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	108	629	789	712	0	0
RTOR Reduction (vph)	25	25	0	0	0	0
Lane Group Flow (vph)	353	334	789	712	0	0
Confl. Peds. (#/hr)		4	5			
Confl. Bikes (#/hr)		24				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	31.2	31.2	18.8	60.0		
Effective Green, g (s)	31.2	31.2	18.8	60.0		
Actuated g/C Ratio	0.52	0.52	0.31	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	779	736	1039	1801		
v/s Ratio Prot	0.24		c0.24	c0.40		
v/s Ratio Perm		0.24				
v/c Ratio	0.45	0.45	0.76	0.40		
Uniform Delay, d1	9.0	9.0	18.6	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.4	0.4	3.2	0.1		
Delay (s)	9.5	9.5	21.8	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	9.5			11.5	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	218	159	178	8	222	16	199	663	5	25	458	160
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.98	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.99		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1191	1972		1141	1254		1215	2426		1215	2270	
Flt Permitted	0.34	1.00		0.54	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	431	1972		650	1254		1215	2426		1215	2270	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	227	166	185	8	231	17	207	691	5	26	477	167
RTOR Reduction (vph)	0	117	0	0	3	0	0	1	0	0	37	0
Lane Group Flow (vph)	227	234	0	8	245	0	207	695	0	26	607	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.7	36.7		23.1	23.1		16.1	43.2		3.8	30.9	
Effective Green, g (s)	36.7	36.7		23.1	23.1		16.1	43.2		3.8	30.9	
Actuated g/C Ratio	0.37	0.37		0.23	0.23		0.16	0.43		0.04	0.31	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	221	723		150	289		195	1048		46	701	
v/s Ratio Prot	c0.09	0.12			0.20		c0.17	0.29		0.02	c0.27	
v/s Ratio Perm	c0.29			0.01								
v/c Ratio	1.03	0.32		0.05	0.85		1.06	0.66		0.57	0.87	
Uniform Delay, d1	31.0	22.7		29.9	36.8		42.0	22.6		47.3	32.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.86	
Incremental Delay, d2	67.8	0.3		0.1	20.0		81.7	3.3		10.9	10.2	
Delay (s)	98.7	23.0		30.1	56.7		123.6	25.9		58.0	38.2	
Level of Service	F	C		C	E		F	C		E	D	
Approach Delay (s)		52.7			55.9			48.3			39.0	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	47.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	97.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	257	680	459	501
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	279	739	499	545
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			546			
pX, platoon unblocked						
vC, conflicting volume	1822	140			279	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1822	140			279	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			61	
cM capacity (veh/h)	42	883			1280	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	140	140	739	499	545
Volume Left	0	0	0	499	0
Volume Right	0	0	739	0	0
cSH	1700	1700	1700	1280	1700
Volume to Capacity	0.08	0.08	0.43	0.39	0.32
Queue Length 95th (ft)	0	0	0	47	0
Control Delay (s)	0.0	0.0	0.0	9.6	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.6	
Approach LOS					

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	171	137	0	158	147
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	186	149	0	172	160
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	149				242	149
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	149				242	149
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				76	82
cM capacity (veh/h)	1430				725	871

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	93	93	149	332
Volume Left	0	0	0	172
Volume Right	0	0	0	160
cSH	1700	1700	1700	789
Volume to Capacity	0.05	0.05	0.09	0.42
Queue Length 95th (ft)	0	0	0	52
Control Delay (s)	0.0	0.0	0.0	12.8
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.8
Approach LOS				B

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	38	291	137	55	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	316	149	60	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	209				390	149
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	209				390	149
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				100	100
cM capacity (veh/h)	1359				569	871

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	147	211	149	60	0
Volume Left	41	0	0	0	0
Volume Right	0	0	0	60	0
cSH	1359	1700	1700	1700	1700
Volume to Capacity	0.03	0.12	0.09	0.04	0.00
Queue Length 95th (ft)	2	0	0	0	0
Control Delay (s)	2.4	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	28	31	37	54	25	47	645	41	20	439	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.97		1.00	0.99		1.00	1.00	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1516			1549		1540	3051		1540	3065	
Flt Permitted		0.84			0.84		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1297			1328		1540	3051		1540	3065	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	30	34	40	59	27	51	701	45	22	477	15
RTOR Reduction (vph)	0	22	0	0	10	0	0	2	0	0	1	0
Lane Group Flow (vph)	0	67	0	0	116	0	51	744	0	22	491	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		15.3			15.3		7.5	83.7		5.8	82.0	
Effective Green, g (s)		15.3			15.3		7.5	83.7		5.8	82.0	
Actuated g/C Ratio		0.13			0.13		0.06	0.70		0.05	0.68	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		165			169		96	2128		74	2094	
v/s Ratio Prot							c0.03	c0.24		0.01	c0.16	
v/s Ratio Perm		0.05			c0.09							
v/c Ratio		0.41			0.69		0.53	0.35		0.30	0.23	
Uniform Delay, d1		48.2			50.1		54.5	7.3		55.1	7.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			11.1		2.8	0.5		0.8	0.3	
Delay (s)		49.8			61.2		57.4	7.7		56.0	7.4	
Level of Service		D			E		E	A		E	A	
Approach Delay (s)		49.8			61.2			10.9			9.5	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	505	74	256	0	0	312
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	549	80	278	0	0	339

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	274	274	80	139	139	339
Volume Left (vph)	274	274	0	0	0	0
Volume Right (vph)	0	0	80	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.9	6.9	3.2	6.8	6.8	6.4
Degree Utilization, x	0.52	0.52	0.07	0.26	0.26	0.60
Capacity (veh/h)	508	509	1121	505	505	551
Control Delay (s)	16.0	16.0	5.2	11.0	11.0	18.4
Approach Delay (s)	14.7			11.0		18.4
Approach LOS	B			B		C

Intersection Summary			
Delay	14.9		
Level of Service	B		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	68	167	0	0	238	69	35	202	30	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	182	0	0	259	75	38	220	33	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	255	334	148	142
Volume Left (vph)	74	0	38	0
Volume Right (vph)	0	75	0	33
Hadj (s)	0.09	-0.10	0.16	-0.13
Departure Headway (s)	5.3	5.0	6.2	5.9
Degree Utilization, x	0.37	0.46	0.25	0.23
Capacity (veh/h)	648	692	550	575
Control Delay (s)	11.4	12.2	10.0	9.4
Approach Delay (s)	11.4	12.2	9.7	
Approach LOS	B	B	A	

Intersection Summary			
Delay	11.2		
Level of Service	B		
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	22	81	6	59	6	68	820	12	0	620	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.90			0.99		1.00	0.99			0.99	
Flpb, ped/bikes		0.98			0.99		1.00	1.00			1.00	
Frt		0.91			0.99		1.00	1.00			0.99	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1132			1565		1540	2252			2226	
Flt Permitted		0.95			0.96		0.95	1.00			1.00	
Satd. Flow (perm)		1083			1506		1540	2252			2226	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	23	85	6	62	6	72	863	13	0	653	26
RTOR Reduction (vph)	0	75	0	0	4	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	51	0	0	70	0	72	876	0	0	678	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		12.1			12.1		9.7	97.6			82.8	
Effective Green, g (s)		12.1			12.1		9.7	97.6			82.8	
Actuated g/C Ratio		0.10			0.10		0.08	0.81			0.69	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		109			151		124	1831			1535	
v/s Ratio Prot							0.05	c0.39			0.30	
v/s Ratio Perm		c0.05			0.05							
v/c Ratio		0.47			0.47		0.58	0.48			0.44	
Uniform Delay, d1		50.9			50.9		53.2	3.4			8.3	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		3.2			2.3		6.8	0.9			0.9	
Delay (s)		54.1			53.2		59.9	4.3			9.2	
Level of Service		D			D		E	A			A	
Approach Delay (s)		54.1			53.2			8.5			9.2	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	377	442	0	0	249	404	223	156	369	69	0	432
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.84	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1013	1540	1621	1193	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1013	1540	1621	1193	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	397	465	0	0	262	425	235	164	388	73	0	455
RTOR Reduction (vph)	0	0	0	0	0	269	0	0	197	0	0	404
Lane Group Flow (vph)	397	465	0	0	262	156	235	164	191	73	0	51
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	18.1	41.2			18.1	18.1	18.4	18.4	18.4	9.6		9.6
Effective Green, g (s)	18.1	41.2			18.1	18.1	18.4	18.4	18.4	9.6		9.6
Actuated g/C Ratio	0.21	0.48			0.21	0.21	0.22	0.22	0.22	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	327	1488			654	215	332	350	257	173		135
v/s Ratio Prot	c0.26	0.15			0.09		0.15	0.10		c0.05		0.04
v/s Ratio Perm						c0.15			c0.16			
v/c Ratio	1.21	0.31			0.40	0.73	0.71	0.47	0.74	0.42		0.38
Uniform Delay, d1	33.5	13.4			28.9	31.3	30.9	29.1	31.2	35.2		35.0
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	121.2	0.5			1.8	19.3	6.7	1.0	11.1	1.7		1.8
Delay (s)	154.7	13.9			30.7	50.6	37.7	30.1	42.3	36.9		36.8
Level of Service	F	B			C	D	D	C	D	D		D
Approach Delay (s)		78.8			43.0			38.4			36.8	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	51.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	85.2	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	82	40	73	3	63	25	133	93	2	12	90	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.94			0.96		1.00	1.00		1.00	0.95	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3162			1731		1711	1795		1711	1705	
Flt Permitted		0.83			0.99		0.66	1.00		0.69	1.00	
Satd. Flow (perm)		2681			1723		1189	1795		1243	1705	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	43	79	3	68	27	145	101	2	13	98	54
RTOR Reduction (vph)	0	34	0	0	12	0	0	2	0	0	42	0
Lane Group Flow (vph)	0	177	0	0	86	0	145	101	0	13	110	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		23.6			23.6		9.0	9.0		9.0	9.0	
Effective Green, g (s)		23.6			23.6		9.0	9.0		9.0	9.0	
Actuated g/C Ratio		0.57			0.57		0.22	0.22		0.22	0.22	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1520			977		257	388		268	368	
v/s Ratio Prot								0.06			0.06	
v/s Ratio Perm		c0.07			0.05		c0.12			0.01		
v/c Ratio		0.12			0.09		0.56	0.26		0.05	0.30	
Uniform Delay, d1		4.2			4.1		14.5	13.5		12.9	13.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.2		2.8	0.4		0.1	0.5	
Delay (s)		4.3			4.3		17.4	13.9		13.0	14.1	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		4.3			4.3			15.9			14.0	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	41.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT WITH M-TR-11C
BASKETBALL GAME
WITH SF GIANTS GAME AT AT&T PARK
WEEKDAY PM PEAK

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	783	704	102	316	636	48	12	710	163	0	0	0
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Lane Util. Factor	0.94	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.93		1.00	0.96			1.00	0.47			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.98		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	3656	2370		2515	2469			4651	547			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	3656	2370		2515	2469			4651	547			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	807	726	105	326	656	49	12	732	168	0	0	0
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	126	0	0	0
Lane Group Flow (vph)	807	821	0	326	705	0	0	744	42	0	0	0
Confl. Peds. (#/hr)			1700			1700	1700		1700			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	20.5	40.8		21.1	42.9			27.7	27.7			
Effective Green, g (s)	20.5	40.8		21.1	42.9			27.7	27.7			
Actuated g/C Ratio	0.19	0.37		0.19	0.39			0.25	0.25			
Clearance Time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	681	879		482	962			1171	137			
v/s Ratio Prot	c0.22	c0.35		0.13	c0.29							
v/s Ratio Perm								0.16	0.08			
v/c Ratio	1.19	0.93		0.68	0.73			0.64	0.31			
Uniform Delay, d1	44.8	33.3		41.3	28.7			36.7	33.4			
Progression Factor	1.21	1.35		1.56	1.18			0.84	2.42			
Incremental Delay, d2	88.6	7.7		1.1	0.9			1.0	1.1			
Delay (s)	142.8	52.7		65.7	34.8			31.9	81.9			
Level of Service	F	D		E	C			C	F			
Approach Delay (s)		97.1			44.6			41.1			0.0	
Approach LOS		F			D			D			A	

Intersection Summary			
HCM 2000 Control Delay	67.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	1358	33	34	590	24	7	131	109	122	447	452
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	*0.80		1.00	*0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.64	1.00	0.85	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00	0.71	1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.96	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1296	3234		1296	2516			1602	858	1088	2403	581
Flt Permitted	0.95	1.00		0.95	1.00			0.96	1.00	0.67	1.00	1.00
Satd. Flow (perm)	1296	3234		1296	2516			1546	858	764	2403	581
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	131	1386	34	35	602	24	7	134	111	124	456	461
RTOR Reduction (vph)	0	2	0	0	3	0	0	0	72	0	35	181
Lane Group Flow (vph)	131	1418	0	35	623	0	0	141	39	124	601	100
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Effective Green, g (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Actuated g/C Ratio	0.13	0.39		0.08	0.33			0.35	0.35	0.36	0.36	0.36
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	169	1264		104	821			536	297	272	856	207
v/s Ratio Prot	0.10	c0.44		0.03	c0.25						c0.25	
v/s Ratio Perm								0.09	0.04	0.16		0.17
v/c Ratio	0.78	1.12		0.34	0.76			0.26	0.13	0.46	0.70	0.48
Uniform Delay, d1	46.2	33.5		47.8	33.2			25.8	24.5	27.2	30.4	27.5
Progression Factor	0.63	0.91		0.94	0.91			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	56.0		1.3	2.8			0.3	0.2	1.2	2.6	1.8
Delay (s)	31.1	86.6		46.1	32.8			26.1	24.7	28.4	33.0	29.3
Level of Service	C	F		D	C			C	C	C	C	C
Approach Delay (s)		81.9			33.6			25.5			31.5	
Approach LOS		F			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	53.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	134.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1494	151	3	1046	77	25
Ideal Flow (vphpl)	1700	1700	1400	1400	1700	1700
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2709			2269	1377	1214
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	2709			2157	1377	1214
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	1556	157	3	1090	80	26
RTOR Reduction (vph)	7	0	0	0	0	14
Lane Group Flow (vph)	1706	0	0	1093	80	12
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1529			1217	458	403
v/s Ratio Prot	c0.63				c0.06	
v/s Ratio Perm				0.51		0.01
v/c Ratio	1.12			0.90	0.17	0.03
Uniform Delay, d1	23.9			21.2	26.0	24.7
Progression Factor	1.00			0.83	1.00	1.00
Incremental Delay, d2	61.7			7.6	0.8	0.1
Delay (s)	85.6			25.1	26.8	24.9
Level of Service	F			C	C	C
Approach Delay (s)	85.6			25.1	26.3	
Approach LOS	F			C	C	

Intersection Summary			
HCM 2000 Control Delay	60.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	88	794	99	22	227	661	205	281	832	261
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		2.0			2.0	2.0			2.0	2.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.97			1.00	0.87
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			1.00	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5795			2871	2501			4094	978
Flt Permitted		1.00			0.74	1.00			0.95	1.00
Satd. Flow (perm)		5795			2124	2501			4094	978
Peak-hour factor, PHF	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93
Adj. Flow (vph)	96	854	106	24	244	711	220	305	895	281
RTOR Reduction (vph)	0	22	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	1034	0	0	268	925	0	0	1228	253
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Perm
Protected Phases		6			4	4		7	7	
Permitted Phases	6			4						7
Actuated Green, G (s)		27.0			25.0	25.0			24.0	24.0
Effective Green, g (s)		29.0			28.0	28.0			27.0	27.0
Actuated g/C Ratio		0.32			0.31	0.31			0.30	0.30
Clearance Time (s)		4.0			5.0	5.0			5.0	5.0
Lane Grp Cap (vph)		1867			660	778			1228	293
v/s Ratio Prot						c0.37			c0.30	
v/s Ratio Perm		0.18			0.13					0.26
v/c Ratio		0.55			0.41	1.19			1.00	0.86
Uniform Delay, d1		25.2			24.4	31.0			31.5	29.8
Progression Factor		1.66			0.15	1.00			1.00	1.00
Incremental Delay, d2		0.6			0.2	97.6			25.7	27.0
Delay (s)		42.3			3.9	128.6			57.2	56.8
Level of Service		D			A	F			E	E
Approach Delay (s)		42.3			3.9	128.6			57.1	
Approach LOS		D			A	F			E	

Intersection Summary			
HCM 2000 Control Delay	66.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	28	419	683	63	221	322	64	211	145	674
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.81		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.91		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1313	1910		2041		1163		1327	2550
Flt Permitted		0.95	1.00		1.00		1.00		0.23	0.88
Satd. Flow (perm)		1313	1910		2041		1163		326	2255
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	30	451	734	68	238	346	69	227	156	725
RTOR Reduction (vph)	0	0	9	0	1	0	46	0	0	0
Lane Group Flow (vph)	0	436	838	0	590	0	16	0	327	781
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	5	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		22.5	22.5		23.0		23.0		42.0	42.0
Effective Green, g (s)		22.5	25.0		24.5		23.0		43.5	43.5
Actuated g/C Ratio		0.25	0.28		0.27		0.26		0.48	0.48
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		328	530		555		297		341	1144
v/s Ratio Prot		0.33	c0.44		c0.29				c0.18	0.13
v/s Ratio Perm							0.01		0.29	0.20
v/c Ratio		1.33	1.58		1.32dr		0.05		0.96	0.68
Uniform Delay, d1		33.8	32.5		32.8		25.3		27.9	17.9
Progression Factor		1.00	1.00		1.00		1.00		1.03	1.11
Incremental Delay, d2		167.7	270.1		56.2		0.3		7.8	0.3
Delay (s)		201.5	302.6		89.0		25.6		36.6	20.3
Level of Service		F	F		F		C		D	C
Approach Delay (s)			268.3		82.9					25.1
Approach LOS			F		F					C

Intersection Summary			
HCM 2000 Control Delay	140.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	58	84	1	1	3	23	849	56	135	177	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	0.99	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.92		1.00	0.99		1.00	0.97	
Flt Protected		0.98	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1584	1353		1450		1272	2502		1540	2983	
Flt Permitted		0.91	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1473	1353		1431		1272	2502		1540	2983	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	34	61	88	1	1	3	24	894	59	142	186	39
RTOR Reduction (vph)	0	0	60	0	2	0	0	5	0	0	18	0
Lane Group Flow (vph)	0	95	28	0	3	0	24	948	0	142	208	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.1	32.1		32.1		14.8	38.5		13.5	37.5	
Effective Green, g (s)		32.1	32.1		32.1		14.8	38.5		13.5	37.5	
Actuated g/C Ratio		0.32	0.32		0.32		0.15	0.38		0.14	0.38	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Grp Cap (vph)		472	434		459		188	963		207	1118	
v/s Ratio Prot							0.02	c0.38		c0.09	0.07	
v/s Ratio Perm		c0.06	0.02		0.00							
v/c Ratio		0.20	0.07		0.01		0.13	0.98		0.69	0.19	
Uniform Delay, d1		24.6	23.5		23.1		37.0	30.5		41.2	21.0	
Progression Factor		1.00	1.00		1.00		1.55	0.40		1.00	1.00	
Incremental Delay, d2		1.0	0.3		0.0		1.1	22.4		17.0	0.4	
Delay (s)		25.6	23.8		23.1		58.5	34.6		58.2	21.4	
Level of Service		C	C		C		E	C		E	C	
Approach Delay (s)		24.8			23.1			35.1			35.6	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	16	23	2	15	44	44	255	16	142	139	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.99	1.00	1.00		1.00	0.95	
Flpb, ped/bikes		0.99			1.00	1.00	0.83	1.00		1.00	1.00	
Frt		0.95			1.00	0.85	1.00	0.99		1.00	0.97	
Flt Protected		0.98			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2811			1611	1363	1272	1603		1540	1482	
Flt Permitted		0.90			0.95	1.00	0.64	1.00		0.95	1.00	
Satd. Flow (perm)		2597			1535	1363	854	1603		1540	1482	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	35	17	25	2	16	47	47	274	17	153	149	42
RTOR Reduction (vph)	0	23	0	0	0	31	0	3	0	0	11	0
Lane Group Flow (vph)	0	54	0	0	18	16	47	288	0	153	180	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		3.8			3.8	15.0	14.6	14.6		11.2	30.8	
Effective Green, g (s)		3.8			3.8	15.0	14.6	14.6		11.2	30.8	
Actuated g/C Ratio		0.09			0.09	0.34	0.33	0.33		0.25	0.69	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		221			130	611	279	524		386	1023	
v/s Ratio Prot						0.01		c0.18		c0.10	0.12	
v/s Ratio Perm		c0.02			0.01	0.01	0.06					
v/c Ratio		0.24			0.14	0.03	0.17	0.55		0.40	0.18	
Uniform Delay, d1		19.1			18.9	9.9	10.7	12.3		13.9	2.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			0.5	0.0	0.3	1.3		0.7	0.1	
Delay (s)		19.6			19.4	9.9	11.0	13.6		14.6	2.5	
Level of Service		B			B	A	B	B		B	A	
Approach Delay (s)		19.6			12.5			13.2			7.9	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	44.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	47	281	934	37	165	228
Ideal Flow (vphpl)	1900	1900	1400	1400	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1540	2364	1791	988	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1540	2364	1791	988	1134	1194
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	305	1015	40	179	248
RTOR Reduction (vph)	0	276	0	6	0	0
Lane Group Flow (vph)	51	29	1015	34	179	248
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	8.6	8.6	47.0	42.0	20.0	72.0
Effective Green, g (s)	8.6	8.6	47.0	42.0	20.0	72.0
Actuated g/C Ratio	0.09	0.09	0.52	0.46	0.22	0.79
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	146	224	929	512	250	948
v/s Ratio Prot	c0.03		c0.57	0.01	c0.16	0.21
v/s Ratio Perm		0.01		0.02		
v/c Ratio	0.35	0.13	1.09	0.07	0.72	0.26
Uniform Delay, d1	38.4	37.6	21.8	13.5	32.7	2.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.3	58.1	0.1	9.4	0.1
Delay (s)	39.8	37.8	79.9	13.5	42.0	2.6
Level of Service	D	D	E	B	D	A
Approach Delay (s)	38.1		77.3			19.1
Approach LOS	D		E			B

Intersection Summary			
HCM 2000 Control Delay	56.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	90.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.
9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	22	37	56	234	219	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.96		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.92		1.00	1.00	0.97	
Flt Protected	0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1555		1679	1531	3054	
Flt Permitted	0.98		0.56	1.00	1.00	
Satd. Flow (perm)	1555		993	1531	3054	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	26	44	66	275	258	55
RTOR Reduction (vph)	40	0	0	0	18	0
Lane Group Flow (vph)	30	0	66	275	295	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	3.7		24.5	24.5	24.5	
Effective Green, g (s)	3.7		24.5	24.5	24.5	
Actuated g/C Ratio	0.10		0.64	0.64	0.64	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	150		636	981	1958	
v/s Ratio Prot	c0.02			c0.18	0.10	
v/s Ratio Perm			0.07			
v/c Ratio	0.20		0.10	0.28	0.15	
Uniform Delay, d1	15.9		2.6	3.0	2.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.7		0.1	0.2	0.0	
Delay (s)	16.6		2.7	3.2	2.8	
Level of Service	B		A	A	A	
Approach Delay (s)	16.6			3.1	2.8	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	38.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.
9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	223	130	874	77	50	499
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	0.99		1.00	1.00
Flpb, ped/bikes	0.93	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1584	1466	3359		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1584	1466	3359		1711	3421
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	248	144	971	86	56	554
RTOR Reduction (vph)	0	103	6	0	0	0
Lane Group Flow (vph)	248	41	1051	0	56	554
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	48.1		7.9	61.1
Effective Green, g (s)	28.7	28.7	48.1		7.9	61.1
Actuated g/C Ratio	0.29	0.29	0.48		0.08	0.61
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	454	420	1615		135	2090
v/s Ratio Prot			c0.31		c0.03	0.16
v/s Ratio Perm	c0.16	0.03				
v/c Ratio	0.55	0.10	0.65		0.41	0.27
Uniform Delay, d1	30.1	26.2	19.6		43.8	9.0
Progression Factor	1.00	1.00	1.72		1.04	0.92
Incremental Delay, d2	1.3	0.1	1.2		2.1	0.1
Delay (s)	31.5	26.3	34.9		47.7	8.3
Level of Service	C	C	C		D	A
Approach Delay (s)	29.6		34.9			12.0
Approach LOS	C		C			B

Intersection Summary			
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	12	22	280	196	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.96	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1540	1346		3065	2950	
Flt Permitted	0.95	1.00		0.91	1.00	
Satd. Flow (perm)	1540	1346		2794	2950	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	14	26	329	231	71
RTOR Reduction (vph)	0	14	0	0	51	0
Lane Group Flow (vph)	12	0	0	355	251	0
Confl. Peds. (#/hr)	1	1	25			25
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	1.3	1.3		11.0	11.0	
Effective Green, g (s)	1.3	1.3		11.0	11.0	
Actuated g/C Ratio	0.03	0.03		0.23	0.23	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	41	36		642	678	
v/s Ratio Prot	c0.01				0.09	
v/s Ratio Perm		0.00		c0.13		
v/c Ratio	0.29	0.01		0.55	0.37	
Uniform Delay, d1	22.8	22.6		16.2	15.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.9	0.1		1.0	0.3	
Delay (s)	26.7	22.7		17.3	15.8	
Level of Service	C	C		B	B	
Approach Delay (s)	24.6			17.3	15.8	
Approach LOS	C			B	B	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	38.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	49	10	96	50	29	5	169	43	8	5	164	122
Peak Hour Factor	0.92	0.84	0.84	0.84	0.84	0.92	0.84	0.92	0.84	0.92	0.92	0.92
Hourly flow rate (vph)	53	12	114	60	35	5	201	47	10	5	178	133

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	53	126	60	40	257	184	133
Volume Left (vph)	53	0	60	0	201	5	0
Volume Right (vph)	0	114	0	5	10	0	133
Hadj (s)	0.53	-0.60	0.53	-0.06	0.17	0.05	-0.67
Departure Headway (s)	6.8	5.6	6.9	6.3	5.9	5.7	5.0
Degree Utilization, x	0.10	0.20	0.11	0.07	0.42	0.29	0.18
Capacity (veh/h)	494	592	480	523	592	602	685
Control Delay (s)	9.3	8.8	9.5	8.5	13.1	9.8	7.9
Approach Delay (s)	8.9		9.1		13.1	9.0	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	10.2		
Level of Service	B		
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	197	101	273	6	243	71	328	682	35	19	428	275
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1267	1365	1126	1283	1365	1099	2515	2569		1296	2415	
Flt Permitted	0.49	1.00	1.00	0.69	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	657	1365	1126	926	1365	1099	2515	2569		1296	2415	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	216	111	300	7	267	78	360	749	38	21	470	302
RTOR Reduction (vph)	0	0	197	0	0	51	0	4	0	0	105	0
Lane Group Flow (vph)	216	111	104	7	267	27	360	783	0	21	667	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	226	470	388	319	470	379	352	971		155	864	
v/s Ratio Prot		0.08			0.20		c0.14	c0.30		0.02	c0.28	
v/s Ratio Perm	c0.33		0.09	0.01		0.02						
v/c Ratio	0.96	0.24	0.27	0.02	0.57	0.07	1.02	0.81		0.14	0.77	
Uniform Delay, d1	32.0	23.4	23.6	21.6	26.7	22.0	43.0	27.8		39.4	28.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.79	0.77		1.12	1.18	
Incremental Delay, d2	49.4	1.2	1.7	0.1	4.9	0.4	29.8	1.9		1.7	6.3	
Delay (s)	81.4	24.5	25.3	21.7	31.6	22.4	63.6	23.2		45.8	40.0	
Level of Service	F	C	C	C	C	C	E	C		D	D	
Approach Delay (s)		44.5			29.3			35.9			40.2	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	38.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	117.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	102	499	7	6	793	47	26	24	24	48	4	132
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1242	1621	1578		1491	1355	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.63	1.00		0.72	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1242	1070	1578		1135	1355	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	110	537	8	6	853	51	28	26	26	52	4	142
RTOR Reduction (vph)	0	0	3	0	0	26	0	21	0	0	112	0
Lane Group Flow (vph)	110	537	5	6	853	25	28	31	0	52	34	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.8	50.2	50.2	2.7	42.1	42.1	18.0	18.0		18.0	18.0	
Effective Green, g (s)	10.8	50.2	50.2	2.7	42.1	42.1	18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.13	0.58	0.58	0.03	0.49	0.49	0.21	0.21		0.21	0.21	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	203	996	847	50	836	608	224	330		237	283	
v/s Ratio Prot	c0.07	0.31		0.00	c0.50			0.02			0.02	
v/s Ratio Perm			0.00			0.02	0.03			c0.05		
v/c Ratio	0.54	0.54	0.01	0.12	1.02	0.04	0.12	0.10		0.22	0.12	
Uniform Delay, d1	35.2	10.8	7.4	40.4	21.9	11.4	27.6	27.4		28.1	27.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.9	2.1	0.0	1.1	36.3	0.0	0.3	0.1		0.5	0.2	
Delay (s)	38.2	12.9	7.5	41.5	58.2	11.4	27.8	27.5		28.6	27.7	
Level of Service	D	B	A	D	E	B	C	C		C	C	
Approach Delay (s)		17.1			55.5			27.6			27.9	
Approach LOS		B			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	37.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	85.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	94.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	149	418	18	22	818	111	49	178	60	130	61	165
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1048	1540	2963			2978	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.61	1.00			0.63	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1048	990	2963			1953	1072
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	155	435	19	23	852	116	51	185	62	135	64	172
RTOR Reduction (vph)	0	0	6	0	0	22	0	33	0	0	0	146
Lane Group Flow (vph)	155	435	13	23	852	94	51	214	0	0	199	26
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	8.0	72.1	72.1	1.5	64.6	64.6	16.6	16.6			15.6	15.6
Effective Green, g (s)	8.0	72.1	72.1	1.5	64.6	64.6	16.6	16.6			15.6	15.6
Actuated g/C Ratio	0.08	0.70	0.70	0.01	0.63	0.63	0.16	0.16			0.15	0.15
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	94	848	962	22	760	656	159	476			295	162
v/s Ratio Prot	c0.13	0.36		0.01	c0.70			0.07				
v/s Ratio Perm			0.01			0.09	0.05				c0.10	0.02
v/c Ratio	1.65	0.51	0.01	1.05	1.12	0.14	0.32	0.45			1.10dl	0.16
Uniform Delay, d1	47.6	7.3	4.7	50.9	19.3	7.9	38.3	39.2			41.4	38.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	334.5	0.5	0.0	206.7	71.2	0.1	1.2	0.7			6.0	0.5
Delay (s)	382.1	7.8	4.7	257.5	90.5	8.0	39.5	39.9			47.4	38.6
Level of Service	F	A	A	F	F	A	D	D			D	D
Approach Delay (s)		103.0			84.8			39.8			43.3	
Approach LOS		F			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	77.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	103.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	107.6%	ICU Level of Service	G
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	450	84	36	552	443	43	357	34	101	130	38
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.90	1.00	1.00	0.96	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1337	928		1337	1126	859	1070	957	922	1070	1072	
Flt Permitted	0.09	1.00		0.16	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	125	928		225	1126	859	1070	957	922	1070	1072	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	43	479	89	38	587	471	46	380	36	107	138	40
RTOR Reduction (vph)	0	6	0	0	0	104	0	0	26	0	10	0
Lane Group Flow (vph)	43	562	0	38	587	367	46	380	10	107	168	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	48.1	48.1		48.1	48.1	57.1	10.7	29.2	29.2	9.0	27.5	
Effective Green, g (s)	48.1	48.1		48.1	48.1	57.1	10.7	29.2	29.2	9.0	27.5	
Actuated g/C Ratio	0.44	0.44		0.44	0.44	0.52	0.10	0.27	0.27	0.08	0.25	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	87	408		128	495	488	104	255	246	88	269	
v/s Ratio Prot	0.01	c0.61		0.01	c0.52	0.06	0.04	c0.40		c0.10	0.16	
v/s Ratio Perm	0.20			0.12		0.36			0.01			
v/c Ratio	0.49	1.38		0.30	1.19	0.75	0.44	1.49	0.04	1.22	0.63	
Uniform Delay, d1	25.7	30.6		38.1	30.6	20.5	46.4	40.0	29.6	50.1	36.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.4	184.5		1.3	102.6	6.4	3.0	240.3	0.1	165.0	4.5	
Delay (s)	30.0	215.1		39.4	133.1	26.9	49.4	280.3	29.7	215.1	40.8	
Level of Service	C	F		D	F	C	D	F	C	F	D	
Approach Delay (s)		202.0			84.2			237.8			106.2	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	145.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.42		
Actuated Cycle Length (s)	109.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	281	86	75	181	18	55	132	70	19	124	202
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	0.98		0.98	
Flpb, ped/bikes		1.00		0.99	1.00			1.00	1.00		1.00	
Frt		0.97		1.00	0.99			1.00	0.85		0.92	
Flt Protected		0.99		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1718		1695	1769			1771	1494		1625	
Flt Permitted		0.90		0.38	1.00			0.72	1.00		0.98	
Satd. Flow (perm)		1556		672	1769			1287	1494		1591	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	87	312	96	83	201	20	61	147	78	21	138	224
RTOR Reduction (vph)	0	9	0	0	4	0	0	0	55	0	64	0
Lane Group Flow (vph)	0	486	0	83	217	0	0	208	23	0	319	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		27.8		27.8	27.8			21.9	21.9		21.9	
Effective Green, g (s)		27.8		27.8	27.8			21.9	21.9		21.9	
Actuated g/C Ratio		0.38		0.38	0.38			0.30	0.30		0.30	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		583		252	663			380	441		470	
v/s Ratio Prot					0.12							
v/s Ratio Perm		c0.31		0.12				0.16	0.02		c0.20	
v/c Ratio		0.83		0.33	0.33			0.55	0.05		0.68	
Uniform Delay, d1		21.0		16.5	16.5			21.9	18.7		23.0	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		9.9		0.8	0.3			1.6	0.0		3.9	
Delay (s)		30.9		17.3	16.8			23.5	18.7		26.9	
Level of Service		C		B	B			C	B		C	
Approach Delay (s)		30.9			16.9			22.2			26.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	74.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	256	389	42	57	346	35	41	755	34	22	398	287
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1300	1300	1300	1300	1300	1300
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1502	3005		1513	3006		1170	2321		1170	2162	
Flt Permitted	0.46	1.00		0.42	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	731	3005		669	3006		1170	2321		1170	2162	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	272	414	45	61	368	37	44	803	36	23	423	305
RTOR Reduction (vph)	0	8	0	0	8	0	0	3	0	0	130	0
Lane Group Flow (vph)	272	451	0	61	397	0	44	836	0	23	598	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Effective Green, g (s)	34.7	34.7		34.7	34.7		11.9	34.9		14.9	37.9	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.12	0.35		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	253	1042		232	1043		139	810		174	819	
v/s Ratio Prot		0.15			0.13		0.04	c0.36		0.02	c0.28	
v/s Ratio Perm	c0.37			0.09								
v/c Ratio	1.08	0.43		0.26	0.38		0.32	1.03		0.13	0.73	
Uniform Delay, d1	32.6	25.1		23.5	24.6		40.3	32.5		36.9	26.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.45	0.72	
Incremental Delay, d2	78.0	1.3		2.7	1.1		5.9	40.1		1.1	4.2	
Delay (s)	110.6	26.4		26.2	25.6		46.2	72.6		54.9	23.3	
Level of Service	F	C		C	C		D	E		D	C	
Approach Delay (s)		57.7			25.7			71.3			24.3	
Approach LOS		E			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	47.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	112.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	1046	28	2	707	2	38	0	8	13	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99		1.00	0.96	
Flpb, ped/bikes	0.99	1.00		1.00	1.00			0.99		0.98	1.00	
Frt	1.00	1.00		1.00	1.00			0.98		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1695	3403		1704	3419			1653		1682	1477	
Flt Permitted	0.30	1.00		0.15	1.00			0.83		0.72	1.00	
Satd. Flow (perm)	533	3403		266	3419			1421		1283	1477	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	1137	30	2	768	2	41	0	9	14	0	14
RTOR Reduction (vph)	0	3	0	0	1	0	0	22	0	0	9	0
Lane Group Flow (vph)	7	1164	0	2	769	0	0	28	0	14	5	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45			0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	239	1531		119	1538			544		491	566	
v/s Ratio Prot		c0.34			0.23						0.00	
v/s Ratio Perm	0.01			0.01				c0.02		0.01		
v/c Ratio	0.03	0.76		0.02	0.50			0.05		0.03	0.01	
Uniform Delay, d1	9.2	13.8		9.1	11.7			11.6		11.5	11.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.2	3.6		0.3	1.2			0.2		0.1	0.0	
Delay (s)	9.4	17.4		9.4	12.9			11.8		11.6	11.5	
Level of Service	A	B		A	B			B		B	B	
Approach Delay (s)		17.3			12.9			11.8			11.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	93	0	0	877	18	467	163	745	0	0	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frpb, ped/bikes		1.00			1.00		1.00	0.98				1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Frt		1.00			1.00		1.00	0.88				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3398			5113		1711	2945				2694
Flt Permitted		0.87			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2980			5113		1711	2945				2694
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	14	97	0	0	914	19	486	170	776	0	0	132
RTOR Reduction (vph)	0	0	0	0	3	0	0	414	0	0	0	126
Lane Group Flow (vph)	0	111	0	0	930	0	486	532	0	0	0	6
Confl. Peds. (#/hr)	20					20	1		10			
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		38.5			29.5		42.0	42.0				4.0
Effective Green, g (s)		38.5			29.5		42.0	42.0				4.0
Actuated g/C Ratio		0.43			0.33		0.47	0.47				0.04
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1293			1675		798	1374				119
v/s Ratio Prot		c0.00			c0.18		c0.28	0.18				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.09			0.56		0.61	0.39				0.05
Uniform Delay, d1		15.3			24.9		17.9	15.6				41.2
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			1.3		3.4	0.8				0.8
Delay (s)		15.4			26.2		21.3	16.4				42.0
Level of Service		B			C		C	B				D
Approach Delay (s)		15.4			26.2			18.1			42.0	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	106	616	773	698	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.98	0.97	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.89	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1499	1417	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1499	1417	3319	1801		
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	108	629	789	712	0	0
RTOR Reduction (vph)	25	25	0	0	0	0
Lane Group Flow (vph)	353	334	789	712	0	0
Confl. Peds. (#/hr)		4	5			
Confl. Bikes (#/hr)		24				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	31.2	31.2	18.8	60.0		
Effective Green, g (s)	31.2	31.2	18.8	60.0		
Actuated g/C Ratio	0.52	0.52	0.31	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	779	736	1039	1801		
v/s Ratio Prot	0.24		c0.24	c0.40		
v/s Ratio Perm		0.24				
v/c Ratio	0.45	0.45	0.76	0.40		
Uniform Delay, d1	9.0	9.0	18.6	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.4	0.4	3.2	0.1		
Delay (s)	9.5	9.5	21.8	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	9.5			11.5	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	226	178	8	222	22	199	655	9	25	458	160
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.95		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.98	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.99		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1192	2021		1148	1246		1215	2423		1215	2270	
Flt Permitted	0.34	1.00		0.51	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	426	2021		612	1246		1215	2423		1215	2270	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	234	235	185	8	231	23	207	682	9	26	477	167
RTOR Reduction (vph)	0	116	0	0	4	0	0	1	0	0	37	0
Lane Group Flow (vph)	234	304	0	8	250	0	207	690	0	26	607	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	37.1	37.1		23.5	23.5		15.7	42.8		3.8	30.9	
Effective Green, g (s)	37.1	37.1		23.5	23.5		15.7	42.8		3.8	30.9	
Actuated g/C Ratio	0.37	0.37		0.24	0.24		0.16	0.43		0.04	0.31	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	221	749		143	292		190	1037		46	701	
v/s Ratio Prot	c0.09	0.15			0.20		c0.17	0.29		0.02	c0.27	
v/s Ratio Perm	c0.30			0.01								
v/c Ratio	1.06	0.41		0.06	0.86		1.09	0.67		0.57	0.87	
Uniform Delay, d1	30.7	23.3		29.7	36.6		42.1	22.9		47.3	32.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	76.9	0.4		0.2	21.1		91.2	3.4		14.9	13.6	
Delay (s)	107.7	23.6		29.8	57.7		133.3	26.3		62.2	46.2	
Level of Service	F	C		C	E		F	C		E	D	
Approach Delay (s)		53.7			56.9			50.9			46.8	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	51.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	98.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	257	680	459	522
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	279	739	499	567
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			514			
pX, platoon unblocked						
vC, conflicting volume	1845	140			279	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1845	140			279	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			61	
cM capacity (veh/h)	41	883			1280	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	140	140	739	499	567
Volume Left	0	0	0	499	0
Volume Right	0	0	739	0	0
cSH	1700	1700	1700	1280	1700
Volume to Capacity	0.08	0.08	0.43	0.39	0.33
Queue Length 95th (ft)	0	0	0	47	0
Control Delay (s)	0.0	0.0	0.0	9.6	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.5	
Approach LOS					

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	172	137	0	169	147
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	187	149	0	184	160
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	149				242	149
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	149				242	149
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				75	82
cM capacity (veh/h)	1430				725	871

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	93	93	149	343
Volume Left	0	0	0	184
Volume Right	0	0	0	160
cSH	1700	1700	1700	786
Volume to Capacity	0.05	0.05	0.09	0.44
Queue Length 95th (ft)	0	0	0	56
Control Delay (s)	0.0	0.0	0.0	13.1
Lane LOS				B
Approach Delay (s)	0.0		0.0	13.1
Approach LOS				B

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	38	302	137	55	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	328	149	60	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	209				396	149
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	209				396	149
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				100	100
cM capacity (veh/h)	1359				564	871

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	151	219	149	60	0
Volume Left	41	0	0	0	0
Volume Right	0	0	0	60	0
cSH	1359	1700	1700	1700	1700
Volume to Capacity	0.03	0.13	0.09	0.04	0.00
Queue Length 95th (ft)	2	0	0	0	0
Control Delay (s)	2.3	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	0.9		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	25.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	34	31	37	54	25	47	639	52	22	439	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.97		1.00	0.99		1.00	1.00	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1523			1549		1540	3044		1540	3065	
Flt Permitted		0.85			0.83		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1317			1302		1540	3044		1540	3065	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	37	34	40	59	27	51	695	57	24	477	15
RTOR Reduction (vph)	0	19	0	0	10	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	77	0	0	116	0	51	749	0	24	491	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		15.3			15.3		7.5	84.4		5.1	82.0	
Effective Green, g (s)		15.3			15.3		7.5	84.4		5.1	82.0	
Actuated g/C Ratio		0.13			0.13		0.06	0.70		0.04	0.68	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		167			166		96	2140		65	2094	
v/s Ratio Prot							c0.03	c0.25		c0.02	0.16	
v/s Ratio Perm		0.06			c0.09							
v/c Ratio		0.46			0.70		0.53	0.35		0.37	0.23	
Uniform Delay, d1		48.5			50.2		54.5	7.0		55.9	7.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.0			12.6		2.8	0.5		1.3	0.3	
Delay (s)		50.5			62.7		57.4	7.5		57.2	7.4	
Level of Service		D			E		E	A		E	A	
Approach Delay (s)		50.5			62.7			10.6			9.7	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	547	74	256	0	0	312
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	595	80	278	0	0	339

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	297	297	80	139	139	339
Volume Left (vph)	297	297	0	0	0	0
Volume Right (vph)	0	0	80	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.9	6.9	3.2	6.9	6.9	6.5
Degree Utilization, x	0.57	0.57	0.07	0.27	0.27	0.61
Capacity (veh/h)	508	500	1121	496	496	543
Control Delay (s)	17.5	17.5	5.2	11.3	11.3	19.0
Approach Delay (s)	16.0			11.3		19.0
Approach LOS	C			B		C

Intersection Summary			
Delay	15.8		
Level of Service	C		
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	68	188	0	0	238	69	35	292	30	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	204	0	0	259	75	38	317	33	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	278	334	197	191
Volume Left (vph)	74	0	38	0
Volume Right (vph)	0	75	0	33
Hadj (s)	0.09	-0.10	0.13	-0.09
Departure Headway (s)	5.6	5.3	6.3	6.1
Degree Utilization, x	0.43	0.49	0.34	0.32
Capacity (veh/h)	615	649	547	565
Control Delay (s)	12.7	13.4	11.3	10.7
Approach Delay (s)	12.7	13.4	11.0	
Approach LOS	B	B	B	

Intersection Summary			
Delay	12.3		
Level of Service	B		
Intersection Capacity Utilization	50.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	43	81	6	59	6	68	825	12	0	620	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.92			0.99		1.00	0.99			0.99	
Flpb, ped/bikes		0.99			0.99		1.00	1.00			1.00	
Frt		0.92			0.99		1.00	1.00			0.99	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1175			1566		1540	2252			2226	
Flt Permitted		0.96			0.98		0.95	1.00			1.00	
Satd. Flow (perm)		1130			1534		1540	2252			2226	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	18	45	85	6	62	6	72	868	13	0	653	26
RTOR Reduction (vph)	0	47	0	0	3	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	101	0	0	71	0	72	881	0	0	678	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		15.8			15.8		9.7	93.9			79.1	
Effective Green, g (s)		15.8			15.8		9.7	93.9			79.1	
Actuated g/C Ratio		0.13			0.13		0.08	0.78			0.66	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		148			201		124	1762			1467	
v/s Ratio Prot							0.05	c0.39			0.30	
v/s Ratio Perm		c0.09			0.05							
v/c Ratio		0.68			0.35		0.58	0.50			0.46	
Uniform Delay, d1		49.7			47.4		53.2	4.7			10.0	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		12.3			1.1		6.8	1.0			1.0	
Delay (s)		62.0			48.5		59.9	5.7			11.1	
Level of Service		E			D		E	A			B	
Approach Delay (s)		62.0			48.5			9.8			11.1	
Approach LOS		E			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	377	451	0	0	249	404	223	156	413	90	0	432
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.84	1.00	1.00	0.86	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1006	1540	1621	1188	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1006	1540	1621	1188	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	397	475	0	0	262	425	235	164	435	95	0	455
RTOR Reduction (vph)	0	0	0	0	0	272	0	0	168	0	0	403
Lane Group Flow (vph)	397	475	0	0	262	153	235	164	267	95	0	52
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	18.0	41.0			18.0	18.0	21.4	21.4	21.4	10.2		10.2
Effective Green, g (s)	18.0	41.0			18.0	18.0	21.4	21.4	21.4	10.2		10.2
Actuated g/C Ratio	0.20	0.46			0.20	0.20	0.24	0.24	0.24	0.12		0.12
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	312	1424			625	204	371	391	286	177		138
v/s Ratio Prot	c0.26	0.15			0.09		0.15	0.10		c0.06		0.04
v/s Ratio Perm						c0.15			c0.22			
v/c Ratio	1.27	0.33			0.42	0.75	0.63	0.42	0.93	0.54		0.38
Uniform Delay, d1	35.3	15.1			30.7	33.2	30.1	28.4	32.9	37.0		36.3
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	145.3	0.6			2.1	22.2	3.5	0.7	35.5	3.1		1.7
Delay (s)	180.6	15.8			32.8	55.4	33.6	29.1	68.4	40.1		38.0
Level of Service	F	B			C	E	C	C	E	D		D
Approach Delay (s)		90.8			46.8			50.9			38.4	
Approach LOS		F			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	59.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	88.6	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	109	73	3	69	25	133	93	2	43	90	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.96			0.97		1.00	1.00		1.00	0.95	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3230			1736		1711	1795		1711	1705	
Flt Permitted		0.85			0.99		0.66	1.00		0.69	1.00	
Satd. Flow (perm)		2788			1726		1189	1795		1243	1705	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	118	79	3	75	27	145	101	2	47	98	54
RTOR Reduction (vph)	0	34	0	0	12	0	0	2	0	0	42	0
Lane Group Flow (vph)	0	255	0	0	93	0	145	101	0	47	110	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		23.6			23.6		9.0	9.0		9.0	9.0	
Effective Green, g (s)		23.6			23.6		9.0	9.0		9.0	9.0	
Actuated g/C Ratio		0.57			0.57		0.22	0.22		0.22	0.22	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1581			979		257	388		268	368	
v/s Ratio Prot								0.06			0.06	
v/s Ratio Perm		c0.09			0.05		c0.12			0.04		
v/c Ratio		0.16			0.10		0.56	0.26		0.18	0.30	
Uniform Delay, d1		4.3			4.1		14.5	13.5		13.3	13.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.2		2.8	0.4		0.3	0.5	
Delay (s)		4.5			4.3		17.4	13.9		13.6	14.1	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		4.5			4.3			15.9			14.0	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	41.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT
BASKETBALL GAME
NO SF GIANTS GAME AT AT&T PARK
WEEKDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	808	695	17	392	920	53	44	860	253	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3046		2987	2999			5478	941			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3046		2987	2999			5478	941			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	878	755	18	426	1000	58	48	935	275	0	0	0
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	195	0	0	0
Lane Group Flow (vph)	878	772	0	426	1057	0	0	983	81	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	38.7		20.2	40.7			32.2	32.2			
Effective Green, g (s)	18.2	38.7		20.2	40.7			32.2	32.2			
Actuated g/C Ratio	0.17	0.35		0.18	0.37			0.29	0.29			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1071		548	1109			1603	275			
v/s Ratio Prot	c0.20	0.25		0.14	c0.35							
v/s Ratio Perm								0.18	0.09			
v/c Ratio	1.18	0.72		0.78	0.95			0.61	0.29			
Uniform Delay, d1	45.9	31.0		42.8	33.7			33.5	30.1			
Progression Factor	0.93	0.93		0.77	0.56			1.45	5.41			
Incremental Delay, d2	90.8	2.3		4.6	12.6			0.6	0.5			
Delay (s)	133.6	31.0		37.6	31.7			49.2	163.2			
Level of Service	F	C		D	C			D	F			
Approach Delay (s)		85.5			33.4			74.1			0.0	
Approach LOS		F			C			E			A	

Intersection Summary			
HCM 2000 Control Delay	64.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	96.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	187	1389	24	31	902	31	26	87	80	51	619	458
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.64	1.00	0.91	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.97	1.00	0.70	1.00	1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.97	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1296	3692		1296	2527			1555	858	1077	2613	581
Flt Permitted	0.95	1.00		0.95	1.00			0.60	1.00	0.68	1.00	1.00
Satd. Flow (perm)	1296	3692		1296	2527			937	858	768	2613	581
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	205	1526	26	34	991	34	29	96	88	56	680	503
RTOR Reduction (vph)	0	2	0	0	2	0	0	0	58	0	15	183
Lane Group Flow (vph)	205	1550	0	34	1023	0	0	125	30	56	806	179
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	12.4	49.5		3.4	38.9			37.2	37.2	38.2	38.2	38.2
Effective Green, g (s)	12.4	49.5		3.4	38.9			37.2	37.2	38.2	38.2	38.2
Actuated g/C Ratio	0.11	0.45		0.03	0.35			0.34	0.34	0.35	0.35	0.35
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	146	1661		40	893			316	290	266	907	201
v/s Ratio Prot	c0.16	0.42		0.03	c0.40						c0.31	
v/s Ratio Perm								0.13	0.03	0.07		0.31
v/c Ratio	1.40	0.93		0.85	1.15			0.40	0.10	0.21	0.89	0.89
Uniform Delay, d1	48.8	28.7		53.0	35.5			27.8	25.0	25.3	33.9	33.9
Progression Factor	0.70	1.11		0.67	0.60			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	185.6	1.3		43.3	71.0			0.8	0.2	0.4	10.6	34.3
Delay (s)	219.8	33.1		78.7	92.4			28.6	25.1	25.7	44.5	68.1
Level of Service	F	C		E	F			C	C	C	D	E
Approach Delay (s)		54.9			91.9			27.2			50.5	
Approach LOS		D			F			C			D	

Intersection Summary			
HCM 2000 Control Delay	61.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	118.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1581	199	2	1384	74	19
Ideal Flow (vphpl)	1850	1850	1850	1850	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2937			2998	1540	1357
Flt Permitted	1.00			0.93	0.95	1.00
Satd. Flow (perm)	2937			2789	1540	1357
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1664	209	2	1457	78	20
RTOR Reduction (vph)	9	0	0	0	0	11
Lane Group Flow (vph)	1864	0	0	1459	78	9
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1658			1574	512	451
v/s Ratio Prot	c0.63				c0.05	
v/s Ratio Perm				0.52		0.01
v/c Ratio	1.12			0.93	0.15	0.02
Uniform Delay, d1	23.9			21.9	25.8	24.7
Progression Factor	1.00			0.79	1.00	1.00
Incremental Delay, d2	64.5			1.3	0.6	0.1
Delay (s)	88.5			18.5	26.4	24.7
Level of Service	F			B	C	C
Approach Delay (s)	88.5			18.5	26.1	
Approach LOS	F			B	C	

Intersection Summary			
HCM 2000 Control Delay	56.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	97.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/27/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	122	1129	155	29	278	527	260	393	1151	258
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.95			1.00	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5773			2869	2440			4101	1122
Flt Permitted		1.00			0.75	1.00			0.95	1.00
Satd. Flow (perm)		5773			2150	2440			4101	1122
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	139	1283	176	33	316	599	295	447	1308	293
RTOR Reduction (vph)	0	29	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1569	0	0	349	893	0	0	1784	264
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		20.5			22.0	22.0			15.0	15.0
Effective Green, g (s)		22.5			25.0	25.0			18.0	18.0
Actuated g/C Ratio		0.30			0.33	0.33			0.24	0.24
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1731			716	813			984	269
v/s Ratio Prot						c0.37			c0.44	0.24
v/s Ratio Perm		0.27			0.16					
v/c Ratio		0.91			0.49	1.10			1.81	0.98
Uniform Delay, d1		25.2			19.9	25.0			28.5	28.3
Progression Factor		1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2		7.2			0.5	62.1			369.9	49.5
Delay (s)		32.4			20.4	87.1			398.4	77.8
Level of Service		C			C	F			F	E
Approach Delay (s)		32.4			20.4	87.1			357.1	
Approach LOS		C			C	F			F	

Intersection Summary			
HCM 2000 Control Delay	177.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	103.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/27/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	29	481	654	48	278	283	30	212	105	725
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)	2.0	4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor	1.00	0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes	1.00	1.00	0.99		0.85		0.98		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Frt	1.00	1.00	0.99		0.92		0.85		1.00	1.00
Flt Protected	0.95	0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)	810	1313	1911		2182		1161		1327	2556
Flt Permitted	0.95	0.95	1.00		1.00		1.00		0.20	0.95
Satd. Flow (perm)	810	1313	1911		2182		1161		279	2428
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	31	506	688	51	293	298	32	223	111	763
RTOR Reduction (vph)	0	0	9	0	1	0	23	0	0	0
Lane Group Flow (vph)	31	455	781	0	593	0	6	0	314	783
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)	18.5	18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)	21.0	18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio	0.27	0.24	0.27		0.23		0.21		0.42	0.42
Clearance Time (s)	4.5	4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)	220	315	521		495		241		287	1045
v/s Ratio Prot	0.04	0.35	c0.41		c0.27				c0.18	0.12
v/s Ratio Perm							0.01		0.28	0.19
v/c Ratio	0.14	1.44	1.50		1.28dr		0.03		1.09	0.75
Uniform Delay, d1	21.2	29.2	28.0		29.8		24.3		26.8	18.8
Progression Factor	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2	1.3	217.1	234.7		107.5		0.2		80.6	4.9
Delay (s)	22.5	246.4	262.7		137.3		24.5		107.4	23.7
Level of Service	C	F	F		F		C		F	C
Approach Delay (s)			251.1		132.0					47.7
Approach LOS			F		F					D

Intersection Summary			
HCM 2000 Control Delay	151.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	77.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	756	184	12	2	26	20	811	72	88	294	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	0.99		1.00	0.98	
Flt Protected		1.00	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1616	1352		1428		1272	2483		1540	3018	
Flt Permitted		0.99	1.00		0.48		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1599	1352		698		1272	2483		1540	3018	
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	38	933	227	15	2	32	25	1001	89	109	363	44
RTOR Reduction (vph)	0	0	74	0	18	0	0	6	0	0	7	0
Lane Group Flow (vph)	0	971	153	0	31	0	25	1084	0	109	400	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		55.1	55.1		55.1		6.1	35.5		15.3	45.0	
Effective Green, g (s)		55.1	55.1		55.1		6.1	35.5		15.3	45.0	
Actuated g/C Ratio		0.45	0.45		0.45		0.05	0.29		0.13	0.37	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		723	611		315		63	723		193	1115	
v/s Ratio Prot							0.02	c0.44		c0.07	0.13	
v/s Ratio Perm		c0.61	0.11		0.05							
v/c Ratio		1.34	0.25		0.10		0.40	1.50		0.56	0.36	
Uniform Delay, d1		33.3	20.6		19.1		56.1	43.1		50.1	27.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		163.6	0.2		0.1		4.1	232.1		3.8	0.2	
Delay (s)		196.9	20.8		19.3		60.1	275.3		53.9	28.1	
Level of Service		F	C		B		E	F		D	C	
Approach Delay (s)		163.5			19.3			270.5			33.6	
Approach LOS		F			B			F			C	

Intersection Summary			
HCM 2000 Control Delay	179.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	121.8	Sum of lost time (s)	15.9
Intersection Capacity Utilization	99.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	622	8	4	21	33	13	54	4	345	221	54
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	0.95	
Flpb, ped/bikes		1.00			1.00	1.00	0.85	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	0.99		1.00	0.97	
Flt Protected		1.00			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2596			1439	1198	1169	1430		1377	1339	
Flt Permitted		0.95			0.91	1.00	0.83	1.00		0.95	1.00	
Satd. Flow (perm)		2474			1318	1198	1025	1430		1377	1339	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	9	648	8	4	22	34	14	56	4	359	230	56
RTOR Reduction (vph)	0	1	0	0	0	15	0	4	0	0	13	0
Lane Group Flow (vph)	0	664	0	0	26	19	14	56	0	359	273	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		16.8			16.8	24.7	4.8	4.8		7.9	17.7	
Effective Green, g (s)		16.8			16.8	24.7	4.8	4.8		7.9	17.7	
Actuated g/C Ratio		0.38			0.38	0.56	0.11	0.11		0.18	0.40	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		934			497	799	110	154		244	532	
v/s Ratio Prot						0.00		0.04		c0.26	c0.20	
v/s Ratio Perm		c0.27			0.02	0.01	0.01					
v/c Ratio		0.71			0.05	0.02	0.13	0.37		1.47	0.51	
Uniform Delay, d1		11.8			8.8	4.5	18.0	18.4		18.3	10.1	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.6			0.0	0.0	0.5	1.5		233.0	0.8	
Delay (s)		14.4			8.8	4.5	18.5	19.9		251.3	11.0	
Level of Service		B			A	A	B	B		F	B	
Approach Delay (s)		14.4			6.4			19.6			144.8	
Approach LOS		B			A			B			F	

Intersection Summary			
HCM 2000 Control Delay	72.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	44.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/27/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	53	236	505	19	828	314
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1743	1535	847	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1743	1535	847	1134	1194
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	57	254	543	20	890	338
RTOR Reduction (vph)	0	226	0	6	0	0
Lane Group Flow (vph)	57	28	543	14	890	338
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	10.1	10.1	45.6	40.6	20.0	70.6
Effective Green, g (s)	10.1	10.1	45.6	40.6	20.0	70.6
Actuated g/C Ratio	0.11	0.11	0.50	0.45	0.22	0.78
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	126	194	771	425	250	929
v/s Ratio Prot	c0.05		c0.35	0.01	c0.78	0.28
v/s Ratio Perm		0.02		0.01		
v/c Ratio	0.45	0.15	0.70	0.03	3.56	0.36
Uniform Delay, d1	37.7	36.4	17.4	14.0	35.4	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.6	0.3	2.9	0.0	1161.9	0.2
Delay (s)	40.3	36.8	20.3	14.1	1197.3	3.4
Level of Service	D	D	C	B	F	A
Approach Delay (s)	37.4		20.1			868.7
Approach LOS	D		C			F

Intersection Summary			
HCM 2000 Control Delay	518.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.53		
Actuated Cycle Length (s)	90.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	113.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	20	24	234	120	126	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.96		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.93		1.00	1.00	0.98	
Flt Protected	0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1563		1670	1531	3077	
Flt Permitted	0.98		0.64	1.00	1.00	
Satd. Flow (perm)	1563		1131	1531	3077	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	24	28	275	141	148	24
RTOR Reduction (vph)	26	0	0	0	7	0
Lane Group Flow (vph)	26	0	275	141	165	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	2.3		27.9	27.9	27.9	
Effective Green, g (s)	2.3		27.9	27.9	27.9	
Actuated g/C Ratio	0.06		0.69	0.69	0.69	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	89		784	1062	2135	
v/s Ratio Prot	c0.02			0.09	0.05	
v/s Ratio Perm			c0.24			
v/c Ratio	0.29		0.35	0.13	0.08	
Uniform Delay, d1	18.2		2.5	2.1	2.0	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.8		0.3	0.1	0.0	
Delay (s)	20.0		2.8	2.1	2.0	
Level of Service	B		A	A	A	
Approach Delay (s)	20.0			2.5	2.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	40.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	132	113	863	101	274	403
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.95	0.99		1.00	1.00
Flpb, ped/bikes	0.91	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1558	1457	3338		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1558	1457	3338		1711	3421
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	148	127	970	113	308	453
RTOR Reduction (vph)	0	97	7	0	0	0
Lane Group Flow (vph)	148	30	1076	0	308	453
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	58.1		17.9	81.1
Effective Green, g (s)	28.7	28.7	58.1		17.9	81.1
Actuated g/C Ratio	0.24	0.24	0.48		0.15	0.68
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	372	348	1616		255	2312
v/s Ratio Prot			c0.32		c0.18	0.13
v/s Ratio Perm	c0.09	0.02				
v/c Ratio	0.40	0.09	0.67		1.21	0.20
Uniform Delay, d1	38.4	35.5	23.6		51.0	7.3
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.7	0.1	2.2		124.4	0.0
Delay (s)	39.1	35.6	25.7		175.4	7.3
Level of Service	D	D	C		F	A
Approach Delay (s)	37.5		25.7			75.4
Approach LOS	D		C			E

Intersection Summary			
HCM 2000 Control Delay	45.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	7	12	344	120	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1518	1341		2880	2969	
Flt Permitted	0.95	1.00		0.94	1.00	
Satd. Flow (perm)	1518	1341		2718	2969	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	8	14	405	141	35
RTOR Reduction (vph)	0	8	0	0	26	0
Lane Group Flow (vph)	12	0	0	419	150	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5		
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	0.6	0.6		12.8	12.8	
Effective Green, g (s)	0.6	0.6		12.8	12.8	
Actuated g/C Ratio	0.01	0.01		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	18	16		711	777	
v/s Ratio Prot	c0.01				0.05	
v/s Ratio Perm		0.00		c0.15		
v/c Ratio	0.67	0.01		0.59	0.19	
Uniform Delay, d1	24.1	23.9		15.8	14.0	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	66.1	0.2		1.3	0.1	
Delay (s)	90.1	24.0		17.0	14.2	
Level of Service	F	C		B	B	
Approach Delay (s)	63.7			17.0	14.2	
Approach LOS	E			B	B	

Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	48.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	138	3	61	23	16	5	86	232	7	5	70	55
Peak Hour Factor	0.92	0.81	0.81	0.81	0.81	0.92	0.81	0.92	0.81	0.92	0.92	0.92
Hourly flow rate (vph)	150	4	75	28	20	5	106	252	9	5	76	60

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	150	79	28	25	367	82	60
Volume Left (vph)	150	0	28	0	106	5	0
Volume Right (vph)	0	75	0	5	9	0	60
Hadj (s)	0.53	-0.63	0.53	-0.12	0.08	0.07	-0.67
Departure Headway (s)	6.5	5.4	6.8	6.2	5.6	5.9	5.1
Degree Utilization, x	0.27	0.12	0.05	0.04	0.57	0.13	0.09
Capacity (veh/h)	517	625	479	527	619	576	655
Control Delay (s)	10.8	7.9	9.0	8.3	15.7	8.6	7.4
Approach Delay (s)	9.8		8.7		15.7	8.1	
Approach LOS	A		A		C	A	

Intersection Summary			
Delay	12.2		
Level of Service	B		
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	256	170	219	2	122	33	209	674	22	10	337	187
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1258	1365	1126	1285	1365	1099	2515	2577		1296	2430	
Flt Permitted	0.67	1.00	1.00	0.59	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	884	1365	1126	798	1365	1099	2515	2577		1296	2430	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	294	195	252	2	140	38	240	775	25	11	387	215
RTOR Reduction (vph)	0	0	165	0	0	25	0	2	0	0	76	0
Lane Group Flow (vph)	294	195	87	2	140	13	240	798	0	11	526	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	304	470	388	275	470	379	352	974		155	869	
v/s Ratio Prot		0.14			0.10		0.10	c0.31		0.01	c0.22	
v/s Ratio Perm	c0.33		0.08	0.00		0.01						
v/c Ratio	0.97	0.41	0.22	0.01	0.30	0.03	0.68	0.82		0.07	0.61	
Uniform Delay, d1	32.2	25.0	23.2	21.5	23.9	21.7	40.9	28.0		39.1	26.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.87	0.80		1.00	1.00	
Incremental Delay, d2	43.9	2.7	1.3	0.0	1.6	0.2	6.0	4.5		0.9	3.1	
Delay (s)	76.1	27.7	24.6	21.6	25.5	21.9	41.4	26.8		39.9	29.4	
Level of Service	E	C	C	C	C	C	D	C		D	C	
Approach Delay (s)		45.8			24.7			30.2			29.6	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	116.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	151	585	9	19	457	42	23	14	13	46	10	114
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.84	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.91	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1225	1621	1582		1477	1373	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.65	1.00		0.74	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1225	1115	1582		1146	1373	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	176	680	10	22	531	49	27	16	15	53	12	133
RTOR Reduction (vph)	0	0	6	0	0	32	0	10	0	0	90	0
Lane Group Flow (vph)	176	680	4	22	531	17	27	21	0	53	55	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	15.0	41.6	41.6	6.0	32.6	32.6	30.0	30.0		30.0	30.0	
Effective Green, g (s)	15.0	41.6	41.6	6.0	32.6	32.6	30.0	30.0		30.0	30.0	
Actuated g/C Ratio	0.16	0.45	0.45	0.06	0.35	0.35	0.32	0.32		0.32	0.32	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	262	766	651	105	600	431	361	512		371	444	
v/s Ratio Prot	c0.11	c0.40		0.01	0.31			0.01			0.04	
v/s Ratio Perm			0.00			0.01	0.02			c0.05		
v/c Ratio	0.67	0.89	0.01	0.21	0.89	0.04	0.07	0.04		0.14	0.12	
Uniform Delay, d1	36.5	23.4	14.1	41.1	28.2	19.7	21.7	21.4		22.2	22.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.6	14.4	0.0	1.0	14.6	0.0	0.1	0.0		0.2	0.1	
Delay (s)	43.1	37.8	14.1	42.0	42.8	19.8	21.8	21.5		22.4	22.2	
Level of Service	D	D	B	D	D	B	C	C		C	C	
Approach Delay (s)		38.6			40.9			21.6			22.2	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	37.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	92.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	79	568	40	64	480	50	31	483	83	94	169	106
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.98	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1045	1540	3012			3025	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.53	1.00			0.55	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1045	864	3012			1678	1072
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	86	617	43	70	522	54	34	525	90	102	184	115
RTOR Reduction (vph)	0	0	19	0	0	26	0	13	0	0	0	86
Lane Group Flow (vph)	86	617	24	70	522	28	34	602	0	0	286	29
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	9.0	58.2	58.2	5.0	53.2	53.2	27.2	27.2			26.2	26.2
Effective Green, g (s)	9.0	58.2	58.2	5.0	53.2	53.2	27.2	27.2			26.2	26.2
Actuated g/C Ratio	0.09	0.56	0.56	0.05	0.51	0.51	0.26	0.26			0.25	0.25
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	105	683	775	74	625	537	227	792			425	271
v/s Ratio Prot	c0.07	c0.51		0.05	0.43			c0.20				
v/s Ratio Perm			0.02			0.03	0.04				0.17	0.03
v/c Ratio	0.82	0.90	0.03	0.95	0.84	0.05	0.15	0.76			1.16dl	0.11
Uniform Delay, d1	46.4	20.1	10.1	49.1	21.4	12.5	29.2	35.1			34.7	29.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	37.1	15.3	0.0	85.3	9.4	0.0	0.3	4.2			4.2	0.2
Delay (s)	83.5	35.4	10.1	134.4	30.8	12.6	29.5	39.3			38.9	29.8
Level of Service	F	D	B	F	C	B	C	D			D	C
Approach Delay (s)		39.5			40.5			38.8			36.3	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	39.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	103.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	516	77	38	350	229	69	230	17	155	109	36
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.90		1.00	*0.80	*0.80	*0.80	*0.90	*0.80	*0.80	*0.90	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.91	1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1329	1050		1337	1126	866	1070	1077	916	1070	1197	
Flt Permitted	0.30	1.00		0.20	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	419	1050		288	1126	866	1070	1077	916	1070	1197	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	561	84	41	380	249	75	250	18	168	118	39
RTOR Reduction (vph)	0	5	0	0	0	100	0	0	14	0	12	0
Lane Group Flow (vph)	25	640	0	41	380	149	75	250	4	168	145	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	53.1	53.1		53.1	53.1	65.1	15.0	21.1	21.1	12.0	18.1	
Effective Green, g (s)	53.1	53.1		53.1	53.1	65.1	15.0	21.1	21.1	12.0	18.1	
Actuated g/C Ratio	0.49	0.49		0.49	0.49	0.60	0.14	0.19	0.19	0.11	0.17	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	224	513		163	551	559	147	209	178	118	199	
v/s Ratio Prot	0.00	c0.61		0.01	c0.34	0.03	0.07	c0.23		c0.16	0.12	
v/s Ratio Perm	0.05			0.12		0.14			0.00			
v/c Ratio	0.11	1.25		0.25	0.69	0.27	0.51	1.20	0.02	1.42	0.73	
Uniform Delay, d1	16.3	27.7		31.7	21.3	10.3	43.3	43.7	35.3	48.2	42.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	127.2		0.8	3.6	0.3	3.0	125.3	0.0	232.7	12.9	
Delay (s)	16.5	154.9		32.5	24.9	10.6	46.3	169.0	35.4	280.9	55.8	
Level of Service	B	F		C	C	B	D	F	D	F	E	
Approach Delay (s)		149.8			20.1			135.1			172.2	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	107.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	108.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	244	319	59	47	105	6	39	74	53	8	29	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.98		0.98	
Flpb, ped/bikes		0.99		0.99	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.90	
Flt Protected		0.98		0.95	1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1467		1699	1781			1763	1497		1351	
Flt Permitted		0.82		0.42	1.00			0.86	1.00		0.98	
Satd. Flow (perm)		1224		746	1781			1534	1497		1329	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	268	351	65	52	115	7	43	81	58	9	32	105
RTOR Reduction (vph)	0	3	0	0	2	0	0	0	44	0	79	0
Lane Group Flow (vph)	0	681	0	52	120	0	0	124	14	0	67	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		35.4		35.4	35.4			15.1	15.1		15.1	
Effective Green, g (s)		35.4		35.4	35.4			15.1	15.1		15.1	
Actuated g/C Ratio		0.59		0.59	0.59			0.25	0.25		0.25	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		716		436	1042			382	373		331	
v/s Ratio Prot					0.07							
v/s Ratio Perm		c0.56		0.07				c0.08	0.01		0.05	
v/c Ratio		0.95		0.12	0.12			0.32	0.04		0.20	
Uniform Delay, d1		11.7		5.6	5.6			18.5	17.2		17.9	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		22.3		0.1	0.0			0.5	0.0		0.3	
Delay (s)		34.0		5.7	5.6			19.0	17.2		18.2	
Level of Service		C		A	A			B	B		B	
Approach Delay (s)		34.0			5.7			18.5			18.2	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	60.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	308	555	48	18	210	11	35	588	44	25	362	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1669	3371		1698	3388		1260	2487		1260	2373	
Flt Permitted	0.60	1.00		0.24	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1049	3371		427	3388		1260	2487		1260	2373	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	342	617	53	20	233	12	39	653	49	28	402	190
RTOR Reduction (vph)	0	6	0	0	4	0	0	5	0	0	56	0
Lane Group Flow (vph)	342	664	0	20	241	0	39	697	0	28	536	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	311	1001		126	1006		212	992		187	899	
v/s Ratio Prot		0.20			0.07		0.03	c0.28		0.02	c0.23	
v/s Ratio Perm	c0.33			0.05								
v/c Ratio	1.10	0.66		0.16	0.24		0.18	0.70		0.15	0.60	
Uniform Delay, d1	35.1	30.8		25.9	26.6		35.6	25.1		37.0	24.9	
Progression Factor	1.00	1.00		1.00	1.00		0.84	0.73		1.50	0.63	
Incremental Delay, d2	80.5	3.5		2.7	0.6		1.2	2.7		1.4	2.4	
Delay (s)	115.6	34.2		28.6	27.2		31.2	21.0		56.8	18.1	
Level of Service	F	C		C	C		C	C		E	B	
Approach Delay (s)		61.7			27.3			21.6			19.8	
Approach LOS		E			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	801	55	6	440	9	36	0	5	17	1	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.98		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3388		1711	3411			1698		1711	1541	
Flt Permitted	0.47	1.00		0.22	1.00			0.81		0.73	1.00	
Satd. Flow (perm)	838	3388		402	3411			1441		1312	1541	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	871	60	7	478	10	39	0	5	18	1	24
RTOR Reduction (vph)	0	8	0	0	2	0	0	22	0	0	15	0
Lane Group Flow (vph)	22	923	0	7	486	0	0	22	0	18	10	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45			0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	377	1524		180	1534			552		502	590	
v/s Ratio Prot		c0.27			0.14						0.01	
v/s Ratio Perm	0.03			0.02				c0.02		0.01		
v/c Ratio	0.06	0.61		0.04	0.32			0.04		0.04	0.02	
Uniform Delay, d1	9.3	12.5		9.2	10.6			11.6		11.6	11.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	1.8		0.4	0.5			0.1		0.1	0.1	
Delay (s)	9.6	14.3		9.6	11.1			11.7		11.7	11.5	
Level of Service	A	B		A	B			B		B	B	
Approach Delay (s)		14.2			11.1			11.7			11.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	92	0	0	527	32	308	594	686	0	0	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.92				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3391			5088		1711	3146				2694
Flt Permitted		0.86			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2943			5088		1711	3146				2694
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	23	107	0	0	613	37	358	691	798	0	0	86
RTOR Reduction (vph)	0	0	0	0	8	0	0	245	0	0	0	80
Lane Group Flow (vph)	0	130	0	0	642	0	358	1244	0	0	0	6
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		40.5			29.5		35.0	35.0				6.0
Effective Green, g (s)		40.5			29.5		35.0	35.0				6.0
Actuated g/C Ratio		0.48			0.35		0.41	0.41				0.07
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1433			1765		704	1295				190
v/s Ratio Prot		c0.01			c0.13		0.21	c0.40				0.00
v/s Ratio Perm		0.04										
v/c Ratio		0.09			0.36		0.51	0.96				0.03
Uniform Delay, d1		12.2			20.7		18.6	24.3				36.8
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.6		2.6	17.2				0.3
Delay (s)		12.3			21.3		21.2	41.6				37.1
Level of Service		B			C		C	D				D
Approach Delay (s)		12.3			21.3			37.6			37.1	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	32.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.
4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	112	444	447	461	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.91	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1537	1427	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1537	1427	3319	1801		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	133	529	532	549	0	0
RTOR Reduction (vph)	61	61	0	0	0	0
Lane Group Flow (vph)	278	262	532	549	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	35.0	35.0	15.0	60.0		
Effective Green, g (s)	35.0	35.0	15.0	60.0		
Actuated g/C Ratio	0.58	0.58	0.25	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	896	832	829	1801		
v/s Ratio Prot	0.18		c0.16	c0.30		
v/s Ratio Perm		0.18				
v/c Ratio	0.31	0.31	0.64	0.30		
Uniform Delay, d1	6.4	6.4	20.1	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.2	0.2	1.7	0.1		
Delay (s)	6.6	6.6	21.8	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	6.6			10.8	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	214	121	165	6	127	10	122	454	13	17	336	143
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.93		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.97	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1175	1943		1137	1253		1215	2414		1215	2246	
Flt Permitted	0.43	1.00		0.56	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	538	1943		670	1253		1215	2414		1215	2246	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	238	134	183	7	141	11	136	504	14	19	373	159
RTOR Reduction (vph)	0	119	0	0	3	0	0	2	0	0	48	0
Lane Group Flow (vph)	238	198	0	7	149	0	136	516	0	19	484	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	35.0	35.0		17.1	17.1		16.4	43.3		5.4	32.3	
Effective Green, g (s)	35.0	35.0		17.1	17.1		16.4	43.3		5.4	32.3	
Actuated g/C Ratio	0.35	0.35		0.17	0.17		0.16	0.43		0.05	0.32	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	268	680		114	214		199	1045		65	725	
v/s Ratio Prot	c0.11	0.10			0.12		c0.11	0.21		0.02	c0.22	
v/s Ratio Perm	c0.20			0.01								
v/c Ratio	0.89	0.29		0.06	0.69		0.68	0.49		0.29	0.67	
Uniform Delay, d1	28.8	23.5		34.7	39.0		39.4	20.4		45.5	29.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.08	1.00	
Incremental Delay, d2	27.8	0.2		0.2	9.4		9.3	1.7		1.8	3.5	
Delay (s)	56.5	23.8		35.0	48.4		48.7	22.1		50.7	32.7	
Level of Service	E	C		C	D		D	C		D	C	
Approach Delay (s)		37.8			47.8			27.6			33.4	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	33.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps
9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	217	386	369	377
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	236	420	401	410
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			505			
pX, platoon unblocked						
vC, conflicting volume	1448	118			236	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1448	118			236	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			70	
cM capacity (veh/h)	85	912			1328	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	118	118	420	401	410
Volume Left	0	0	0	401	0
Volume Right	0	0	420	0	0
cSH	1700	1700	1700	1328	1700
Volume to Capacity	0.07	0.07	0.25	0.30	0.24
Queue Length 95th (ft)	0	0	0	32	0
Control Delay (s)	0.0	0.0	0.0	8.9	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.4	
Approach LOS					

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp
9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	137	111	0	146	180
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	149	121	0	159	196
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	121				195	121
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	121				195	121
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				80	78
cM capacity (veh/h)	1465				775	908

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	74	74	121	354
Volume Left	0	0	0	159
Volume Right	0	0	0	196
cSH	1700	1700	1700	843
Volume to Capacity	0.04	0.04	0.07	0.42
Queue Length 95th (ft)	0	0	0	53
Control Delay (s)	0.0	0.0	0.0	12.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.3
Approach LOS				B

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	44	239	111	64	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	48	260	121	70	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	190				346	121
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	190				346	121
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				100	100
cM capacity (veh/h)	1381				603	908

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	134	173	121	70	0
Volume Left	48	0	0	0	0
Volume Right	0	0	0	70	0
cSH	1381	1700	1700	1700	1700
Volume to Capacity	0.03	0.10	0.07	0.04	0.00
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	2.9	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.3		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	16	20	8	33	16	48	487	28	19	344	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.96		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1514			1549		1540	3054		1540	3041	
Flt Permitted		0.89			0.95		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1378			1478		1540	3054		1540	3041	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	17	22	9	36	17	52	529	30	21	374	34
RTOR Reduction (vph)	0	20	0	0	15	0	0	3	0	0	4	0
Lane Group Flow (vph)	0	40	0	0	47	0	52	556	0	21	404	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.1			7.1		5.2	52.9		5.0	52.7	
Effective Green, g (s)		7.1			7.1		5.2	52.9		5.0	52.7	
Actuated g/C Ratio		0.09			0.09		0.06	0.66		0.06	0.66	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		121			130		99	2014		96	1998	
v/s Ratio Prot							c0.03	c0.18		0.01	c0.13	
v/s Ratio Perm		0.03			c0.03							
v/c Ratio		0.33			0.36		0.53	0.28		0.22	0.20	
Uniform Delay, d1		34.3			34.4		36.3	5.7		35.7	5.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			1.7		2.3	0.3		0.4	0.2	
Delay (s)		35.9			36.1		38.6	6.0		36.2	5.7	
Level of Service		D			D		D	A		D	A	
Approach Delay (s)		35.9			36.1			8.8			7.2	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	374	17	161	0	0	203
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	407	18	175	0	0	221

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	203	203	18	88	88	221
Volume Left (vph)	203	203	0	0	0	0
Volume Right (vph)	0	0	18	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.1	6.1	3.2	6.0	6.0	5.7
Degree Utilization, x	0.35	0.35	0.02	0.15	0.15	0.35
Capacity (veh/h)	562	564	1121	564	563	600
Control Delay (s)	11.2	11.2	5.1	8.9	8.9	11.8
Approach Delay (s)	10.9			8.9		11.8
Approach LOS	B			A		B

Intersection Summary			
Delay	10.7		
Level of Service	B		
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	84	105	0	0	150	65	23	173	5	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	91	114	0	0	163	71	25	188	5	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	205	234	119	99
Volume Left (vph)	91	0	25	0
Volume Right (vph)	0	71	0	5
Hadj (s)	0.12	-0.15	0.14	0.00
Departure Headway (s)	4.9	4.6	5.7	5.6
Degree Utilization, x	0.28	0.30	0.19	0.15
Capacity (veh/h)	696	742	595	608
Control Delay (s)	9.8	9.6	8.8	8.4
Approach Delay (s)	9.8	9.6	8.6	
Approach LOS	A	A	A	

Intersection Summary			
Delay	9.3		
Level of Service	A		
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	26	62	4	62	4	76	517	6	0	362	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.92			0.99		1.00	1.00			0.97	
Flpb, ped/bikes		0.99			1.00		1.00	1.00			1.00	
Frt		0.92			0.99		1.00	1.00			0.98	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1182			1587		1540	2258			2165	
Flt Permitted		0.96			0.98		0.95	1.00			1.00	
Satd. Flow (perm)		1140			1565		1540	2258			2165	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	27	65	4	65	4	80	544	6	0	381	47
RTOR Reduction (vph)	0	59	0	0	3	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	47	0	0	70	0	80	550	0	0	424	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		8.8			8.8		8.8	71.3			57.4	
Effective Green, g (s)		8.8			8.8		8.8	71.3			57.4	
Actuated g/C Ratio		0.10			0.10		0.10	0.79			0.63	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		110			152		149	1780			1374	
v/s Ratio Prot							c0.05	c0.24			0.20	
v/s Ratio Perm		0.04			c0.04							
v/c Ratio		0.43			0.46		0.54	0.31			0.31	
Uniform Delay, d1		38.4			38.6		38.9	2.7			7.5	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		2.7			2.2		3.7	0.5			0.6	
Delay (s)		41.1			40.8		42.5	3.1			8.1	
Level of Service		D			D		D	A			A	
Approach Delay (s)		41.1			40.8			8.1			8.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.4	Sum of lost time (s)	15.4
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	214	295	0	0	179	209	181	180	288	82	0	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.85	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1019	1540	1621	1195	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1019	1540	1621	1195	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	225	311	0	0	188	220	191	189	303	86	0	311
RTOR Reduction (vph)	0	0	0	0	0	166	0	0	243	0	0	275
Lane Group Flow (vph)	225	311	0	0	188	54	191	189	60	86	0	36
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	15.7	41.3			20.6	20.6	16.4	16.4	16.4	9.5		9.5
Effective Green, g (s)	15.7	41.3			20.6	20.6	16.4	16.4	16.4	9.5		9.5
Actuated g/C Ratio	0.19	0.50			0.25	0.25	0.20	0.20	0.20	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	290	1528			762	252	303	319	235	175		137
v/s Ratio Prot	c0.15	0.10			c0.06		c0.12	0.12		c0.06		0.03
v/s Ratio Perm						0.05			0.05			
v/c Ratio	0.78	0.20			0.25	0.22	0.63	0.59	0.25	0.49		0.26
Uniform Delay, d1	32.1	11.7			25.1	24.9	30.6	30.4	28.2	34.6		33.6
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	12.2	0.3			0.8	2.0	4.2	2.9	0.6	2.2		1.0
Delay (s)	44.3	12.0			25.9	26.8	34.8	33.3	28.8	36.7		34.6
Level of Service	D	B			C	C	C	C	C	D		C
Approach Delay (s)		25.6			26.4			31.7			35.1	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	29.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	83.2	Sum of lost time (s)	21.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	48	55	0	36	8	62	49	3	4	36	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.95			0.97		1.00	0.99		1.00	0.92	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3185			1750		1711	1786		1711	1650	
Flt Permitted		0.88			1.00		0.77	1.00		0.77	1.00	
Satd. Flow (perm)		2848			1750		1385	1786		1385	1650	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	52	60	0	39	9	67	53	3	4	39	49
RTOR Reduction (vph)	0	22	0	0	3	0	0	3	0	0	42	0
Lane Group Flow (vph)	0	147	0	0	45	0	67	53	0	4	46	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		23.8			23.8		5.2	5.2		5.2	5.2	
Effective Green, g (s)		23.8			23.8		5.2	5.2		5.2	5.2	
Actuated g/C Ratio		0.63			0.63		0.14	0.14		0.14	0.14	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1783			1096		189	244		189	225	
v/s Ratio Prot					0.03			0.03			0.03	
v/s Ratio Perm		c0.05					c0.05			0.00		
v/c Ratio		0.08			0.04		0.35	0.22		0.02	0.20	
Uniform Delay, d1		2.8			2.7		14.9	14.6		14.2	14.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.1		1.1	0.5		0.0	0.4	
Delay (s)		2.9			2.8		16.0	15.0		14.2	15.0	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.9			2.8			15.6			15.0	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	38.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT WITH M-TR-11C
BASKETBALL GAME
NO SF GIANTS GAME AT AT&T PARK
WEEKDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	808	695	17	378	927	53	44	860	253	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3046		2987	3000			5478	941			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3046		2987	3000			5478	941			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	878	755	18	411	1008	58	48	935	275	0	0	0
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	195	0	0	0
Lane Group Flow (vph)	878	772	0	411	1065	0	0	983	81	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	38.8		20.1	40.7			32.2	32.2			
Effective Green, g (s)	18.2	38.8		20.1	40.7			32.2	32.2			
Actuated g/C Ratio	0.17	0.35		0.18	0.37			0.29	0.29			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1074		545	1110			1603	275			
v/s Ratio Prot	c0.20	0.25		0.14	c0.36							
v/s Ratio Perm								0.18	0.09			
v/c Ratio	1.18	0.72		0.75	0.96			0.61	0.29			
Uniform Delay, d1	45.9	30.9		42.6	33.9			33.5	30.1			
Progression Factor	0.92	0.92		0.77	0.56			1.45	5.41			
Incremental Delay, d2	90.9	2.3		3.9	13.4			0.6	0.5			
Delay (s)	133.3	30.7		36.9	32.5			49.2	163.2			
Level of Service	F	C		D	C			D	F			
Approach Delay (s)		85.3			33.7			74.1			0.0	
Approach LOS		F			C			E			A	

Intersection Summary			
HCM 2000 Control Delay	64.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	96.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	187	1389	24	31	909	31	26	87	80	51	598	458
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.64	1.00	0.90	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.97	1.00	0.70	1.00	1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.97	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1296	3692		1296	2527			1553	858	1077	2584	581
Flt Permitted	0.95	1.00		0.95	1.00			0.60	1.00	0.68	1.00	1.00
Satd. Flow (perm)	1296	3692		1296	2527			948	858	768	2584	581
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	205	1526	26	34	999	34	29	96	88	56	657	503
RTOR Reduction (vph)	0	2	0	0	2	0	0	0	58	0	17	184
Lane Group Flow (vph)	205	1550	0	34	1031	0	0	125	30	56	791	168
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	12.6	49.7		3.4	38.9			37.0	37.0	38.0	38.0	38.0
Effective Green, g (s)	12.6	49.7		3.4	38.9			37.0	37.0	38.0	38.0	38.0
Actuated g/C Ratio	0.11	0.45		0.03	0.35			0.34	0.34	0.35	0.35	0.35
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	148	1668		40	893			318	288	265	892	200
v/s Ratio Prot	c0.16	0.42		0.03	c0.41						c0.31	
v/s Ratio Perm								0.13	0.03	0.07		0.29
v/c Ratio	1.39	0.93		0.85	1.15			0.39	0.10	0.21	0.89	0.84
Uniform Delay, d1	48.7	28.5		53.0	35.5			27.9	25.1	25.4	34.0	33.2
Progression Factor	0.70	1.11		0.67	0.60			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	177.2	1.2		42.3	74.7			0.8	0.2	0.4	10.6	25.9
Delay (s)	211.2	32.8		77.6	95.9			28.7	25.2	25.8	44.5	59.1
Level of Service	F	C		E	F			C	C	C	D	E
Approach Delay (s)		53.6			95.3			27.3			47.9	
Approach LOS		D			F			C			D	

Intersection Summary			
HCM 2000 Control Delay	61.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	118.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1581	199	2	1391	74	19
Ideal Flow (vphpl)	1850	1850	1850	1850	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2937			2998	1540	1357
Flt Permitted	1.00			0.93	0.95	1.00
Satd. Flow (perm)	2937			2789	1540	1357
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1664	209	2	1464	78	20
RTOR Reduction (vph)	9	0	0	0	0	11
Lane Group Flow (vph)	1864	0	0	1466	78	9
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1658			1574	512	451
v/s Ratio Prot	c0.63				c0.05	
v/s Ratio Perm				0.53		0.01
v/c Ratio	1.12			0.93	0.15	0.02
Uniform Delay, d1	23.9			22.0	25.8	24.7
Progression Factor	1.00			0.78	1.00	1.00
Incremental Delay, d2	64.5			1.3	0.6	0.1
Delay (s)	88.5			18.6	26.4	24.7
Level of Service	F			B	C	C
Approach Delay (s)	88.5			18.6	26.1	
Approach LOS	F			B	C	

Intersection Summary			
HCM 2000 Control Delay	56.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	97.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	122	1129	155	29	278	527	260	378	1169	258
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.95			1.00	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5773			2869	2440			4101	1122
Flt Permitted		1.00			0.75	1.00			0.95	1.00
Satd. Flow (perm)		5773			2150	2440			4101	1122
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	139	1283	176	33	316	599	295	430	1328	293
RTOR Reduction (vph)	0	29	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1569	0	0	349	893	0	0	1787	264
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4				7		
Actuated Green, G (s)		20.5			22.0	22.0			15.0	15.0
Effective Green, g (s)		22.5			25.0	25.0			18.0	18.0
Actuated g/C Ratio		0.30			0.33	0.33			0.24	0.24
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1731			716	813			984	269
v/s Ratio Prot						c0.37			c0.44	0.24
v/s Ratio Perm		0.27			0.16					
v/c Ratio		0.91			0.49	1.10			1.82	0.98
Uniform Delay, d1		25.2			19.9	25.0			28.5	28.3
Progression Factor		1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2		7.2			0.5	62.1			371.3	49.5
Delay (s)		32.4			20.4	87.1			399.8	77.8
Level of Service		C			C	F			F	E
Approach Delay (s)		32.4			20.4	87.1			358.3	
Approach LOS		C			C	F			F	

Intersection Summary			
HCM 2000 Control Delay	178.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	103.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp
10/21/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	29	481	654	48	278	283	30	212	105	710
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)	2.0	4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor	1.00	0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes	1.00	1.00	0.99		0.85		0.98		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Frt	1.00	1.00	0.99		0.92		0.85		1.00	1.00
Flt Protected	0.95	0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)	810	1313	1911		2182		1161		1327	2555
Flt Permitted	0.95	0.95	1.00		1.00		1.00		0.20	0.94
Satd. Flow (perm)	810	1313	1911		2182		1161		279	2417
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	31	506	688	51	293	298	32	223	111	747
RTOR Reduction (vph)	0	0	9	0	1	0	23	0	0	0
Lane Group Flow (vph)	31	455	781	0	593	0	6	0	310	771
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)	18.5	18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)	21.0	18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio	0.27	0.24	0.27		0.23		0.21		0.42	0.42
Clearance Time (s)	4.5	4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)	220	315	521		495		241		287	1042
v/s Ratio Prot	0.04	0.35	c0.41		c0.27				c0.17	0.12
v/s Ratio Perm							0.01		0.28	0.19
v/c Ratio	0.14	1.44	1.50		1.28dr		0.03		1.08	0.74
Uniform Delay, d1	21.2	29.2	28.0		29.8		24.3		26.8	18.7
Progression Factor	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2	1.3	217.1	234.7		107.5		0.2		76.1	4.7
Delay (s)	22.5	246.4	262.7		137.3		24.5		102.9	23.4
Level of Service	C	F	F		F		C		F	C
Approach Delay (s)			251.1		132.0					46.2
Approach LOS			F		F					D

Intersection Summary			
HCM 2000 Control Delay	151.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	77.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.
10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	756	184	12	2	26	20	811	72	88	284	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	0.99		1.00	0.99	
Flt Protected		1.00	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1616	1352		1428		1272	2483		1540	3024	
Flt Permitted		0.99	1.00		0.48		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1599	1352		698		1272	2483		1540	3024	
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	38	933	227	15	2	32	25	1001	89	109	351	38
RTOR Reduction (vph)	0	0	74	0	18	0	0	6	0	0	6	0
Lane Group Flow (vph)	0	971	153	0	31	0	25	1084	0	109	383	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		55.1	55.1		55.1		6.1	35.5		15.3	45.0	
Effective Green, g (s)		55.1	55.1		55.1		6.1	35.5		15.3	45.0	
Actuated g/C Ratio		0.45	0.45		0.45		0.05	0.29		0.13	0.37	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		723	611		315		63	723		193	1117	
v/s Ratio Prot							0.02	c0.44		c0.07	0.13	
v/s Ratio Perm		c0.61	0.11		0.05							
v/c Ratio		1.34	0.25		0.10		0.40	1.50		0.56	0.34	
Uniform Delay, d1		33.3	20.6		19.1		56.1	43.1		50.1	27.7	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		163.6	0.2		0.1		4.1	232.1		3.8	0.2	
Delay (s)		196.9	20.8		19.3		60.1	275.3		53.9	27.9	
Level of Service		F	C		B		E	F		D	C	
Approach Delay (s)		163.5			19.3			270.5			33.6	
Approach LOS		F			B			F			C	

Intersection Summary			
HCM 2000 Control Delay	180.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	121.8	Sum of lost time (s)	15.9
Intersection Capacity Utilization	99.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

7: Fourth St. & Channel St.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	622	8	4	16	33	13	54	4	345	221	33
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00	0.85	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		1.00			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2596			1436	1198	1166	1430		1377	1377	
Flt Permitted		0.95			0.89	1.00	0.93	1.00		0.95	1.00	
Satd. Flow (perm)		2474			1295	1198	1142	1430		1377	1377	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	9	648	8	4	17	34	14	56	4	359	230	34
RTOR Reduction (vph)	0	1	0	0	0	15	0	4	0	0	9	0
Lane Group Flow (vph)	0	664	0	0	21	19	14	56	0	359	255	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		16.7			16.7	24.3	4.3	4.3		7.6	16.9	
Effective Green, g (s)		16.7			16.7	24.3	4.3	4.3		7.6	16.9	
Actuated g/C Ratio		0.38			0.38	0.56	0.10	0.10		0.17	0.39	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		947			496	805	112	141		240	533	
v/s Ratio Prot						0.00		0.04		c0.26	c0.19	
v/s Ratio Perm		c0.27			0.02	0.01	0.01					
v/c Ratio		0.70			0.04	0.02	0.12	0.40		1.50	0.48	
Uniform Delay, d1		11.3			8.4	4.3	17.9	18.4		18.0	10.0	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.4			0.0	0.0	0.5	1.9		243.8	0.7	
Delay (s)		13.7			8.5	4.3	18.4	20.3		261.8	10.7	
Level of Service		B			A	A	B	C		F	B	
Approach Delay (s)		13.7			5.9			19.9			155.4	
Approach LOS		B			A			B			F	

Intersection Summary			
HCM 2000 Control Delay	76.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	43.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

8: Seventh St. & Mission Bay St.

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	53	236	505	19	781	314
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1743	1535	847	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1743	1535	847	1134	1194
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	57	254	543	20	840	338
RTOR Reduction (vph)	0	226	0	6	0	0
Lane Group Flow (vph)	57	28	543	14	840	338
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	10.1	10.1	45.6	40.6	20.0	70.6
Effective Green, g (s)	10.1	10.1	45.6	40.6	20.0	70.6
Actuated g/C Ratio	0.11	0.11	0.50	0.45	0.22	0.78
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	126	194	771	425	250	929
v/s Ratio Prot	c0.05		c0.35	0.01	c0.74	0.28
v/s Ratio Perm		0.02		0.01		
v/c Ratio	0.45	0.15	0.70	0.03	3.36	0.36
Uniform Delay, d1	37.7	36.4	17.4	14.0	35.4	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.6	0.3	2.9	0.0	1072.2	0.2
Delay (s)	40.3	36.8	20.3	14.1	1107.5	3.4
Level of Service	D	D	C	B	F	A
Approach Delay (s)	37.4		20.1			790.7
Approach LOS	D		C			F

Intersection Summary			
HCM 2000 Control Delay	465.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.47		
Actuated Cycle Length (s)	90.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	109.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	20	24	234	120	126	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.96		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.93		1.00	1.00	0.98	
Flt Protected	0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1563		1670	1531	3077	
Flt Permitted	0.98		0.64	1.00	1.00	
Satd. Flow (perm)	1563		1131	1531	3077	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	24	28	275	141	148	24
RTOR Reduction (vph)	26	0	0	0	7	0
Lane Group Flow (vph)	26	0	275	141	165	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	2.3		27.9	27.9	27.9	
Effective Green, g (s)	2.3		27.9	27.9	27.9	
Actuated g/C Ratio	0.06		0.69	0.69	0.69	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	89		784	1062	2135	
v/s Ratio Prot	c0.02			0.09	0.05	
v/s Ratio Perm			c0.24			
v/c Ratio	0.29		0.35	0.13	0.08	
Uniform Delay, d1	18.2		2.5	2.1	2.0	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.8		0.3	0.1	0.0	
Delay (s)	20.0		2.8	2.1	2.0	
Level of Service	B		A	A	A	
Approach Delay (s)	20.0			2.5	2.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	40.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	132	113	863	101	274	394
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.95	0.99		1.00	1.00
Flpb, ped/bikes	0.91	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1558	1457	3338		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1558	1457	3338		1711	3421
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	148	127	970	113	308	443
RTOR Reduction (vph)	0	97	7	0	0	0
Lane Group Flow (vph)	148	30	1076	0	308	443
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	58.1		17.9	81.1
Effective Green, g (s)	28.7	28.7	58.1		17.9	81.1
Actuated g/C Ratio	0.24	0.24	0.48		0.15	0.68
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	372	348	1616		255	2312
v/s Ratio Prot			c0.32		c0.18	0.13
v/s Ratio Perm	c0.09	0.02				
v/c Ratio	0.40	0.09	0.67		1.21	0.19
Uniform Delay, d1	38.4	35.5	23.6		51.0	7.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.7	0.1	2.2		124.4	0.0
Delay (s)	39.1	35.6	25.7		175.4	7.3
Level of Service	D	D	C		F	A
Approach Delay (s)	37.5		25.7			76.2
Approach LOS	D		C			E

Intersection Summary			
HCM 2000 Control Delay	45.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th
10/21/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	7	12	344	120	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1518	1341		2880	2969	
Flt Permitted	0.95	1.00		0.94	1.00	
Satd. Flow (perm)	1518	1341		2718	2969	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	8	14	405	141	35
RTOR Reduction (vph)	0	8	0	0	26	0
Lane Group Flow (vph)	12	0	0	419	150	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5		
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	0.6	0.6		12.8	12.8	
Effective Green, g (s)	0.6	0.6		12.8	12.8	
Actuated g/C Ratio	0.01	0.01		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	18	16		711	777	
v/s Ratio Prot	c0.01				0.05	
v/s Ratio Perm		0.00		c0.15		
v/c Ratio	0.67	0.01		0.59	0.19	
Uniform Delay, d1	24.1	23.9		15.8	14.0	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	66.1	0.2		1.3	0.1	
Delay (s)	90.1	24.0		17.0	14.2	
Level of Service	F	C		B	B	
Approach Delay (s)	63.7			17.0	14.2	
Approach LOS	E			B	B	

Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	48.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th
10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	138	3	61	23	16	5	86	232	7	5	70	55
Peak Hour Factor	0.92	0.81	0.81	0.81	0.81	0.92	0.81	0.92	0.81	0.92	0.92	0.92
Hourly flow rate (vph)	150	4	75	28	20	5	106	252	9	5	76	60

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	150	79	28	25	367	82	60
Volume Left (vph)	150	0	28	0	106	5	0
Volume Right (vph)	0	75	0	5	9	0	60
Hadj (s)	0.53	-0.63	0.53	-0.12	0.08	0.07	-0.67
Departure Headway (s)	6.5	5.4	6.8	6.2	5.6	5.9	5.1
Degree Utilization, x	0.27	0.12	0.05	0.04	0.57	0.13	0.09
Capacity (veh/h)	517	625	479	527	619	576	655
Control Delay (s)	10.8	7.9	9.0	8.3	15.7	8.6	7.4
Approach Delay (s)	9.8		8.7		15.7	8.1	
Approach LOS	A		A		C	A	

Intersection Summary			
Delay	12.2		
Level of Service	B		
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

13: Third St. & 16th St.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	256	170	227	2	122	33	208	674	22	10	337	178
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1258	1365	1126	1285	1365	1099	2515	2577		1296	2435	
Flt Permitted	0.67	1.00	1.00	0.59	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	884	1365	1126	798	1365	1099	2515	2577		1296	2435	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	294	195	261	2	140	38	239	775	25	11	387	205
RTOR Reduction (vph)	0	0	171	0	0	25	0	2	0	0	69	0
Lane Group Flow (vph)	294	195	90	2	140	13	239	798	0	11	523	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	304	470	388	275	470	379	352	974		155	871	
v/s Ratio Prot		0.14			0.10		0.10	c0.31		0.01	c0.21	
v/s Ratio Perm	c0.33		0.08	0.00		0.01						
v/c Ratio	0.97	0.41	0.23	0.01	0.30	0.03	0.68	0.82		0.07	0.60	
Uniform Delay, d1	32.2	25.0	23.3	21.5	23.9	21.7	40.9	28.0		39.1	26.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.87	0.81		1.00	1.00	
Incremental Delay, d2	43.9	2.7	1.4	0.0	1.6	0.2	5.9	4.5		0.9	3.1	
Delay (s)	76.1	27.7	24.7	21.6	25.5	21.9	41.6	27.1		39.9	29.3	
Level of Service	E	C	C	C	C	C	D	C		D	C	
Approach Delay (s)		45.6			24.7			30.4			29.5	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	116.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

14: Construction Driveway/4th St & 16th St.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	151	593	9	19	446	42	23	14	13	46	10	114
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.84	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.91	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1225	1621	1582		1477	1373	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.65	1.00		0.74	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1225	1115	1582		1146	1373	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	176	690	10	22	519	49	27	16	15	53	12	133
RTOR Reduction (vph)	0	0	6	0	0	32	0	10	0	0	90	0
Lane Group Flow (vph)	176	690	4	22	519	17	27	21	0	53	55	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	15.0	41.6	41.6	6.0	32.6	32.6	30.0	30.0		30.0	30.0	
Effective Green, g (s)	15.0	41.6	41.6	6.0	32.6	32.6	30.0	30.0		30.0	30.0	
Actuated g/C Ratio	0.16	0.45	0.45	0.06	0.35	0.35	0.32	0.32		0.32	0.32	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	262	766	651	105	600	431	361	512		371	444	
v/s Ratio Prot	c0.11	c0.40		0.01	0.30			0.01			0.04	
v/s Ratio Perm			0.00			0.01	0.02			c0.05		
v/c Ratio	0.67	0.90	0.01	0.21	0.86	0.04	0.07	0.04		0.14	0.12	
Uniform Delay, d1	36.5	23.6	14.1	41.1	27.9	19.7	21.7	21.4		22.2	22.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.6	15.8	0.0	1.0	12.4	0.0	0.1	0.0		0.2	0.1	
Delay (s)	43.1	39.4	14.1	42.0	40.3	19.8	21.8	21.5		22.4	22.2	
Level of Service	D	D	B	D	D	B	C	C		C	C	
Approach Delay (s)		39.8			38.7			21.6			22.2	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	36.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	92.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.
10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	575	32	55	480	49	31	464	83	94	124	106
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.98	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1046	1540	3009			3014	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.59	1.00			0.56	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1046	951	3009			1722	1072
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	625	35	60	522	53	34	504	90	102	135	115
RTOR Reduction (vph)	0	0	15	0	0	25	0	14	0	0	0	87
Lane Group Flow (vph)	82	625	20	60	522	28	34	580	0	0	237	28
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	9.0	58.2	58.2	5.0	53.2	53.2	25.9	25.9			24.9	24.9
Effective Green, g (s)	9.0	58.2	58.2	5.0	53.2	53.2	25.9	25.9			24.9	24.9
Actuated g/C Ratio	0.09	0.57	0.57	0.05	0.52	0.52	0.25	0.25			0.24	0.24
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	107	692	785	75	633	545	241	763			419	261
v/s Ratio Prot	c0.07	c0.51		0.04	0.43			c0.19				
v/s Ratio Perm			0.01			0.03	0.04				0.14	0.03
v/c Ratio	0.77	0.90	0.03	0.80	0.82	0.05	0.14	0.76			1.17dl	0.11
Uniform Delay, d1	45.5	19.5	9.6	48.1	20.5	12.0	29.5	35.2			33.9	30.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	27.3	15.1	0.0	43.9	8.6	0.0	0.3	4.4			1.8	0.2
Delay (s)	72.8	34.6	9.6	91.9	29.1	12.1	29.8	39.6			35.6	30.2
Level of Service	E	C	A	F	C	B	C	D			D	C
Approach Delay (s)		37.6			33.6			39.1			33.8	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	36.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	102.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	87.6%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.
10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	512	77	38	350	229	69	230	17	155	109	36
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.90		1.00	*0.80	*0.80	*0.80	*0.90	*0.80	*0.80	*0.90	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.91	1.00	1.00	0.96	1.00	0.98	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1329	1050		1337	1126	866	1070	1077	916	1070	1197	
Flt Permitted	0.30	1.00		0.21	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	419	1050		293	1126	866	1070	1077	916	1070	1197	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	557	84	41	380	249	75	250	18	168	118	39
RTOR Reduction (vph)	0	5	0	0	0	100	0	0	14	0	12	0
Lane Group Flow (vph)	25	636	0	41	380	149	75	250	4	168	145	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	53.1	53.1		53.1	53.1	65.1	15.0	21.1	21.1	12.0	18.1	
Effective Green, g (s)	53.1	53.1		53.1	53.1	65.1	15.0	21.1	21.1	12.0	18.1	
Actuated g/C Ratio	0.49	0.49		0.49	0.49	0.60	0.14	0.19	0.19	0.11	0.17	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	224	513		165	551	559	147	209	178	118	199	
v/s Ratio Prot	0.00	c0.61		0.01	c0.34	0.03	0.07	c0.23		c0.16	0.12	
v/s Ratio Perm	0.05			0.12		0.14			0.00			
v/c Ratio	0.11	1.24		0.25	0.69	0.27	0.51	1.20	0.02	1.42	0.73	
Uniform Delay, d1	16.3	27.7		31.3	21.3	10.3	43.3	43.7	35.3	48.2	42.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	123.6		0.8	3.6	0.3	3.0	125.3	0.0	232.7	12.9	
Delay (s)	16.5	151.3		32.1	24.9	10.6	46.3	169.0	35.4	280.9	55.8	
Level of Service	B	F		C	C	B	D	F	D	F	E	
Approach Delay (s)		146.3			20.1			135.1			172.2	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	106.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	108.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.
10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	244	319	59	47	105	6	39	74	53	8	29	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.98	
Flpb, ped/bikes		0.99		0.99	1.00			0.99	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.90	
Flt Protected		0.98		0.95	1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1459		1696	1780			1760	1489		1343	
Flt Permitted		0.82		0.40	1.00			0.84	1.00		0.98	
Satd. Flow (perm)		1218		722	1780			1507	1489		1321	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	268	351	65	52	115	7	43	81	58	9	32	105
RTOR Reduction (vph)	0	3	0	0	2	0	0	0	47	0	84	0
Lane Group Flow (vph)	0	681	0	52	120	0	0	124	11	0	62	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		52.3		52.3	52.3			18.7	18.7		18.7	
Effective Green, g (s)		52.3		52.3	52.3			18.7	18.7		18.7	
Actuated g/C Ratio		0.55		0.55	0.55			0.20	0.20		0.20	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		669		396	977			296	292		259	
v/s Ratio Prot					0.07							
v/s Ratio Perm		c0.56		0.07				c0.08	0.01		0.05	
v/c Ratio		1.02		0.13	0.12			0.42	0.04		0.24	
Uniform Delay, d1		21.5		10.4	10.4			33.5	31.0		32.2	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		39.5		0.2	0.1			1.0	0.1		0.5	
Delay (s)		60.9		10.6	10.4			34.5	31.0		32.7	
Level of Service		E		B	B			C	C		C	
Approach Delay (s)		60.9			10.5			33.4			32.7	
Approach LOS		E			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	45.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	95.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.
10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	308	555	48	18	210	11	32	586	44	25	370	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1669	3371		1698	3388		1260	2487		1260	2375	
Flt Permitted	0.60	1.00		0.24	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1049	3371		427	3388		1260	2487		1260	2375	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	342	617	53	20	233	12	36	651	49	28	411	190
RTOR Reduction (vph)	0	6	0	0	4	0	0	5	0	0	54	0
Lane Group Flow (vph)	342	664	0	20	241	0	36	695	0	28	547	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	311	1001		126	1006		212	992		187	900	
v/s Ratio Prot		0.20			0.07		0.03	c0.28		0.02	c0.23	
v/s Ratio Perm	c0.33			0.05								
v/c Ratio	1.10	0.66		0.16	0.24		0.17	0.70		0.15	0.61	
Uniform Delay, d1	35.1	30.8		25.9	26.6		35.5	25.1		37.0	25.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.50	0.63	
Incremental Delay, d2	80.5	3.5		2.7	0.6		1.7	4.1		1.4	2.5	
Delay (s)	115.6	34.2		28.6	27.2		37.3	29.2		57.1	18.2	
Level of Service	F	C		C	C		D	C		E	B	
Approach Delay (s)		61.7			27.3			29.6			19.9	
Approach LOS		E			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	39.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	98.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	801	55	6	437	9	36	0	5	17	1	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.98		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3388		1711	3411			1698		1711	1541	
Flt Permitted	0.47	1.00		0.22	1.00			0.81		0.73	1.00	
Satd. Flow (perm)	842	3388		402	3411			1441		1312	1541	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	871	60	7	475	10	39	0	5	18	1	24
RTOR Reduction (vph)	0	8	0	0	2	0	0	22	0	0	15	0
Lane Group Flow (vph)	22	923	0	7	483	0	0	22	0	18	10	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45			0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	378	1524		180	1534			552		502	590	
v/s Ratio Prot		c0.27			0.14						0.01	
v/s Ratio Perm	0.03			0.02				c0.02		0.01		
v/c Ratio	0.06	0.61		0.04	0.31			0.04		0.04	0.02	
Uniform Delay, d1	9.3	12.5		9.2	10.6			11.6		11.6	11.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	1.8		0.4	0.5			0.1		0.1	0.1	
Delay (s)	9.6	14.3		9.6	11.1			11.7		11.7	11.5	
Level of Service	A	B		A	B			B		B	B	
Approach Delay (s)		14.2			11.1			11.7			11.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	41.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	92	0	0	527	29	308	538	686	0	0	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.92				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3391			5091		1711	3134				2694
Flt Permitted		0.86			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2944			5091		1711	3134				2694
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	23	107	0	0	613	34	358	626	798	0	0	86
RTOR Reduction (vph)	0	0	0	0	7	0	0	271	0	0	0	80
Lane Group Flow (vph)	0	130	0	0	640	0	358	1153	0	0	0	6
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		40.5			29.5		35.0	35.0				6.0
Effective Green, g (s)		40.5			29.5		35.0	35.0				6.0
Actuated g/C Ratio		0.48			0.35		0.41	0.41				0.07
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1434			1766		704	1290				190
v/s Ratio Prot		c0.01			c0.13		0.21	c0.37				0.00
v/s Ratio Perm		0.04										
v/c Ratio		0.09			0.36		0.51	0.89				0.03
Uniform Delay, d1		12.2			20.7		18.6	23.3				36.8
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.6		2.6	9.8				0.3
Delay (s)		12.3			21.3		21.2	33.1				37.1
Level of Service		B			C		C	C				D
Approach Delay (s)		12.3			21.3			30.7			37.1	
Approach LOS		B			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

10/21/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	112	444	447	461	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.91	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1537	1427	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1537	1427	3319	1801		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	133	529	532	549	0	0
RTOR Reduction (vph)	61	61	0	0	0	0
Lane Group Flow (vph)	278	262	532	549	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	35.0	35.0	15.0	60.0		
Effective Green, g (s)	35.0	35.0	15.0	60.0		
Actuated g/C Ratio	0.58	0.58	0.25	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	896	832	829	1801		
v/s Ratio Prot	0.18		c0.16	c0.30		
v/s Ratio Perm		0.18				
v/c Ratio	0.31	0.31	0.64	0.30		
Uniform Delay, d1	6.4	6.4	20.1	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.2	0.2	1.7	0.1		
Delay (s)	6.6	6.6	21.8	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	6.6			10.8	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	267	125	165	6	127	10	122	453	13	17	336	143
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.93		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.97	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1175	1948		1138	1253		1215	2414		1215	2246	
Flt Permitted	0.43	1.00		0.56	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	538	1948		667	1253		1215	2414		1215	2246	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	297	139	183	7	141	11	136	503	14	19	373	159
RTOR Reduction (vph)	0	117	0	0	3	0	0	2	0	0	49	0
Lane Group Flow (vph)	297	205	0	7	149	0	136	515	0	19	483	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	35.9	35.9		17.1	17.1		16.4	42.3		5.5	31.4	
Effective Green, g (s)	35.9	35.9		17.1	17.1		16.4	42.3		5.5	31.4	
Actuated g/C Ratio	0.36	0.36		0.17	0.17		0.16	0.42		0.06	0.31	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	279	699		114	214		199	1021		66	705	
v/s Ratio Prot	c0.14	0.11			0.12		c0.11	0.21		0.02	c0.22	
v/s Ratio Perm	c0.24			0.01								
v/c Ratio	1.06	0.29		0.06	0.69		0.68	0.50		0.29	0.69	
Uniform Delay, d1	30.2	23.0		34.7	39.0		39.4	21.2		45.4	30.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	72.0	0.2		0.2	9.4		9.3	1.8		2.4	5.4	
Delay (s)	102.2	23.2		35.0	48.4		48.7	22.9		47.8	35.3	
Level of Service	F	C		C	D		D	C		D	D	
Approach Delay (s)		61.1			47.8			28.3			35.8	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	42.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	95.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23:

10/21/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	217	386	369	377
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	236	420	401	410
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			545			
pX, platoon unblocked						
vC, conflicting volume	1448	118			236	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1448	118			236	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			70	
cM capacity (veh/h)	85	912			1328	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	118	118	420	401	410
Volume Left	0	0	0	401	0
Volume Right	0	0	420	0	0
cSH	1700	1700	1700	1328	1700
Volume to Capacity	0.07	0.07	0.25	0.30	0.24
Queue Length 95th (ft)	0	0	0	32	0
Control Delay (s)	0.0	0.0	0.0	8.9	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.4	
Approach LOS					

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

10/21/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	139	111	0	226	180
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	151	121	0	246	196
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	121				196	121
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	121				196	121
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				68	78
cM capacity (veh/h)	1465				774	908

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	76	76	121	441
Volume Left	0	0	0	246
Volume Right	0	0	0	196
cSH	1700	1700	1700	828
Volume to Capacity	0.04	0.04	0.07	0.53
Queue Length 95th (ft)	0	0	0	80
Control Delay (s)	0.0	0.0	0.0	14.2
Lane LOS				B
Approach Delay (s)	0.0		0.0	14.2
Approach LOS				B

Intersection Summary			
Average Delay	8.8		
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

10/21/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰↑	↑	↱	Y	
Volume (veh/h)	44	320	111	64	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	48	348	121	70	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	190				390	121
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	190				390	121
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				100	100
cM capacity (veh/h)	1381				566	908

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	164	232	121	70	0
Volume Left	48	0	0	0	0
Volume Right	0	0	0	70	0
cSH	1381	1700	1700	1700	1700
Volume to Capacity	0.03	0.14	0.07	0.04	0.00
Queue Length 95th (ft)	3	0	0	0	0
Control Delay (s)	2.5	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	22.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↱		↰	↑↱	
Volume (vph)	19	20	20	8	33	16	48	483	84	27	344	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.96		1.00	0.98		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1522			1549		1540	3011		1540	3041	
Flt Permitted		0.90			0.95		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1392			1485		1540	3011		1540	3041	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	22	22	9	36	17	52	525	91	29	374	34
RTOR Reduction (vph)	0	20	0	0	15	0	0	9	0	0	4	0
Lane Group Flow (vph)	0	45	0	0	47	0	52	607	0	29	404	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.2			7.2		5.2	54.0		3.8	52.6	
Effective Green, g (s)		7.2			7.2		5.2	54.0		3.8	52.6	
Actuated g/C Ratio		0.09			0.09		0.06	0.67		0.05	0.66	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		124			133		99	2027		72	1994	
v/s Ratio Prot							c0.03	c0.20		c0.02	0.13	
v/s Ratio Perm		c0.03			0.03							
v/c Ratio		0.36			0.35		0.53	0.30		0.40	0.20	
Uniform Delay, d1		34.3			34.3		36.3	5.4		37.1	5.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.8			1.6		2.3	0.4		1.3	0.2	
Delay (s)		36.1			35.9		38.6	5.7		38.4	5.7	
Level of Service		D			D		D	A		D	A	
Approach Delay (s)		36.1			35.9			8.3			7.9	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

28: Pennsylvania & 280 SB Off-Ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑			↑
Sign Control	Stop		Stop			Stop
Volume (vph)	374	17	161	0	0	203
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	407	18	175	0	0	221

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	203	203	18	88	88	221
Volume Left (vph)	203	203	0	0	0	0
Volume Right (vph)	0	0	18	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.1	6.1	3.2	6.0	6.0	5.7
Degree Utilization, x	0.35	0.35	0.02	0.15	0.15	0.35
Capacity (veh/h)	562	564	1121	564	563	600
Control Delay (s)	11.2	11.2	5.1	8.9	8.9	11.8
Approach Delay (s)	10.9			8.9		11.8
Approach LOS	B			A		B

Intersection Summary			
Delay	10.7		
Level of Service	B		
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

29: Indiana St/280 NB On-Ramp/ Indiana & 25th

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑			↑↱			↰↑↱				
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	84	105	0	0	150	65	23	273	5	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	91	114	0	0	163	71	25	297	5	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	205	234	173	154
Volume Left (vph)	91	0	25	0
Volume Right (vph)	0	71	0	5
Hadj (s)	0.12	-0.15	0.11	0.01
Departure Headway (s)	5.2	4.9	5.7	5.6
Degree Utilization, x	0.30	0.32	0.28	0.24
Capacity (veh/h)	654	694	598	607
Control Delay (s)	10.4	10.2	9.7	9.2
Approach Delay (s)	10.4	10.2	9.4	
Approach LOS	B	B	A	

Intersection Summary			
Delay	9.9		
Level of Service	A		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	26	62	4	62	4	76	568	6	0	362	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.92			0.99		1.00	1.00			0.97	
Flpb, ped/bikes		0.99			1.00		1.00	1.00			1.00	
Frt		0.92			0.99		1.00	1.00			0.98	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1182			1587		1540	2259			2165	
Flt Permitted		0.96			0.98		0.95	1.00			1.00	
Satd. Flow (perm)		1140			1565		1540	2259			2165	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	27	65	4	65	4	80	598	6	0	381	47
RTOR Reduction (vph)	0	59	0	0	3	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	47	0	0	70	0	80	604	0	0	424	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		8.8			8.8		8.8	71.3			57.4	
Effective Green, g (s)		8.8			8.8		8.8	71.3			57.4	
Actuated g/C Ratio		0.10			0.10		0.10	0.79			0.63	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		110			152		149	1781			1374	
v/s Ratio Prot							c0.05	c0.27			0.20	
v/s Ratio Perm		0.04			c0.04							
v/c Ratio		0.43			0.46		0.54	0.34			0.31	
Uniform Delay, d1		38.4			38.6		38.9	2.8			7.5	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		2.7			2.2		3.7	0.5			0.6	
Delay (s)		41.1			40.8		42.5	3.3			8.1	
Level of Service		D			D		D	A			A	
Approach Delay (s)		41.1			40.8			7.9			8.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	90.4	Sum of lost time (s)	15.4
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	214	298	0	0	179	209	181	180	342	82	0	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.84	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1018	1540	1621	1195	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1018	1540	1621	1195	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	225	314	0	0	188	220	191	189	360	86	0	311
RTOR Reduction (vph)	0	0	0	0	0	166	0	0	243	0	0	276
Lane Group Flow (vph)	225	314	0	0	188	54	191	189	117	86	0	35
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	15.7	41.3			20.6	20.6	16.6	16.6	16.6	9.5		9.5
Effective Green, g (s)	15.7	41.3			20.6	20.6	16.6	16.6	16.6	9.5		9.5
Actuated g/C Ratio	0.19	0.50			0.25	0.25	0.20	0.20	0.20	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	289	1524			760	251	306	322	237	175		137
v/s Ratio Prot	c0.15	0.10			c0.06		c0.12	0.12		c0.06		0.03
v/s Ratio Perm						0.05			0.10			
v/c Ratio	0.78	0.21			0.25	0.22	0.62	0.59	0.49	0.49		0.26
Uniform Delay, d1	32.2	11.8			25.2	25.0	30.5	30.3	29.7	34.7		33.7
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	12.4	0.3			0.8	2.0	3.9	2.7	1.6	2.2		1.0
Delay (s)	44.6	12.1			26.0	27.0	34.5	33.0	31.3	36.8		34.7
Level of Service	D	B			C	C	C	C	C	D		C
Approach Delay (s)		25.7			26.5			32.6			35.2	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	83.4	Sum of lost time (s)	21.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	48	55	0	36	8	62	49	3	4	36	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.95			0.97		1.00	0.99		1.00	0.92	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3187			1750		1711	1786		1711	1650	
Flt Permitted		0.87			1.00		0.77	1.00		0.77	1.00	
Satd. Flow (perm)		2836			1750		1385	1786		1385	1650	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	52	60	0	39	9	67	53	3	4	39	49
RTOR Reduction (vph)	0	22	0	0	3	0	0	3	0	0	42	0
Lane Group Flow (vph)	0	151	0	0	45	0	67	53	0	4	46	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		23.8			23.8		5.2	5.2		5.2	5.2	
Effective Green, g (s)		23.8			23.8		5.2	5.2		5.2	5.2	
Actuated g/C Ratio		0.63			0.63		0.14	0.14		0.14	0.14	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1776			1096		189	244		189	225	
v/s Ratio Prot					0.03			0.03			0.03	
v/s Ratio Perm		c0.05					c0.05			0.00		
v/c Ratio		0.08			0.04		0.35	0.22		0.02	0.20	
Uniform Delay, d1		2.8			2.7		14.9	14.6		14.2	14.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.1		1.1	0.5		0.0	0.4	
Delay (s)		2.9			2.8		16.0	15.0		14.2	15.0	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.9			2.8			15.6			15.0	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	38.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT
BASKETBALL GAME
WITH SF GIANTS GAME AT AT&T PARK
WEEKDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	618	425	167	546	481	52	26	538	88	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.91		1.00	0.97			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.96		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	2683		2987	2938			5482	938			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	2683		2987	2938			5482	938			
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	702	483	190	620	547	59	30	611	100	0	0	0
RTOR Reduction (vph)	0	38	0	0	2	0	0	0	81	0	0	0
Lane Group Flow (vph)	702	635	0	620	604	0	0	641	19	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	28.2	38.7		31.5	42.0			20.9	20.9			
Effective Green, g (s)	28.2	38.7		31.5	42.0			20.9	20.9			
Actuated g/C Ratio	0.26	0.35		0.29	0.38			0.19	0.19			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	1148	943		855	1121			1041	178			
v/s Ratio Prot	0.16	c0.24		c0.21	0.21							
v/s Ratio Perm								0.12	0.02			
v/c Ratio	0.61	0.67		0.73	0.54			0.62	0.11			
Uniform Delay, d1	36.1	30.3		35.4	26.5			40.9	36.8			
Progression Factor	1.00	1.00		0.70	0.32			1.14	10.34			
Incremental Delay, d2	1.0	3.8		1.4	0.2			1.0	0.2			
Delay (s)	37.0	34.1		26.2	8.7			47.7	381.2			
Level of Service	D	C		C	A			D	F			
Approach Delay (s)		35.6			17.5			92.7			0.0	
Approach LOS		D			B			F			A	

Intersection Summary			
HCM 2000 Control Delay	41.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	96.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	1004	22	33	431	43	10	140	76	131	936	357
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.94			1.00	0.65	1.00	0.98	0.51
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00	0.73	1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4374		1296	2407			1606	879	1119	2880	627
Flt Permitted	0.95	1.00		0.95	1.00			0.91	1.00	0.66	1.00	1.00
Satd. Flow (perm)	1540	4374		1296	2407			1462	879	772	2880	627
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	134	1068	23	35	459	46	11	149	81	139	996	380
RTOR Reduction (vph)	0	2	0	0	6	0	0	0	47	0	2	91
Lane Group Flow (vph)	134	1089	0	35	499	0	0	160	34	139	1032	251
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	13.4	41.6		7.5	34.1			51.0	51.0	52.0	52.0	52.0
Effective Green, g (s)	13.4	41.6		7.5	34.1			51.0	51.0	52.0	52.0	52.0
Actuated g/C Ratio	0.11	0.35		0.06	0.28			0.42	0.42	0.43	0.43	0.43
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	171	1516		81	683			621	373	334	1248	271
v/s Ratio Prot	0.09	c0.25		0.03	c0.21						0.36	
v/s Ratio Perm								0.11	0.04	0.18		c0.40
v/c Ratio	0.78	0.72		0.43	0.73			0.26	0.09	0.42	0.83	0.93
Uniform Delay, d1	51.9	34.1		54.2	38.8			22.3	20.6	23.5	30.0	32.2
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.5	3.0		3.7	3.9			0.2	0.1	0.8	4.6	35.1
Delay (s)	72.4	37.1		57.9	42.7			22.5	20.8	24.3	34.6	67.3
Level of Service	E	D		E	D			C	C	C	C	E
Approach Delay (s)		40.9			43.7			21.9			41.1	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	40.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	140.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1130	131	2	796	87	22
Ideal Flow (vphpl)	1200	1200	1200	1200	1200	1200
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1908			1944	972	857
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	1908			1853	972	857
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1165	135	2	821	90	23
RTOR Reduction (vph)	8	0	0	0	0	15
Lane Group Flow (vph)	1292	0	0	823	90	8
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1077			1046	323	285
v/s Ratio Prot	c0.68				c0.09	
v/s Ratio Perm				0.44		0.01
v/c Ratio	1.20			0.79	0.28	0.03
Uniform Delay, d1	23.9			18.8	27.0	24.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	99.0			6.0	2.1	0.2
Delay (s)	123.0			24.7	29.1	24.9
Level of Service	F			C	C	C
Approach Delay (s)	123.0			24.7	28.3	
Approach LOS	F			C	C	

Intersection Summary			
HCM 2000 Control Delay	82.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	114	935	103	43	245	586	279	505	1154	218
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.99			1.00	0.95			1.00	0.85
Flt Protected		1.00			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5800			2858	2445			4105	1122
Flt Permitted		1.00			0.68	1.00			0.95	1.00
Satd. Flow (perm)		5800			1962	2445			4105	1122
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	119	974	107	45	255	610	291	526	1202	227
RTOR Reduction (vph)	0	24	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	1176	0	0	300	899	0	0	1751	204
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		20.0			22.0	22.0			15.5	15.5
Effective Green, g (s)		22.0			25.0	25.0			18.5	18.5
Actuated g/C Ratio		0.29			0.33	0.33			0.25	0.25
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1701			654	815			1012	276
v/s Ratio Prot						c0.37			c0.43	0.18
v/s Ratio Perm		0.20			0.15					
v/c Ratio		0.69			0.46	1.10			1.73	0.74
Uniform Delay, d1		23.5			19.7	25.0			28.2	26.0
Progression Factor		1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2		1.2			0.5	63.6			332.8	9.9
Delay (s)		24.7			20.2	88.6			361.0	35.9
Level of Service		C			C	F			F	D
Approach Delay (s)		24.7			20.2	88.6			327.1	
Approach LOS		C			C	F			F	

Intersection Summary			
HCM 2000 Control Delay	173.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	112.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	39	445	673	91	249	240	54	174	124	907
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)	2.0	4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor	1.00	0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes	1.00	1.00	0.99		0.86		0.98		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Frt	1.00	1.00	0.98		0.93		0.85		1.00	1.00
Flt Protected	0.95	0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)	810	1313	1889		2193		1161		1327	2557
Flt Permitted	0.95	0.95	1.00		1.00		1.00		0.23	0.95
Satd. Flow (perm)	810	1313	1889		2193		1161		326	2441
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	43	489	740	100	274	264	59	191	136	997
RTOR Reduction (vph)	0	0	17	0	1	0	42	0	0	0
Lane Group Flow (vph)	43	440	872	0	543	0	11	0	313	1011
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)	18.5	18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)	21.0	18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio	0.27	0.24	0.27		0.23		0.21		0.42	0.42
Clearance Time (s)	4.5	4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)	220	315	515		498		241		300	1049
v/s Ratio Prot	0.05	0.34	c0.46		c0.25				0.17	c0.16
v/s Ratio Perm							0.01		0.27	0.25
v/c Ratio	0.20	1.40	1.69		1.14dr		0.05		1.04	0.96
Uniform Delay, d1	21.5	29.2	28.0		29.8		24.4		26.1	21.7
Progression Factor	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2	2.0	196.8	319.9		67.3		0.4		63.7	20.3
Delay (s)	23.5	226.1	347.9		97.0		24.8		89.8	42.0
Level of Service	C	F	F		F		C		F	D
Approach Delay (s)			298.6		90.6					53.3
Approach LOS			F		F					D

Intersection Summary			
HCM 2000 Control Delay	162.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	77.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	137	151	1	2	1	71	495	162	204	321	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1700	1700	1700	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	0.97		1.00	0.99	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.97		1.00	0.96		1.00	0.96	
Flt Protected		0.99	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1599	1352		1535		1377	2568		1540	2943	
Flt Permitted		0.94	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1524	1352		1500		1377	2568		1540	2943	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	39	147	162	1	2	1	76	532	174	219	345	113
RTOR Reduction (vph)	0	0	113	0	1	0	0	26	0	0	28	0
Lane Group Flow (vph)	0	186	49	0	3	0	76	680	0	219	430	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.2	32.2		32.2		11.7	36.7		22.1	47.4	
Effective Green, g (s)		32.2	32.2		32.2		11.7	36.7		22.1	47.4	
Actuated g/C Ratio		0.30	0.30		0.30		0.11	0.34		0.21	0.44	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		459	407		451		150	881		318	1304	
v/s Ratio Prot							0.06	c0.26		c0.14	0.15	
v/s Ratio Perm		c0.12	0.04		0.00							
v/c Ratio		0.41	0.12		0.01		0.51	0.77		0.69	0.33	
Uniform Delay, d1		29.7	27.1		26.2		44.9	31.4		39.2	19.4	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6	0.1		0.0		2.7	4.2		6.1	0.1	
Delay (s)		30.3	27.2		26.2		47.6	35.6		45.3	19.5	
Level of Service		C	C		C		D	D		D	B	
Approach Delay (s)		28.9			26.2			36.8			27.9	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	31.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	106.9	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	21	13	7	78	93	21	106	16	287	273	169
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.99	1.00	0.99		1.00	0.90	
Flpb, ped/bikes		0.99			1.00	1.00	0.87	1.00		1.00	1.00	
Frt		0.96			1.00	0.85	1.00	0.98		1.00	0.94	
Flt Protected		0.99			1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2431			1443	1218	1201	1412		1377	1225	
Flt Permitted		0.86			0.97	1.00	0.50	1.00		0.95	1.00	
Satd. Flow (perm)		2129			1401	1218	632	1412		1377	1225	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	13	23	14	8	86	102	23	116	18	315	300	186
RTOR Reduction (vph)	0	12	0	0	0	47	0	9	0	0	26	0
Lane Group Flow (vph)	0	38	0	0	94	55	23	125	0	315	460	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		7.1			7.1	26.5	8.0	8.0		19.4	32.4	
Effective Green, g (s)		7.1			7.1	26.5	8.0	8.0		19.4	32.4	
Actuated g/C Ratio		0.14			0.14	0.54	0.16	0.16		0.39	0.65	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		305			200	775	102	228		539	801	
v/s Ratio Prot						0.03		0.09		0.23	c0.38	
v/s Ratio Perm		0.02			c0.07	0.02	0.04					
v/c Ratio		0.12			0.47	0.07	0.23	0.55		0.58	0.57	
Uniform Delay, d1		18.5			19.5	5.6	18.1	19.1		11.9	4.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			1.7	0.0	1.1	2.7		1.6	1.0	
Delay (s)		18.7			21.2	5.6	19.2	21.8		13.5	5.7	
Level of Service		B			C	A	B	C		B	A	
Approach Delay (s)		18.7			13.1			21.4			8.8	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	49.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.
4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	42	244	522	28	791	321
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1743	1535	846	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1743	1535	846	1134	1194
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	54	313	669	36	1014	412
RTOR Reduction (vph)	0	279	0	8	0	0
Lane Group Flow (vph)	54	34	669	28	1014	412
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	10.0	10.0	47.1	42.1	20.0	72.1
Effective Green, g (s)	10.0	10.0	47.1	42.1	20.0	72.1
Actuated g/C Ratio	0.11	0.11	0.51	0.46	0.22	0.78
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	123	189	785	432	246	934
v/s Ratio Prot	c0.05		c0.44	0.01	c0.89	0.35
v/s Ratio Perm		0.02		0.02		
v/c Ratio	0.44	0.18	0.85	0.06	4.12	0.44
Uniform Delay, d1	38.4	37.3	19.5	14.0	36.0	3.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.5	0.5	8.9	0.1	1414.5	0.3
Delay (s)	40.9	37.8	28.4	14.0	1450.5	3.7
Level of Service	D	D	C	B	F	A
Approach Delay (s)	38.2		27.6			1032.5
Approach LOS	D		C			F

Intersection Summary			
HCM 2000 Control Delay	602.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.76		
Actuated Cycle Length (s)	92.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	110.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	37	33	261	297	112	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.97		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.97	1.00	1.00	
Frt	0.94		1.00	1.00	0.96	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1591		1667	1531	2988	
Flt Permitted	0.97		0.64	1.00	1.00	
Satd. Flow (perm)	1591		1116	1531	2988	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	44	39	311	354	133	51
RTOR Reduction (vph)	35	0	0	0	16	0
Lane Group Flow (vph)	48	0	311	354	168	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	4.1		30.1	30.1	30.1	
Effective Green, g (s)	4.1		30.1	30.1	30.1	
Actuated g/C Ratio	0.09		0.68	0.68	0.68	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	147		759	1042	2034	
v/s Ratio Prot	c0.03			0.23	0.06	
v/s Ratio Perm			c0.28			
v/c Ratio	0.32		0.41	0.34	0.08	
Uniform Delay, d1	18.8		3.1	2.9	2.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.3		0.4	0.2	0.0	
Delay (s)	20.0		3.5	3.1	2.4	
Level of Service	C		A	A	A	
Approach Delay (s)	20.0			3.3	2.4	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	44.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	123	124	801	151	309	394
Ideal Flow (vphpl)	1200	1200	1200	1200	1200	1200
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.95	0.99		1.00	1.00
Flpb, ped/bikes	0.91	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	984	920	2085		1080	2161
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	984	920	2085		1080	2161
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	137	138	890	168	343	438
RTOR Reduction (vph)	0	105	13	0	0	0
Lane Group Flow (vph)	137	33	1045	0	343	438
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	61.1		14.9	81.1
Effective Green, g (s)	28.7	28.7	61.1		14.9	81.1
Actuated g/C Ratio	0.24	0.24	0.51		0.12	0.68
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	235	220	1061		134	1460
v/s Ratio Prot			c0.50		c0.32	0.20
v/s Ratio Perm	c0.14	0.04				
v/c Ratio	0.58	0.15	0.99		2.56	0.30
Uniform Delay, d1	40.4	36.0	29.0		52.5	7.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.7	0.3	24.3		723.3	0.1
Delay (s)	44.0	36.3	53.3		775.8	8.0
Level of Service	D	D	D		F	A
Approach Delay (s)	40.2		53.3			345.2
Approach LOS	D		D			F

Intersection Summary			
HCM 2000 Control Delay	159.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	114.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	7	12	548	115	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1540	1345		2883	2964	
Flt Permitted	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1540	1345		2735	2964	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	8	14	645	135	35
RTOR Reduction (vph)	0	8	0	0	24	0
Lane Group Flow (vph)	12	0	0	659	146	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5		
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	1.4	1.4		17.0	17.0	
Effective Green, g (s)	1.4	1.4		17.0	17.0	
Actuated g/C Ratio	0.03	0.03		0.32	0.32	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	40	34		862	934	
v/s Ratio Prot	c0.01				0.05	
v/s Ratio Perm		0.00		c0.24		
v/c Ratio	0.30	0.01		0.76	0.16	
Uniform Delay, d1	25.8	25.6		16.6	13.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.2	0.1		4.1	0.1	
Delay (s)	30.0	25.6		20.7	13.4	
Level of Service	C	C		C	B	
Approach Delay (s)	28.2			20.7	13.4	
Approach LOS	C			C	B	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	53.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	150	9	70	22	18	5	108	251	8	5	70	55
Peak Hour Factor	0.92	0.77	0.77	0.77	0.77	0.92	0.77	0.92	0.77	0.92	0.92	0.92
Hourly flow rate (vph)	163	12	91	29	23	5	140	273	10	5	76	60

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	163	103	29	29	423	82	60
Volume Left (vph)	163	0	29	0	140	5	0
Volume Right (vph)	0	91	0	5	10	0	60
Hadj (s)	0.53	-0.59	0.53	-0.10	0.09	0.07	-0.67
Departure Headway (s)	6.8	5.6	7.1	6.5	5.7	6.1	5.4
Degree Utilization, x	0.31	0.16	0.06	0.05	0.67	0.14	0.09
Capacity (veh/h)	501	596	455	496	610	551	621
Control Delay (s)	11.5	8.5	9.4	8.7	19.7	8.9	7.7
Approach Delay (s)	10.4		9.0		19.7	8.4	
Approach LOS	B		A		C	A	

Intersection Summary			
Delay	14.4		
Level of Service	B		
Intersection Capacity Utilization	48.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	238	177	260	4	137	40	199	675	41	11	308	197
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1258	1365	1126	1285	1365	1099	2515	2564		1296	2415	
Flt Permitted	0.67	1.00	1.00	0.61	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	884	1365	1126	824	1365	1099	2515	2564		1296	2415	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	243	181	265	4	140	41	203	689	42	11	314	201
RTOR Reduction (vph)	0	0	174	0	0	27	0	4	0	0	103	0
Lane Group Flow (vph)	243	181	91	4	140	14	203	727	0	11	412	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	304	470	388	284	470	379	352	969		155	864	
v/s Ratio Prot		0.13			0.10		0.08	c0.28		0.01	c0.17	
v/s Ratio Perm	c0.27		0.08	0.00		0.01						
v/c Ratio	0.80	0.39	0.24	0.01	0.30	0.04	0.58	0.75		0.07	0.48	
Uniform Delay, d1	29.6	24.7	23.3	21.6	23.9	21.7	40.2	27.0		39.1	24.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.87	0.77		1.00	1.00	
Incremental Delay, d2	19.4	2.4	1.4	0.1	1.6	0.2	3.7	3.0		0.9	1.9	
Delay (s)	49.0	27.1	24.8	21.6	25.5	21.9	38.8	23.7		39.9	26.7	
Level of Service	D	C	C	C	C	C	D	C		D	C	
Approach Delay (s)		33.9			24.6			27.0			27.0	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	116.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	172	606	10	17	466	50	20	13	27	41	11	117
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.90		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1237	1621	1531		1487	1375	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.67	1.00		0.73	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1237	1138	1531		1143	1375	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	177	625	10	18	480	52	21	13	28	42	11	121
RTOR Reduction (vph)	0	0	5	0	0	31	0	21	0	0	91	0
Lane Group Flow (vph)	177	625	5	18	480	21	21	20	0	42	41	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	15.7	47.6	47.6	2.7	34.6	34.6	22.0	22.0		22.0	22.0	
Effective Green, g (s)	15.7	47.6	47.6	2.7	34.6	34.6	22.0	22.0		22.0	22.0	
Actuated g/C Ratio	0.18	0.55	0.55	0.03	0.40	0.40	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	291	930	790	50	676	490	286	385		288	346	
v/s Ratio Prot	c0.11	c0.37		0.01	0.28			0.01			0.03	
v/s Ratio Perm			0.00			0.02	0.02			c0.04		
v/c Ratio	0.61	0.67	0.01	0.36	0.71	0.04	0.07	0.05		0.15	0.12	
Uniform Delay, d1	33.0	14.2	9.1	41.5	22.1	16.2	24.9	24.7		25.4	25.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.6	3.9	0.0	4.4	3.5	0.0	0.1	0.1		0.2	0.2	
Delay (s)	36.5	18.1	9.1	45.8	25.7	16.2	25.0	24.8		25.6	25.3	
Level of Service	D	B	A	D	C	B	C	C		C	C	
Approach Delay (s)		22.0			25.4			24.9			25.4	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	87.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	605	52	78	464	62	31	381	83	100	236	116
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.99	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1045	1540	2997			3034	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.45	1.00			0.59	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1045	722	2997			1816	1072
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	135	688	59	89	527	70	35	433	94	114	268	132
RTOR Reduction (vph)	0	0	26	0	0	29	0	19	0	0	0	98
Lane Group Flow (vph)	135	688	33	89	527	41	35	508	0	0	382	34
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	10.0	50.2	50.2	7.0	46.2	46.2	25.9	25.9			24.9	24.9
Effective Green, g (s)	10.0	50.2	50.2	7.0	46.2	46.2	25.9	25.9			24.9	24.9
Actuated g/C Ratio	0.10	0.52	0.52	0.07	0.48	0.48	0.27	0.27			0.26	0.26
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	126	634	719	112	584	502	194	807			470	277
v/s Ratio Prot	c0.11	c0.57		0.06	0.43			0.17				
v/s Ratio Perm			0.02			0.04	0.05				c0.21	0.03
v/c Ratio	1.07	1.09	0.05	0.79	0.90	0.08	0.18	0.63			0.93dl	0.12
Uniform Delay, d1	43.0	22.9	11.2	43.8	22.9	13.5	27.0	30.9			33.4	27.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	100.6	61.0	0.0	31.0	17.2	0.1	0.4	1.5			10.3	0.2
Delay (s)	143.7	84.0	11.3	74.9	40.1	13.6	27.4	32.4			43.7	27.4
Level of Service	F	F	B	E	D	B	C	C			D	C
Approach Delay (s)		88.3			41.9			32.1			39.5	
Approach LOS		F			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	54.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	96.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	546	68	42	343	226	64	198	40	191	122	32
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.91	1.00	1.00	0.96	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1331	937		1337	1126	869	1070	957	915	1070	1075	
Flt Permitted	0.26	1.00		0.08	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	364	937		119	1126	869	1070	957	915	1070	1075	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	34	628	78	48	394	260	74	228	46	220	140	37
RTOR Reduction (vph)	0	4	0	0	0	104	0	0	37	0	10	0
Lane Group Flow (vph)	34	702	0	48	394	156	74	228	9	220	167	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	50.1	50.1		52.0	52.0	66.0	14.0	21.1	21.1	14.0	21.1	
Effective Green, g (s)	50.1	50.1		52.0	52.0	66.0	14.0	21.1	21.1	14.0	21.1	
Actuated g/C Ratio	0.46	0.46		0.47	0.47	0.60	0.13	0.19	0.19	0.13	0.19	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	191	426		109	532	560	136	183	175	136	206	
v/s Ratio Prot	0.00	c0.75		0.02	c0.35	0.04	0.07	c0.24		c0.21	0.16	
v/s Ratio Perm	0.08			0.19		0.14			0.01			
v/c Ratio	0.18	1.65		0.44	0.74	0.28	0.54	1.25	0.05	1.62	0.81	
Uniform Delay, d1	19.0	29.9		47.7	23.5	10.6	45.0	44.4	36.3	48.0	42.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	302.1		2.8	5.5	0.3	4.4	147.9	0.1	309.1	21.1	
Delay (s)	19.5	332.1		50.5	29.0	10.8	49.4	192.4	36.4	357.1	63.6	
Level of Service	B	F		D	C	B	D	F	D	F	E	
Approach Delay (s)		317.7			23.8			141.4			226.3	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	178.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.52		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥		↰	↱			↰	↱		✥	
Volume (vph)	264	537	27	35	141	7	35	100	69	5	48	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.98	
Flpb, ped/bikes		0.99		0.99	1.00			1.00	1.00		1.00	
Frt		1.00		1.00	0.99			1.00	0.85		0.91	
Flt Protected		0.98		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1484		1699	1784			1770	1486		1362	
Flt Permitted		0.84		0.34	1.00			0.86	1.00		0.99	
Satd. Flow (perm)		1260		610	1784			1549	1486		1351	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	272	554	28	36	145	7	36	103	71	5	49	97
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	58	0	62	0
Lane Group Flow (vph)	0	853	0	36	151	0	0	139	13	0	89	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		62.2		62.2	62.2			19.6	19.6		19.6	
Effective Green, g (s)		62.2		62.2	62.2			19.6	19.6		19.6	
Actuated g/C Ratio		0.59		0.59	0.59			0.19	0.19		0.19	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		740		358	1047			286	275		250	
v/s Ratio Prot					0.08							
v/s Ratio Perm		c0.68		0.06				c0.09	0.01		0.07	
v/c Ratio		1.15		0.10	0.14			0.49	0.05		0.36	
Uniform Delay, d1		21.9		9.6	9.8			38.6	35.5		37.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		83.9		0.1	0.1			1.3	0.1		0.9	
Delay (s)		105.7		9.7	9.9			39.9	35.5		38.5	
Level of Service		F		A	A			D	D		D	
Approach Delay (s)		105.7			9.9			38.5			38.5	
Approach LOS		F			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	75.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	105.9	Sum of lost time (s)	14.0
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

18: Third St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	286	782	46	22	202	45	58	585	20	26	344	202
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1300	1300	1300	1300	1300	1300
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1495	3030		1523	2951		1170	2325		1170	2183	
Flt Permitted	0.58	1.00		0.13	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	907	3030		216	2951		1170	2325		1170	2183	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	308	841	49	24	217	48	62	629	22	28	370	217
RTOR Reduction (vph)	0	4	0	0	19	0	0	2	0	0	85	0
Lane Group Flow (vph)	308	886	0	24	246	0	62	649	0	28	502	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	269	899		64	876		197	927		174	827	
v/s Ratio Prot		0.29			0.08		0.05	c0.28		0.02	c0.23	
v/s Ratio Perm	c0.34			0.11								
v/c Ratio	1.14	0.99		0.38	0.28		0.31	0.70		0.16	0.61	
Uniform Delay, d1	35.1	34.9		27.8	27.0		36.5	25.1		37.1	25.0	
Progression Factor	1.00	1.00		1.00	1.00		0.83	0.74		1.40	0.68	
Incremental Delay, d2	99.8	26.7		16.0	0.8		2.7	2.9		1.8	3.0	
Delay (s)	134.9	61.6		43.8	27.8		33.0	21.3		53.8	20.0	
Level of Service	F	E		D	C		C	C		D	B	
Approach Delay (s)		80.5			29.1			22.3			21.5	
Approach LOS		F			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	47.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	1128	55	6	484	9	36	0	5	17	1	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.98		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3397		1711	3412			1698		1711	1541	
Flt Permitted	0.43	1.00		0.15	1.00			0.81		0.73	1.00	
Satd. Flow (perm)	781	3397		267	3412			1441		1312	1541	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	1226	60	7	526	10	39	0	5	18	1	24
RTOR Reduction (vph)	0	6	0	0	2	0	0	22	0	0	15	0
Lane Group Flow (vph)	22	1280	0	7	534	0	0	22	0	18	10	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45			0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	351	1528		120	1535			552		502	590	
v/s Ratio Prot		c0.38			0.16						0.01	
v/s Ratio Perm	0.03			0.03				c0.02		0.01		
v/c Ratio	0.06	0.84		0.06	0.35			0.04		0.04	0.02	
Uniform Delay, d1	9.3	14.6		9.3	10.8			11.6		11.6	11.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	5.6		0.9	0.6			0.1		0.1	0.1	
Delay (s)	9.7	20.2		10.2	11.4			11.7		11.7	11.5	
Level of Service	A	C		B	B			B		B	B	
Approach Delay (s)		20.0			11.4			11.7			11.6	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	102	0	0	567	36	253	547	1107	0	0	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.90				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3393			5086		1711	3078				2694
Flt Permitted		0.86			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2952			5086		1711	3078				2694
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	111	0	0	616	39	275	595	1203	0	0	80
RTOR Reduction (vph)	0	0	0	0	8	0	0	405	0	0	0	75
Lane Group Flow (vph)	0	133	0	0	647	0	275	1393	0	0	0	5
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		43.5			32.5		37.0	37.0				6.0
Effective Green, g (s)		43.5			32.5		37.0	37.0				6.0
Actuated g/C Ratio		0.48			0.36		0.41	0.41				0.07
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1456			1836		703	1265				179
v/s Ratio Prot		c0.01			c0.13		0.16	c0.45				0.00
v/s Ratio Perm		0.04										
v/c Ratio		0.09			0.35		0.39	1.16dr				0.03
Uniform Delay, d1		12.6			21.0		18.6	26.5				39.3
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.5		1.6	57.9				0.3
Delay (s)		12.7			21.6		20.2	84.4				39.6
Level of Service		B			C		C	F				D
Approach Delay (s)		12.7			21.6			75.9			39.6	
Approach LOS		B			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	59.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	122	498	465	428	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.91	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1534	1427	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1534	1427	3319	1801		
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	139	566	528	486	0	0
RTOR Reduction (vph)	62	62	0	0	0	0
Lane Group Flow (vph)	303	278	528	486	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	35.1	35.1	14.9	60.0		
Effective Green, g (s)	35.1	35.1	14.9	60.0		
Actuated g/C Ratio	0.59	0.59	0.25	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	897	834	824	1801		
v/s Ratio Prot	c0.20		c0.16	0.27		
v/s Ratio Perm		0.19				
v/c Ratio	0.34	0.33	0.64	0.27		
Uniform Delay, d1	6.4	6.4	20.2	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.2	0.2	1.7	0.1		
Delay (s)	6.7	6.7	21.9	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	6.7			11.4	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	220	154	144	3	120	9	127	392	9	8	314	102
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.99		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.97	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.99		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1173	1996		1139	1254		1215	2417		1215	2278	
Flt Permitted	0.44	1.00		0.55	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	545	1996		659	1254		1215	2417		1215	2278	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	247	173	162	3	135	10	143	440	10	9	353	115
RTOR Reduction (vph)	0	103	0	0	3	0	0	1	0	0	34	0
Lane Group Flow (vph)	247	232	0	3	142	0	143	449	0	9	434	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.4	36.4		16.5	16.5		17.5	44.4		2.9	29.8	
Effective Green, g (s)	36.4	36.4		16.5	16.5		17.5	44.4		2.9	29.8	
Actuated g/C Ratio	0.36	0.36		0.16	0.16		0.18	0.44		0.03	0.30	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	290	726		108	206		212	1073		35	678	
v/s Ratio Prot	c0.12	0.12			0.11		c0.12	0.19		0.01	c0.19	
v/s Ratio Perm	c0.19			0.00								
v/c Ratio	0.85	0.32		0.03	0.69		0.67	0.42		0.26	0.64	
Uniform Delay, d1	27.0	22.9		35.0	39.3		38.6	19.0		47.5	30.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.17	1.05	
Incremental Delay, d2	20.7	0.3		0.1	9.2		8.2	1.2		2.8	3.3	
Delay (s)	47.7	23.1		35.1	48.5		46.8	20.2		58.5	35.2	
Level of Service	D	C		D	D		D	C		E	D	
Approach Delay (s)		33.6			48.2			26.6			35.6	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	33.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	197	413	333	320
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	214	449	362	348
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			495			
pX, platoon unblocked						
vC, conflicting volume	1286	107			214	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1286	107			214	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			73	
cM capacity (veh/h)	114	926			1353	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	107	107	449	362	348
Volume Left	0	0	0	362	0
Volume Right	0	0	449	0	0
cSH	1700	1700	1700	1353	1700
Volume to Capacity	0.06	0.06	0.26	0.27	0.20
Queue Length 95th (ft)	0	0	0	27	0
Control Delay (s)	0.0	0.0	0.0	8.6	0.0
Lane LOS				A	
Approach Delay (s)	0.0			4.4	
Approach LOS					

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	125	115	0	163	172
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	136	125	0	177	187
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	125				193	125
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	125				193	125
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				77	79
cM capacity (veh/h)	1459				778	902

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	68	68	125	364
Volume Left	0	0	0	177
Volume Right	0	0	0	187
cSH	1700	1700	1700	837
Volume to Capacity	0.04	0.04	0.07	0.44
Queue Length 95th (ft)	0	0	0	56
Control Delay (s)	0.0	0.0	0.0	12.6
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.6
Approach LOS				B

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	92	196	115	106	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	100	213	125	115	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	240				432	125
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	240				432	125
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				100	100
cM capacity (veh/h)	1324				510	902

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	171	142	125	115	0
Volume Left	100	0	0	0	0
Volume Right	0	0	0	115	0
cSH	1324	1700	1700	1700	1700
Volume to Capacity	0.08	0.08	0.07	0.07	0.00
Queue Length 95th (ft)	6	0	0	0	0
Control Delay (s)	4.9	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.7		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	17	22	27	27	17	45	556	43	17	376	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.94			0.97		1.00	0.99		1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1507			1539		1540	3046		1540	3049	
Flt Permitted		0.92			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1396			1387		1540	3046		1540	3049	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	18	24	29	29	18	49	604	47	18	409	29
RTOR Reduction (vph)	0	22	0	0	11	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	32	0	0	65	0	49	649	0	18	436	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		9.8			9.8		7.3	91.3		3.7	87.7	
Effective Green, g (s)		9.8			9.8		7.3	91.3		3.7	87.7	
Actuated g/C Ratio		0.08			0.08		0.06	0.76		0.03	0.73	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		114			113		93	2317		47	2228	
v/s Ratio Prot							c0.03	c0.21		c0.01	0.14	
v/s Ratio Perm		0.02			c0.05							
v/c Ratio		0.28			0.58		0.53	0.28		0.38	0.20	
Uniform Delay, d1		51.8			53.1		54.7	4.4		57.0	5.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3			6.9		2.5	0.3		1.9	0.2	
Delay (s)		53.1			60.0		57.1	4.7		58.9	5.3	
Level of Service		D			E		E	A		E	A	
Approach Delay (s)		53.1			60.0			8.3			7.4	
Approach LOS		D			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	337	23	170	0	0	208
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	366	25	185	0	0	226

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	183	183	25	92	92	226
Volume Left (vph)	183	183	0	0	0	0
Volume Right (vph)	0	0	25	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.2	6.2	3.2	5.9	5.9	5.6
Degree Utilization, x	0.31	0.31	0.02	0.15	0.15	0.35
Capacity (veh/h)	558	560	1121	575	574	609
Control Delay (s)	10.8	10.8	5.1	8.8	8.8	11.7
Approach Delay (s)	10.4			8.8		11.7
Approach LOS	B			A		B

Intersection Summary			
Delay	10.4		
Level of Service	B		
Intersection Capacity Utilization	27.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	56	126	0	0	133	63	8	185	18	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	137	0	0	145	68	9	201	20	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	198	213	109	120
Volume Left (vph)	61	0	9	0
Volume Right (vph)	0	68	0	20
Hadj (s)	0.10	-0.16	0.07	-0.08
Departure Headway (s)	4.9	4.6	5.6	5.4
Degree Utilization, x	0.27	0.27	0.17	0.18
Capacity (veh/h)	701	742	611	626
Control Delay (s)	9.6	9.3	8.5	8.4
Approach Delay (s)	9.6	9.3	8.4	
Approach LOS	A	A	A	

Intersection Summary			
Delay	9.1		
Level of Service	A		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	31	76	7	49	2	68	592	11	0	362	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.92			1.00		1.00	0.99			0.97	
Flpb, ped/bikes		0.98			0.99		1.00	1.00			1.00	
Frt		0.93			1.00		1.00	1.00			0.99	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1164			1581		1540	2247			2169	
Flt Permitted		0.93			0.97		0.95	1.00			1.00	
Satd. Flow (perm)		1090			1536		1540	2247			2169	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	31	33	80	7	52	2	72	623	12	0	381	37
RTOR Reduction (vph)	0	43	0	0	1	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	101	0	0	60	0	72	635	0	0	415	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		16.1			16.1		9.7	93.6			78.8	
Effective Green, g (s)		16.1			16.1		9.7	93.6			78.8	
Actuated g/C Ratio		0.13			0.13		0.08	0.78			0.66	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		146			206		124	1752			1424	
v/s Ratio Prot							c0.05	c0.28			0.19	
v/s Ratio Perm		c0.09			0.04							
v/c Ratio		0.69			0.29		0.58	0.36			0.29	
Uniform Delay, d1		49.6			46.8		53.2	4.0			8.7	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		12.8			0.8		6.8	0.6			0.5	
Delay (s)		62.3			47.6		59.9	4.6			9.3	
Level of Service		E			D		E	A			A	
Approach Delay (s)		62.3			47.6			10.3			9.3	
Approach LOS		E			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	228	330	0	0	218	236	104	146	414	56	0	264
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.85	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1020	1540	1621	1196	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1020	1540	1621	1196	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	240	347	0	0	229	248	109	154	436	59	0	278
RTOR Reduction (vph)	0	0	0	0	0	187	0	0	257	0	0	248
Lane Group Flow (vph)	240	347	0	0	229	61	109	154	179	59	0	30
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	16.0	41.4			20.4	20.4	16.4	16.4	16.4	8.8		8.8
Effective Green, g (s)	16.0	41.4			20.4	20.4	16.4	16.4	16.4	8.8		8.8
Actuated g/C Ratio	0.19	0.50			0.25	0.25	0.20	0.20	0.20	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	298	1543			760	251	305	321	237	164		128
v/s Ratio Prot	c0.16	0.11			c0.07		0.07	0.10		c0.04		0.02
v/s Ratio Perm						0.06			c0.15			
v/c Ratio	0.81	0.22			0.30	0.24	0.36	0.48	0.75	0.36		0.23
Uniform Delay, d1	31.8	11.6			25.3	24.9	28.6	29.3	31.2	34.3		33.8
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	14.6	0.3			1.0	2.3	0.7	1.1	12.7	1.4		0.9
Delay (s)	46.4	11.9			26.3	27.2	29.3	30.5	43.9	35.6		34.7
Level of Service	D	B			C	C	C	C	D	D		C
Approach Delay (s)		26.0			26.8			38.7			34.9	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	31.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	82.6	Sum of lost time (s)	21.0
Intersection Capacity Utilization	87.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	103	21	47	3	35	5	59	52	0	1	45	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.96			0.99		1.00	1.00		1.00	0.92	
Flt Protected		0.97			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3185			1768		1711	1801		1711	1659	
Flt Permitted		0.81			0.99		0.78	1.00		0.78	1.00	
Satd. Flow (perm)		2653			1753		1412	1801		1412	1659	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	112	23	51	3	38	5	64	57	0	1	49	54
RTOR Reduction (vph)	0	19	0	0	2	0	0	0	0	0	47	0
Lane Group Flow (vph)	0	167	0	0	44	0	64	57	0	1	56	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		23.8			23.8		5.1	5.1		5.1	5.1	
Effective Green, g (s)		23.8			23.8		5.1	5.1		5.1	5.1	
Actuated g/C Ratio		0.63			0.63		0.13	0.13		0.13	0.13	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1666			1100		190	242		190	223	
v/s Ratio Prot								0.03			0.03	
v/s Ratio Perm		c0.06			0.03		c0.05			0.00		
v/c Ratio		0.10			0.04		0.34	0.24		0.01	0.25	
Uniform Delay, d1		2.8			2.7		14.9	14.7		14.2	14.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.1		1.1	0.5		0.0	0.6	
Delay (s)		2.9			2.8		15.9	15.2		14.2	15.3	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.9			2.8			15.6			15.3	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.14		
Actuated Cycle Length (s)	37.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	29.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT WITH M-TR-11C
BASKETBALL GAME
WITH SF GIANTS GAME AT AT&T PARK
WEEKDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	618	425	132	491	507	52	26	538	88	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.92		1.00	0.97			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.96		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	2745		2987	2944			5482	938			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	2745		2987	2944			5482	938			
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	702	483	150	558	576	59	30	611	100	0	0	0
RTOR Reduction (vph)	0	27	0	0	2	0	0	0	81	0	0	0
Lane Group Flow (vph)	702	606	0	558	633	0	0	641	19	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	27.3	38.7		31.5	42.9			20.9	20.9			
Effective Green, g (s)	27.3	38.7		31.5	42.9			20.9	20.9			
Actuated g/C Ratio	0.25	0.35		0.29	0.39			0.19	0.19			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	1111	965		855	1148			1041	178			
v/s Ratio Prot	0.16	c0.22		c0.19	0.21							
v/s Ratio Perm								0.12	0.02			
v/c Ratio	0.63	0.63		0.65	0.55			0.62	0.11			
Uniform Delay, d1	36.9	29.7		34.4	26.1			40.9	36.8			
Progression Factor	1.00	1.00		0.70	0.30			1.14	10.34			
Incremental Delay, d2	1.2	3.1		0.7	0.2			1.0	0.2			
Delay (s)	38.1	32.8		24.8	8.0			47.7	381.2			
Level of Service	D	C		C	A			D	F			
Approach Delay (s)		35.5			15.9			92.7			0.0	
Approach LOS		D			B			F			A	

Intersection Summary			
HCM 2000 Control Delay	41.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	985	22	33	457	43	10	140	76	114	863	357
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.94			1.00	0.65	1.00	0.98	0.51
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00	0.73	1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4373		1296	2417			1604	879	1119	2875	627
Flt Permitted	0.95	1.00		0.95	1.00			0.92	1.00	0.65	1.00	1.00
Satd. Flow (perm)	1540	4373		1296	2417			1474	879	770	2875	627
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	134	1048	23	35	486	46	11	149	81	121	918	380
RTOR Reduction (vph)	0	2	0	0	6	0	0	0	48	0	2	100
Lane Group Flow (vph)	134	1069	0	35	526	0	0	160	33	121	954	242
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	13.4	43.3		8.0	36.3			48.8	48.8	49.8	49.8	49.8
Effective Green, g (s)	13.4	43.3		8.0	36.3			48.8	48.8	49.8	49.8	49.8
Actuated g/C Ratio	0.11	0.36		0.07	0.30			0.41	0.41	0.41	0.41	0.41
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	171	1577		86	731			599	357	319	1193	260
v/s Ratio Prot	0.09	c0.24		0.03	c0.22						0.33	
v/s Ratio Perm								0.11	0.04	0.16		c0.39
v/c Ratio	0.78	0.68		0.41	0.72			0.27	0.09	0.38	0.80	0.93
Uniform Delay, d1	51.9	32.4		53.7	37.3			23.7	21.9	24.4	30.7	33.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.5	2.4		3.1	3.5			0.2	0.1	0.8	3.8	37.5
Delay (s)	72.4	34.8		56.8	40.8			23.9	22.1	25.1	34.6	70.9
Level of Service	E	C		E	D			C	C	C	C	E
Approach Delay (s)		39.0			41.8			23.3			42.5	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	39.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	140.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1111	131	2	822	87	22
Ideal Flow (vphpl)	1200	1200	1200	1200	1200	1200
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1908			1944	972	857
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	1908			1853	972	857
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1145	135	2	847	90	23
RTOR Reduction (vph)	8	0	0	0	0	15
Lane Group Flow (vph)	1272	0	0	849	90	8
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1077			1046	323	285
v/s Ratio Prot	c0.67				c0.09	
v/s Ratio Perm				0.46		0.01
v/c Ratio	1.18			0.81	0.28	0.03
Uniform Delay, d1	23.9			19.2	27.0	24.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	91.1			6.9	2.1	0.2
Delay (s)	115.1			26.1	29.1	24.9
Level of Service	F			C	C	C
Approach Delay (s)	115.1			26.1	28.3	
Approach LOS	F			C	C	

Intersection Summary			
HCM 2000 Control Delay	77.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	101.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

9/18/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	114	935	103	43	245	586	279	437	1235	218
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.99			1.00	0.95			1.00	0.85
Flt Protected		1.00			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5800			2858	2445			4105	1122
Flt Permitted		1.00			0.68	1.00			0.95	1.00
Satd. Flow (perm)		5800			1962	2445			4105	1122
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	119	974	107	45	255	610	291	455	1286	227
RTOR Reduction (vph)	0	24	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	1176	0	0	300	899	0	0	1764	204
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		20.0			22.0	22.0			15.5	15.5
Effective Green, g (s)		22.0			25.0	25.0			18.5	18.5
Actuated g/C Ratio		0.29			0.33	0.33			0.25	0.25
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1701			654	815			1012	276
v/s Ratio Prot						c0.37			c0.43	0.18
v/s Ratio Perm		0.20			0.15					
v/c Ratio		0.69			0.46	1.10			1.74	0.74
Uniform Delay, d1		23.5			19.7	25.0			28.2	26.0
Progression Factor		1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2		1.2			0.5	63.6			338.5	9.9
Delay (s)		24.7			20.2	88.6			366.8	35.9
Level of Service		C			C	F			F	D
Approach Delay (s)		24.7			20.2	88.6			332.5	
Approach LOS		C			C	F			F	

Intersection Summary			
HCM 2000 Control Delay	176.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	113.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

9/18/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	39	445	673	91	249	240	54	174	124	839
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)	2.0	4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor	1.00	0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes	1.00	1.00	0.99		0.86		0.98		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Frt	1.00	1.00	0.98		0.93		0.85		1.00	1.00
Flt Protected	0.95	0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)	810	1313	1889		2193		1161		1327	2557
Flt Permitted	0.95	0.95	1.00		1.00		1.00		0.23	0.95
Satd. Flow (perm)	810	1313	1889		2193		1161		326	2441
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	43	489	740	100	274	264	59	191	136	922
RTOR Reduction (vph)	0	0	17	0	1	0	42	0	0	0
Lane Group Flow (vph)	43	440	872	0	543	0	11	0	313	936
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)	18.5	18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)	21.0	18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio	0.27	0.24	0.27		0.23		0.21		0.42	0.42
Clearance Time (s)	4.5	4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)	220	315	515		498		241		300	1049
v/s Ratio Prot	0.05	0.34	c0.46		c0.25				c0.17	0.14
v/s Ratio Perm							0.01		0.27	0.23
v/c Ratio	0.20	1.40	1.69		1.14dr		0.05		1.04	0.89
Uniform Delay, d1	21.5	29.2	28.0		29.8		24.4		26.1	20.6
Progression Factor	1.00	1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2	2.0	196.8	319.9		67.3		0.4		63.7	11.5
Delay (s)	23.5	226.1	347.9		97.0		24.8		89.8	32.1
Level of Service	C	F	F		F		C		F	C
Approach Delay (s)			298.6		90.6					46.6
Approach LOS			F		F					D

Intersection Summary			
HCM 2000 Control Delay	162.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	77.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	137	142	1	2	1	71	493	162	204	282	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1700	1700	1700	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	0.97		1.00	0.99	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.97		1.00	0.96		1.00	0.96	
Flt Protected		0.99	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1604	1352		1535		1377	2568		1540	2942	
Flt Permitted		0.96	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1553	1352		1501		1377	2568		1540	2942	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	28	147	153	1	2	1	76	530	174	219	303	100
RTOR Reduction (vph)	0	0	107	0	1	0	0	26	0	0	28	0
Lane Group Flow (vph)	0	175	46	0	3	0	76	678	0	219	375	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.2	32.2		32.2		11.7	36.7		22.1	47.4	
Effective Green, g (s)		32.2	32.2		32.2		11.7	36.7		22.1	47.4	
Actuated g/C Ratio		0.30	0.30		0.30		0.11	0.34		0.21	0.44	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		467	407		452		150	881		318	1304	
v/s Ratio Prot							0.06	c0.26		c0.14	0.13	
v/s Ratio Perm		c0.11	0.03		0.00							
v/c Ratio		0.37	0.11		0.01		0.51	0.77		0.69	0.29	
Uniform Delay, d1		29.4	27.0		26.2		44.9	31.3		39.2	19.0	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5	0.1		0.0		2.7	4.2		6.1	0.1	
Delay (s)		29.9	27.1		26.2		47.6	35.5		45.3	19.1	
Level of Service		C	C		C		D	D		D	B	
Approach Delay (s)		28.6			26.2			36.7			28.3	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	32.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	106.9	Sum of lost time (s)	15.9
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	11	13	7	66	93	21	106	16	278	246	132
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.99	1.00	0.99		1.00	0.91	
Flpb, ped/bikes		0.99			1.00	1.00	0.86	1.00		1.00	1.00	
Frt		0.95			1.00	0.85	1.00	0.98		1.00	0.95	
Flt Protected		0.98			1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2383			1442	1222	1189	1412		1377	1248	
Flt Permitted		0.85			0.96	1.00	0.52	1.00		0.95	1.00	
Satd. Flow (perm)		2051			1390	1222	650	1412		1377	1248	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	13	12	14	8	73	102	23	116	18	305	270	145
RTOR Reduction (vph)	0	13	0	0	0	49	0	9	0	0	20	0
Lane Group Flow (vph)	0	26	0	0	81	53	23	125	0	305	395	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		5.0			5.0	25.0	8.1	8.1		20.0	33.1	
Effective Green, g (s)		5.0			5.0	25.0	8.1	8.1		20.0	33.1	
Actuated g/C Ratio		0.10			0.10	0.52	0.17	0.17		0.42	0.69	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		213			144	762	109	237		572	858	
v/s Ratio Prot						0.03		0.09		c0.22	c0.32	
v/s Ratio Perm		0.01			c0.06	0.01	0.04					
v/c Ratio		0.12			0.56	0.07	0.21	0.53		0.53	0.46	
Uniform Delay, d1		19.6			20.5	5.8	17.2	18.3		10.5	3.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			5.0	0.0	1.0	2.1		1.0	0.4	
Delay (s)		19.8			25.5	5.8	18.2	20.4		11.5	3.8	
Level of Service		B			C	A	B	C		B	A	
Approach Delay (s)		19.8			14.5			20.0			7.1	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	48.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	42	244	522	28	624	313
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1743	1535	846	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1743	1535	846	1134	1194
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	54	313	669	36	800	401
RTOR Reduction (vph)	0	279	0	8	0	0
Lane Group Flow (vph)	54	34	669	28	800	401
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	10.0	10.0	47.1	42.1	20.0	72.1
Effective Green, g (s)	10.0	10.0	47.1	42.1	20.0	72.1
Actuated g/C Ratio	0.11	0.11	0.51	0.46	0.22	0.78
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	123	189	785	432	246	934
v/s Ratio Prot	c0.05		c0.44	0.01	c0.71	0.34
v/s Ratio Perm		0.02		0.02		
v/c Ratio	0.44	0.18	0.85	0.06	3.25	0.43
Uniform Delay, d1	38.4	37.3	19.5	14.0	36.0	3.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.5	0.5	8.9	0.1	1023.9	0.3
Delay (s)	40.9	37.8	28.4	14.0	1059.9	3.6
Level of Service	D	D	C	B	F	A
Approach Delay (s)	38.2		27.6			707.2
Approach LOS	D		C			F

Intersection Summary			
HCM 2000 Control Delay	388.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.52		
Actuated Cycle Length (s)	92.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	96.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	37	33	233	297	112	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.97		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.94		1.00	1.00	0.96	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1593		1668	1531	2989	
Flt Permitted	0.97		0.64	1.00	1.00	
Satd. Flow (perm)	1593		1117	1531	2989	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	44	39	277	354	133	51
RTOR Reduction (vph)	35	0	0	0	17	0
Lane Group Flow (vph)	48	0	277	354	167	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	4.1		28.5	28.5	28.5	
Effective Green, g (s)	4.1		28.5	28.5	28.5	
Actuated g/C Ratio	0.10		0.67	0.67	0.67	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	153		747	1024	1999	
v/s Ratio Prot	c0.03			0.23	0.06	
v/s Ratio Perm			c0.25			
v/c Ratio	0.31		0.37	0.35	0.08	
Uniform Delay, d1	17.9		3.1	3.0	2.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.2		0.3	0.2	0.0	
Delay (s)	19.1		3.4	3.2	2.5	
Level of Service	B		A	A	A	
Approach Delay (s)	19.1			3.3	2.5	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	42.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	123	124	800	143	282	380
Ideal Flow (vphpl)	1200	1200	1200	1200	1200	1200
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.95	0.99		1.00	1.00
Flpb, ped/bikes	0.91	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	984	920	2089		1080	2161
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	984	920	2089		1080	2161
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	137	138	889	159	313	422
RTOR Reduction (vph)	0	105	12	0	0	0
Lane Group Flow (vph)	137	33	1036	0	313	422
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	61.1		14.9	81.1
Effective Green, g (s)	28.7	28.7	61.1		14.9	81.1
Actuated g/C Ratio	0.24	0.24	0.51		0.12	0.68
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	235	220	1063		134	1460
v/s Ratio Prot			c0.50		c0.29	0.20
v/s Ratio Perm	c0.14	0.04				
v/c Ratio	0.58	0.15	0.97		2.34	0.29
Uniform Delay, d1	40.4	36.0	28.7		52.5	7.8
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.7	0.3	22.1		623.8	0.1
Delay (s)	44.0	36.3	50.8		676.3	7.9
Level of Service	D	D	D		F	A
Approach Delay (s)	40.2		50.8			292.6
Approach LOS	D		D			F

Intersection Summary			
HCM 2000 Control Delay	135.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	112.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	7	12	520	115	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1540	1344		2882	2965	
Flt Permitted	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1540	1344		2733	2965	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	8	14	612	135	35
RTOR Reduction (vph)	0	8	0	0	24	0
Lane Group Flow (vph)	12	0	0	626	146	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5		
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	1.3	1.3		16.6	16.6	
Effective Green, g (s)	1.3	1.3		16.6	16.6	
Actuated g/C Ratio	0.02	0.02		0.31	0.31	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	37	32		849	921	
v/s Ratio Prot	c0.01				0.05	
v/s Ratio Perm		0.00		c0.23		
v/c Ratio	0.32	0.01		0.74	0.16	
Uniform Delay, d1	25.6	25.4		16.5	13.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.1	0.1		3.4	0.1	
Delay (s)	30.7	25.5		19.8	13.4	
Level of Service	C	C		B	B	
Approach Delay (s)	28.6			19.8	13.4	
Approach LOS	C			B	B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	53.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	37.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	136	9	94	22	18	5	108	228	8	5	70	55
Peak Hour Factor	0.92	0.77	0.77	0.77	0.77	0.92	0.77	0.92	0.77	0.92	0.92	0.92
Hourly flow rate (vph)	148	12	122	29	23	5	140	248	10	5	76	60

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	148	134	29	29	398	82	60
Volume Left (vph)	148	0	29	0	140	5	0
Volume Right (vph)	0	122	0	5	10	0	60
Hadj (s)	0.53	-0.60	0.53	-0.10	0.09	0.07	-0.67
Departure Headway (s)	6.7	5.5	7.1	6.4	5.7	6.1	5.4
Degree Utilization, x	0.27	0.21	0.06	0.05	0.64	0.14	0.09
Capacity (veh/h)	507	608	461	504	606	552	623
Control Delay (s)	11.0	8.8	9.3	8.6	18.2	8.9	7.7
Approach Delay (s)	9.9		8.9		18.2	8.4	
Approach LOS	A		A		C	A	

Intersection Summary			
Delay	13.4		
Level of Service	B		
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	232	165	267	4	137	40	192	671	63	11	308	183
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1258	1365	1126	1284	1365	1099	2515	2550		1296	2423	
Flt Permitted	0.67	1.00	1.00	0.63	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	884	1365	1126	848	1365	1099	2515	2550		1296	2423	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	237	168	272	4	140	41	196	685	64	11	314	187
RTOR Reduction (vph)	0	0	178	0	0	27	0	7	0	0	87	0
Lane Group Flow (vph)	237	168	94	4	140	14	196	742	0	11	414	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	304	470	388	292	470	379	352	963		155	867	
v/s Ratio Prot		0.12			0.10		0.08	c0.29		0.01	c0.17	
v/s Ratio Perm	c0.27		0.08	0.00		0.01						
v/c Ratio	0.78	0.36	0.24	0.01	0.30	0.04	0.56	0.77		0.07	0.48	
Uniform Delay, d1	29.3	24.5	23.4	21.6	23.9	21.7	40.1	27.3		39.1	24.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.87	0.78		1.00	1.00	
Incremental Delay, d2	17.8	2.1	1.5	0.1	1.6	0.2	3.4	3.2		0.9	1.9	
Delay (s)	47.1	26.6	24.9	21.6	25.5	21.9	38.1	24.4		39.9	26.7	
Level of Service	D	C	C	C	C	C	D	C		D	C	
Approach Delay (s)		33.1			24.6			27.3			27.0	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	116.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	116	595	10	17	449	47	20	13	27	41	11	117
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.94	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.90		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1243	1621	1531		1491	1377	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.67	1.00		0.73	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1243	1146	1531		1146	1377	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	120	613	10	18	463	48	21	13	28	42	11	121
RTOR Reduction (vph)	0	0	5	0	0	27	0	21	0	0	90	0
Lane Group Flow (vph)	120	613	5	18	463	21	21	20	0	42	42	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.7	45.7	45.7	2.7	37.7	37.7	21.4	21.4		21.4	21.4	
Effective Green, g (s)	10.7	45.7	45.7	2.7	37.7	37.7	21.4	21.4		21.4	21.4	
Actuated g/C Ratio	0.13	0.54	0.54	0.03	0.44	0.44	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	204	919	781	51	758	552	289	386		289	347	
v/s Ratio Prot	c0.07	c0.36		0.01	0.27			0.01			0.03	
v/s Ratio Perm			0.00			0.02	0.02			c0.04		
v/c Ratio	0.59	0.67	0.01	0.35	0.61	0.04	0.07	0.05		0.15	0.12	
Uniform Delay, d1	35.0	14.1	9.0	40.2	18.0	13.3	24.1	24.0		24.6	24.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.3	3.8	0.0	4.2	1.5	0.0	0.1	0.1		0.2	0.2	
Delay (s)	39.3	17.9	9.1	44.4	19.4	13.3	24.3	24.1		24.8	24.6	
Level of Service	D	B	A	D	B	B	C	C		C	C	
Approach Delay (s)		21.2			19.7			24.1			24.7	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	84.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	584	40	64	464	58	31	334	37	100	169	116
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.98	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1047	1540	3033			3023	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.51	1.00			0.61	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1047	828	3033			1880	1072
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	119	664	45	73	527	66	35	380	42	114	192	132
RTOR Reduction (vph)	0	0	20	0	0	27	0	9	0	0	0	104
Lane Group Flow (vph)	119	664	25	73	527	39	35	413	0	0	306	28
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	10.0	50.2	50.2	7.0	46.2	46.2	20.6	20.6			19.6	19.6
Effective Green, g (s)	10.0	50.2	50.2	7.0	46.2	46.2	20.6	20.6			19.6	19.6
Actuated g/C Ratio	0.11	0.55	0.55	0.08	0.51	0.51	0.23	0.23			0.22	0.22
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	133	671	761	118	618	532	187	688			405	231
v/s Ratio Prot	c0.10	c0.55		0.05	0.43			0.14				
v/s Ratio Perm			0.02			0.04	0.04				c0.16	0.03
v/c Ratio	0.89	0.99	0.03	0.62	0.85	0.07	0.19	0.60			0.92dl	0.12
Uniform Delay, d1	39.9	20.0	9.2	40.6	19.3	11.4	28.3	31.4			33.4	28.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	47.4	31.7	0.0	9.3	11.0	0.1	0.5	1.4			7.8	0.2
Delay (s)	87.3	51.8	9.3	49.9	30.3	11.4	28.8	32.8			41.2	28.9
Level of Service	F	D	A	D	C	B	C	C			D	C
Approach Delay (s)		54.6			30.6			32.5			37.5	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	40.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	90.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	506	68	42	343	226	64	198	40	183	122	32
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.91	1.00	1.00	0.96	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1331	935		1337	1126	869	1070	957	915	1070	1075	
Flt Permitted	0.26	1.00		0.08	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	364	935		119	1126	869	1070	957	915	1070	1075	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	34	582	78	48	394	260	74	228	46	210	140	37
RTOR Reduction (vph)	0	4	0	0	0	104	0	0	37	0	10	0
Lane Group Flow (vph)	34	656	0	48	394	156	74	228	9	210	167	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	50.1	50.1		52.0	52.0	66.0	14.0	21.1	21.1	14.0	21.1	
Effective Green, g (s)	50.1	50.1		52.0	52.0	66.0	14.0	21.1	21.1	14.0	21.1	
Actuated g/C Ratio	0.46	0.46		0.47	0.47	0.60	0.13	0.19	0.19	0.13	0.19	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	191	425		109	532	560	136	183	175	136	206	
v/s Ratio Prot	0.00	c0.70		0.02	c0.35	0.04	0.07	c0.24		c0.20	0.16	
v/s Ratio Perm	0.08			0.19		0.14			0.01			
v/c Ratio	0.18	1.54		0.44	0.74	0.28	0.54	1.25	0.05	1.54	0.81	
Uniform Delay, d1	19.0	29.9		45.3	23.5	10.6	45.0	44.4	36.3	48.0	42.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	255.7		2.8	5.5	0.3	4.4	147.9	0.1	277.9	21.1	
Delay (s)	19.5	285.7		48.2	29.0	10.8	49.4	192.4	36.4	325.9	63.6	
Level of Service	B	F		D	C	B	D	F	D	F	E	
Approach Delay (s)		272.6			23.6			141.4			206.0	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	157.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.45		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	241	509	27	35	141	7	35	100	69	5	72	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.98	
Flpb, ped/bikes		0.99		0.99	1.00			1.00	1.00		1.00	
Frt		1.00		1.00	0.99			1.00	0.85		0.93	
Flt Protected		0.98		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1484		1697	1784			1770	1486		1385	
Flt Permitted		0.84		0.35	1.00			0.83	1.00		0.99	
Satd. Flow (perm)		1266		630	1784			1481	1486		1376	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	248	525	28	36	145	7	36	103	71	5	74	97
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	58	0	42	0
Lane Group Flow (vph)	0	800	0	36	151	0	0	139	13	0	134	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		62.2		62.2	62.2			19.8	19.8		19.8	
Effective Green, g (s)		62.2		62.2	62.2			19.8	19.8		19.8	
Actuated g/C Ratio		0.59		0.59	0.59			0.19	0.19		0.19	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		742		369	1045			276	277		256	
v/s Ratio Prot					0.08							
v/s Ratio Perm		c0.63		0.06				0.09	0.01		c0.10	
v/c Ratio		1.08		0.10	0.14			0.50	0.05		0.52	
Uniform Delay, d1		21.9		9.6	9.9			38.7	35.4		38.9	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		56.2		0.1	0.1			1.4	0.1		1.9	
Delay (s)		78.2		9.7	10.0			40.2	35.5		40.8	
Level of Service		E		A	A			D	D		D	
Approach Delay (s)		78.2			9.9			38.6			40.8	
Approach LOS		E			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	58.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	106.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	91.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	286	731	46	22	202	45	54	597	20	26	351	202
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1300	1300	1300	1300	1300	1300
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.97		1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1495	3028		1522	2951		1170	2326		1170	2185	
Flt Permitted	0.58	1.00		0.14	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	907	3028		224	2951		1170	2326		1170	2185	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	308	786	49	24	217	48	58	642	22	28	377	217
RTOR Reduction (vph)	0	4	0	0	19	0	0	2	0	0	81	0
Lane Group Flow (vph)	308	831	0	24	246	0	58	662	0	28	513	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	269	899		66	876		197	928		174	828	
v/s Ratio Prot		0.27			0.08		0.05	c0.28		0.02	c0.23	
v/s Ratio Perm	c0.34			0.11								
v/c Ratio	1.14	0.92		0.36	0.28		0.29	0.71		0.16	0.62	
Uniform Delay, d1	35.1	34.1		27.7	27.0		36.3	25.2		37.1	25.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.40	0.67	
Incremental Delay, d2	99.8	16.5		14.8	0.8		3.8	4.6		1.8	3.1	
Delay (s)	134.9	50.5		42.5	27.8		40.1	29.9		53.7	19.9	
Level of Service	F	D		D	C		D	C		D	B	
Approach Delay (s)		73.3			29.0			30.7			21.4	
Approach LOS		E			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	46.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	1077	55	6	480	9	36	0	5	17	1	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.98		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3396		1711	3412			1698		1711	1541	
Flt Permitted	0.44	1.00		0.15	1.00			0.81		0.73	1.00	
Satd. Flow (perm)	785	3396		267	3412			1441		1312	1541	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	1171	60	7	522	10	39	0	5	18	1	24
RTOR Reduction (vph)	0	6	0	0	2	0	0	22	0	0	15	0
Lane Group Flow (vph)	22	1225	0	7	530	0	0	22	0	18	10	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0			23.0		23.0	23.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45			0.38		0.38	0.38	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Grp Cap (vph)	353	1528		120	1535			552		502	590	
v/s Ratio Prot		c0.36			0.16						0.01	
v/s Ratio Perm	0.03			0.03				c0.02		0.01		
v/c Ratio	0.06	0.80		0.06	0.35			0.04		0.04	0.02	
Uniform Delay, d1	9.3	14.2		9.3	10.7			11.6		11.6	11.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	4.5		0.9	0.6			0.1		0.1	0.1	
Delay (s)	9.7	18.7		10.2	11.4			11.7		11.7	11.5	
Level of Service	A	B		B	B			B		B	B	
Approach Delay (s)		18.6			11.3			11.7			11.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	102	0	0	567	32	253	398	1056	0	0	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.89				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3393			5090		1711	3049				2694
Flt Permitted		0.86			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2953			5090		1711	3049				2694
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	111	0	0	616	35	275	433	1148	0	0	80
RTOR Reduction (vph)	0	0	0	0	7	0	0	483	0	0	0	75
Lane Group Flow (vph)	0	133	0	0	644	0	275	1098	0	0	0	5
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		43.5			32.5		37.0	37.0				6.0
Effective Green, g (s)		43.5			32.5		37.0	37.0				6.0
Actuated g/C Ratio		0.48			0.36		0.41	0.41				0.07
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1456			1838		703	1253				179
v/s Ratio Prot		c0.01			c0.13		0.16	c0.36				0.00
v/s Ratio Perm		0.04										
v/c Ratio		0.09			0.35		0.39	1.03dr				0.03
Uniform Delay, d1		12.6			21.0		18.6	24.4				39.3
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.5		1.6	8.8				0.3
Delay (s)		12.7			21.6		20.2	33.2				39.6
Level of Service		B			C		C	C				D
Approach Delay (s)		12.7			21.6			31.2			39.6	
Approach LOS		B			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	28.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	70.0%	ICU Level of Service	C
Analysis Period (min)	15		
dr Defacto Right Lane. Recode with 1 though lane as a right lane.			
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	122	498	465	428	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.91	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1534	1427	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1534	1427	3319	1801		
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	139	566	528	486	0	0
RTOR Reduction (vph)	62	62	0	0	0	0
Lane Group Flow (vph)	303	278	528	486	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	35.1	35.1	14.9	60.0		
Effective Green, g (s)	35.1	35.1	14.9	60.0		
Actuated g/C Ratio	0.59	0.59	0.25	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	897	834	824	1801		
v/s Ratio Prot	c0.20		c0.16	0.27		
v/s Ratio Perm		0.19				
v/c Ratio	0.34	0.33	0.64	0.27		
Uniform Delay, d1	6.4	6.4	20.2	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.2	0.2	1.7	0.1		
Delay (s)	6.7	6.7	21.9	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	6.7			11.4	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	266	478	144	3	120	33	127	381	15	8	314	102
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.97		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.97	1.00		0.96	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.97		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1178	2141		1169	1201		1215	2406		1215	2278	
Flt Permitted	0.42	1.00		0.39	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	521	2141		475	1201		1215	2406		1215	2278	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	299	537	162	3	135	37	143	428	17	9	353	115
RTOR Reduction (vph)	0	27	0	0	11	0	0	2	0	0	34	0
Lane Group Flow (vph)	299	672	0	3	161	0	143	443	0	9	434	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	39.5	39.5		19.0	19.0		16.0	41.6		2.6	28.2	
Effective Green, g (s)	39.5	39.5		19.0	19.0		16.0	41.6		2.6	28.2	
Actuated g/C Ratio	0.40	0.40		0.19	0.19		0.16	0.42		0.03	0.28	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	305	845		90	228		194	1000		31	642	
v/s Ratio Prot	c0.15	0.31			0.13		c0.12	0.18		0.01	c0.19	
v/s Ratio Perm	c0.24			0.01								
v/c Ratio	0.98	0.79		0.03	0.71		0.74	0.44		0.29	0.68	
Uniform Delay, d1	27.6	26.7		33.0	37.9		40.0	20.9		47.8	31.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	46.0	5.2		0.2	9.6		13.6	1.4		5.1	5.6	
Delay (s)	73.5	31.9		33.2	47.5		53.6	22.3		52.9	37.5	
Level of Service	E	C		C	D		D	C		D	D	
Approach Delay (s)		44.4			47.3			29.9			37.7	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	39.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	95.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

23: Pennsylvania & I-280 SB On-Ramps

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	197	413	333	441
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	214	449	362	479
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			545			
pX, platoon unblocked						
vC, conflicting volume	1417	107			214	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1417	107			214	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			73	
cM capacity (veh/h)	94	926			1353	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	107	107	449	362	479
Volume Left	0	0	0	362	0
Volume Right	0	0	449	0	0
cSH	1700	1700	1700	1353	1700
Volume to Capacity	0.06	0.06	0.26	0.27	0.28
Queue Length 95th (ft)	0	0	0	27	0
Control Delay (s)	0.0	0.0	0.0	8.6	0.0
Lane LOS				A	
Approach Delay (s)	0.0			3.7	
Approach LOS					

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	126	115	0	236	172
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	137	125	0	257	187
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	125				193	125
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	125				193	125
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				67	79
cM capacity (veh/h)	1459				777	902

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	68	68	125	443
Volume Left	0	0	0	257
Volume Right	0	0	0	187
cSH	1700	1700	1700	825
Volume to Capacity	0.04	0.04	0.07	0.54
Queue Length 95th (ft)	0	0	0	82
Control Delay (s)	0.0	0.0	0.0	14.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	14.3
Approach LOS				B

Intersection Summary			
Average Delay	9.0		
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	92	271	115	106	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	100	295	125	115	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	240				472	125
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	240				472	125
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				100	100
cM capacity (veh/h)	1324				481	902

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	198	196	125	115	0
Volume Left	100	0	0	0	0
Volume Right	0	0	0	115	0
cSH	1324	1700	1700	1700	1700
Volume to Capacity	0.08	0.12	0.07	0.07	0.00
Queue Length 95th (ft)	6	0	0	0	0
Control Delay (s)	4.3	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.2		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	27	22	27	27	17	45	563	94	24	376	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.97		1.00	0.98		1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1526			1539		1540	3013		1540	3049	
Flt Permitted		0.93			0.85		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1431			1338		1540	3013		1540	3049	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	29	24	29	29	18	49	612	102	26	409	29
RTOR Reduction (vph)	0	21	0	0	11	0	0	5	0	0	2	0
Lane Group Flow (vph)	0	44	0	0	65	0	49	709	0	26	436	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		9.8			9.8		7.3	89.9		5.1	87.7	
Effective Green, g (s)		9.8			9.8		7.3	89.9		5.1	87.7	
Actuated g/C Ratio		0.08			0.08		0.06	0.75		0.04	0.73	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		116			109		93	2257		65	2228	
v/s Ratio Prot							c0.03	c0.24		c0.02	0.14	
v/s Ratio Perm		0.03			c0.05							
v/c Ratio		0.38			0.60		0.53	0.31		0.40	0.20	
Uniform Delay, d1		52.2			53.2		54.7	4.9		56.0	5.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.1			8.5		2.5	0.4		1.5	0.2	
Delay (s)		54.3			61.7		57.1	5.3		57.4	5.3	
Level of Service		D			E		E	A		E	A	
Approach Delay (s)		54.3			61.7			8.6			8.2	
Approach LOS		D			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	591	23	170	0	0	208
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	642	25	185	0	0	226

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	321	321	25	92	92	226
Volume Left (vph)	321	321	0	0	0	0
Volume Right (vph)	0	0	25	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.3	6.3	3.2	6.7	6.7	6.3
Degree Utilization, x	0.56	0.56	0.02	0.17	0.17	0.39
Capacity (veh/h)	557	560	1121	508	507	551
Control Delay (s)	15.9	15.9	5.1	9.9	9.9	13.3
Approach Delay (s)	15.5			9.9		13.3
Approach LOS	C			A		B

Intersection Summary			
Delay	14.1		
Level of Service	B		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	56	253	0	0	133	63	8	260	18	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	275	0	0	145	68	9	283	20	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	336	213	150	161
Volume Left (vph)	61	0	9	0
Volume Right (vph)	0	68	0	20
Hadj (s)	0.07	-0.16	0.06	-0.05
Departure Headway (s)	5.1	5.1	6.0	5.9
Degree Utilization, x	0.48	0.30	0.25	0.26
Capacity (veh/h)	673	670	570	580
Control Delay (s)	12.8	10.3	9.7	9.7
Approach Delay (s)	12.8	10.3	9.7	
Approach LOS	B	B	A	

Intersection Summary			
Delay	11.0		
Level of Service	B		
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	158	76	7	49	2	68	650	11	0	362	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.96			1.00		1.00	0.99			0.97	
Flpb, ped/bikes		0.99			0.99		1.00	1.00			1.00	
Frt		0.96			1.00		1.00	1.00			0.99	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1284			1585		1540	2249			2169	
Flt Permitted		0.96			0.96		0.95	1.00			1.00	
Satd. Flow (perm)		1243			1530		1540	2249			2169	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	31	166	80	7	52	2	72	684	12	0	381	37
RTOR Reduction (vph)	0	12	0	0	1	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	265	0	0	60	0	72	695	0	0	414	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		31.6			31.6		9.7	78.1			63.3	
Effective Green, g (s)		31.6			31.6		9.7	78.1			63.3	
Actuated g/C Ratio		0.26			0.26		0.08	0.65			0.53	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		327			402		124	1463			1144	
v/s Ratio Prot							0.05	c0.31			0.19	
v/s Ratio Perm		c0.21			0.04							
v/c Ratio		0.81			0.15		0.58	0.48			0.36	
Uniform Delay, d1		41.4			33.9		53.2	10.6			16.6	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		14.1			0.2		6.8	1.1			0.9	
Delay (s)		55.5			34.1		59.9	11.7			17.4	
Level of Service		E			C		E	B			B	
Approach Delay (s)		55.5			34.1			16.2			17.4	
Approach LOS		E			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	228	343	0	0	218	236	104	146	643	183	0	264
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.83	1.00	1.00	0.86	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1002	1540	1621	1183	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1002	1540	1621	1183	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	240	361	0	0	229	248	109	154	677	193	0	278
RTOR Reduction (vph)	0	0	0	0	0	196	0	0	152	0	0	241
Lane Group Flow (vph)	240	361	0	0	229	52	109	154	525	193	0	37
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	16.8	41.0			19.2	19.2	22.0	22.0	22.0	12.0		12.0
Effective Green, g (s)	16.8	41.0			19.2	19.2	22.0	22.0	22.0	12.0		12.0
Actuated g/C Ratio	0.18	0.45			0.21	0.21	0.24	0.24	0.24	0.13		0.13
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	284	1387			649	211	372	391	286	203		158
v/s Ratio Prot	c0.16	0.12			c0.07		0.07	0.10		c0.13		0.03
v/s Ratio Perm						0.05			c0.44			
v/c Ratio	0.85	0.26			0.35	0.25	0.29	0.39	1.83	0.95		0.23
Uniform Delay, d1	35.8	15.6			30.6	29.9	28.2	28.9	34.5	39.2		35.4
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	20.0	0.5			1.5	2.8	0.4	0.7	388.8	49.0		0.8
Delay (s)	55.8	16.0			32.1	32.7	28.6	29.6	423.3	88.2		36.1
Level of Service	E	B			C	C	C	C	F	F		D
Approach Delay (s)		31.9			32.4			313.0			57.5	
Approach LOS		C			C			F			E	

Intersection Summary			
HCM 2000 Control Delay	143.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	91.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	347	47	3	59	5	59	52	0	158	45	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	1.00		1.00	0.92	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3338			1780		1711	1801		1711	1659	
Flt Permitted		0.88			0.98		0.69	1.00		0.72	1.00	
Satd. Flow (perm)		2964			1752		1243	1801		1296	1659	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	116	377	51	3	64	5	64	57	0	172	49	54
RTOR Reduction (vph)	0	15	0	0	2	0	0	0	0	0	42	0
Lane Group Flow (vph)	0	529	0	0	70	0	64	57	0	172	61	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		21.1			21.1		9.0	9.0		9.0	9.0	
Effective Green, g (s)		21.1			21.1		9.0	9.0		9.0	9.0	
Actuated g/C Ratio		0.54			0.54		0.23	0.23		0.23	0.23	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1599			945		286	414		298	381	
v/s Ratio Prot								0.03			0.04	
v/s Ratio Perm		c0.18			0.04		0.05			c0.13		
v/c Ratio		0.33			0.07		0.22	0.14		0.58	0.16	
Uniform Delay, d1		5.0			4.3		12.2	12.0		13.4	12.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			0.2		0.4	0.2		2.7	0.2	
Delay (s)		5.6			4.5		12.6	12.1		16.1	12.2	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		5.6			4.5			12.4			14.6	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	39.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT
BASKETBALL GAME
NO SF GIANTS GAME AT AT&T PARK
WEEKDAY LATE EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	478	420	8	94	764	52	37	491	385	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.90			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3064		2987	3028			5522	1237			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3064		2987	3028			5522	1237			
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	576	506	10	113	920	63	45	592	464	0	0	0
RTOR Reduction (vph)	0	1	0	0	4	0	0	0	281	0	0	0
Lane Group Flow (vph)	576	515	0	113	979	0	0	637	183	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	54.8		9.5	46.1			26.8	26.8			
Effective Green, g (s)	18.2	54.8		9.5	46.1			26.8	26.8			
Actuated g/C Ratio	0.17	0.50		0.09	0.42			0.24	0.24			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1526		257	1269			1345	301			
v/s Ratio Prot	c0.13	0.17		0.04	c0.32							
v/s Ratio Perm								0.12	c0.15			
v/c Ratio	0.78	0.34		0.44	0.77			0.47	0.61			
Uniform Delay, d1	44.0	16.6		47.7	27.4			35.6	36.9			
Progression Factor	0.55	0.26		1.13	0.37			1.00	1.00			
Incremental Delay, d2	4.5	0.5		0.4	0.9			0.3	3.4			
Delay (s)	28.8	4.9		54.1	11.0			35.8	40.4			
Level of Service	C	A		D	B			D	D			
Approach Delay (s)		17.5			15.5			37.7			0.0	
Approach LOS		B			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	837	21	40	725	36	12	30	30	39	181	171
Ideal Flow (vphpl)	1400	1400	1400	1400	1400	1400	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.97			1.00	0.63	1.00	0.86	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.91	1.00	0.67	1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.96	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1134	3218		1134	2186			1448	853	1027	2448	580
Flt Permitted	0.95	1.00		0.95	1.00			0.83	1.00	0.72	1.00	1.00
Satd. Flow (perm)	1134	3218		1134	2186			1224	853	783	2448	580
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	93	996	25	48	863	43	14	36	36	46	215	204
RTOR Reduction (vph)	0	2	0	0	2	0	0	0	31	0	38	108
Lane Group Flow (vph)	93	1019	0	48	904	0	0	50	5	46	252	21
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.5	61.7		11.9	57.5			16.5	16.5	17.5	17.5	17.5
Effective Green, g (s)	14.5	61.7		11.9	57.5			16.5	16.5	17.5	17.5	17.5
Actuated g/C Ratio	0.13	0.56		0.11	0.52			0.15	0.15	0.16	0.16	0.16
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	149	1805		122	1142			183	127	124	389	92
v/s Ratio Prot	0.08	c0.32		0.04	c0.41						c0.10	
v/s Ratio Perm								0.04	0.01	0.06		0.04
v/c Ratio	0.62	0.56		0.39	0.79			0.27	0.04	0.37	0.65	0.22
Uniform Delay, d1	45.2	15.5		45.7	21.4			41.4	40.0	41.3	43.4	40.3
Progression Factor	0.86	1.09		0.67	0.44			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.1	0.8		1.3	2.5			0.8	0.1	1.9	3.7	1.2
Delay (s)	44.0	17.7		31.9	11.8			42.2	40.1	43.2	47.1	41.6
Level of Service	D	B		C	B			D	D	D	D	D
Approach Delay (s)		19.9			12.8			41.4			45.2	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	925	62	0	908	28	11
Ideal Flow (vphpl)	1100	1100	1000	1000	1000	1000
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1764			1621	810	714
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	1764			1621	810	714
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	1101	74	0	1081	33	13
RTOR Reduction (vph)	2	0	0	0	0	12
Lane Group Flow (vph)	1173	0	0	1081	33	1
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	91.2			91.2	7.5	7.5
Effective Green, g (s)	91.2			91.2	7.5	7.5
Actuated g/C Ratio	0.83			0.83	0.07	0.07
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1462			1343	55	48
v/s Ratio Prot	0.67			c0.67	c0.04	
v/s Ratio Perm						0.00
v/c Ratio	0.80			0.80	0.60	0.02
Uniform Delay, d1	4.8			4.8	49.8	47.8
Progression Factor	1.00			1.53	1.00	1.00
Incremental Delay, d2	4.7			2.5	16.4	0.2
Delay (s)	9.6			9.9	66.2	48.0
Level of Service	A			A	E	D
Approach Delay (s)	9.6			9.9	61.0	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	143	771	99	35	123	323	194	89	208	92
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	1.00
Flpb, ped/bikes		0.99			0.99	1.00			1.00	1.00
Frt		0.99			1.00	0.94			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5762			2834	2410			4076	1122
Flt Permitted		0.99			0.77	1.00			0.95	1.00
Satd. Flow (perm)		5762			2212	2410			4076	1122
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	168	907	116	41	145	380	228	105	245	108
RTOR Reduction (vph)	0	24	0	0	0	24	0	0	0	0
Lane Group Flow (vph)	0	1167	0	0	186	584	0	0	361	97
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		24.1			21.3	21.3			12.1	12.1
Effective Green, g (s)		26.1			24.3	24.3			15.1	15.1
Actuated g/C Ratio		0.35			0.32	0.32			0.20	0.20
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		2005			716	780			820	225
v/s Ratio Prot						c0.24			c0.09	0.09
v/s Ratio Perm		0.20			0.08					
v/c Ratio		0.58			0.26	0.75			0.44	0.43
Uniform Delay, d1		20.0			18.7	22.6			26.2	26.2
Progression Factor		1.00			0.49	1.00			1.00	1.00
Incremental Delay, d2		0.4			0.1	4.0			0.4	1.3
Delay (s)		20.4			9.4	26.6			26.6	27.5
Level of Service		C			A	C			C	C
Approach Delay (s)		20.4			9.4	26.6			26.8	
Approach LOS		C			A	C			C	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations		↰↰	↰↑↑↱		↑↱		↱		↰	↰↑
Volume (vph)	27	776	210	22	131	112	14	170	20	365
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	1.00		0.87		1.00		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.93		0.85		1.00	1.00
Flt Protected		0.95	0.97		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1214	1877		2248		1188		1327	2553
Flt Permitted		0.95	0.97		1.00		1.00		0.52	0.95
Satd. Flow (perm)		1214	1877		2248		1188		720	2431
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	28	817	221	23	138	118	15	179	21	384
RTOR Reduction (vph)	0	0	6	0	1	0	10	0	0	0
Lane Group Flow (vph)	0	567	516	0	257	0	3	0	181	403
Confl. Peds. (#/hr)	25			60		200				
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		299	525		524		253		413	1073
v/s Ratio Prot		c0.47	0.27		c0.11				c0.07	0.06
v/s Ratio Perm							0.00		0.12	0.10
v/c Ratio		1.90	1.60dl		0.49		0.01		0.44	0.38
Uniform Delay, d1		28.2	26.8		24.9		23.3		17.3	14.4
Progression Factor		1.00	1.00		1.00		1.00		1.04	1.03
Incremental Delay, d2		415.7	35.4		3.3		0.1		2.6	0.8
Delay (s)		444.0	62.2		28.2		23.3		20.6	15.7
Level of Service		F	E		C		C		C	B
Approach Delay (s)			261.0		27.9					17.2
Approach LOS			F		C					B

Intersection Summary			
HCM 2000 Control Delay	155.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰↑↱		↰	↑↑		↰	↑↑	
Volume (vph)	125	10	37	66	711	253	5	362	4	1	61	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1547	1356		2938		1272	2536		1540	3036	
Flt Permitted		0.16	1.00		0.92		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		263	1356		2713		1272	2536		1540	3036	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	152	12	45	80	867	309	6	441	5	1	74	6
RTOR Reduction (vph)	0	0	23	0	26	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	164	22	0	1230	0	6	445	0	1	76	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.6	32.6		32.6		1.0	16.4		0.8	16.5	
Effective Green, g (s)		32.6	32.6		32.6		1.0	16.4		0.8	16.5	
Actuated g/C Ratio		0.50	0.50		0.50		0.02	0.25		0.01	0.25	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		130	672		1346		19	633		18	762	
v/s Ratio Prot							0.00	c0.18		0.00	c0.02	
v/s Ratio Perm		c0.62	0.02		0.45							
v/c Ratio		1.26	0.03		0.91		0.32	0.70		0.06	0.10	
Uniform Delay, d1		16.6	8.5		15.3		32.0	22.4		32.1	18.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		165.3	0.0		9.7		3.5	3.5		0.5	0.1	
Delay (s)		181.8	8.5		24.9		35.5	26.0		32.5	18.9	
Level of Service		F	A		C		D	C		C	B	
Approach Delay (s)		144.5			24.9			26.1			19.1	
Approach LOS		F			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	37.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	65.7	Sum of lost time (s)	15.9
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	62	3	1	711	9	2	20	61	48	47	8
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.96	1.00	0.95		1.00	0.95	
Flpb, ped/bikes		1.00			1.00	1.00	0.73	1.00		1.00	1.00	
Frt		0.99			1.00	0.85	1.00	0.89		1.00	0.98	
Flt Protected		1.00			1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2573			1450	1186	1007	1227		1377	1353	
Flt Permitted		0.86			1.00	1.00	0.71	1.00		0.95	1.00	
Satd. Flow (perm)		2222			1450	1186	755	1227		1377	1353	
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Adj. Flow (vph)	6	78	4	1	900	11	3	25	77	61	59	10
RTOR Reduction (vph)	0	2	0	0	0	4	0	69	0	0	7	0
Lane Group Flow (vph)	0	86	0	0	901	7	3	33	0	61	62	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		29.4			29.4	37.0	6.4	6.4		7.6	19.0	
Effective Green, g (s)		29.4			29.4	37.0	6.4	6.4		7.6	19.0	
Actuated g/C Ratio		0.50			0.50	0.63	0.11	0.11		0.13	0.33	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		1118			729	852	82	134		179	440	
v/s Ratio Prot						0.00		c0.03		c0.04	0.05	
v/s Ratio Perm		0.04			0.62	0.00	0.00					
v/c Ratio		0.08			1.24	0.01	0.04	0.25		0.34	0.14	
Uniform Delay, d1		7.5			14.5	3.9	23.2	23.8		23.1	13.9	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			117.8	0.0	0.2	1.0		0.4	0.1	
Delay (s)		7.5			132.3	3.9	23.4	24.8		23.5	14.1	
Level of Service		A			F	A	C	C		C	B	
Approach Delay (s)		7.5			130.8			24.7			18.5	
Approach LOS		A			F			C			B	

Intersection Summary			
HCM 2000 Control Delay	101.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	58.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	6	911	356	11	65	68
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1747	1535	846	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1747	1535	846	1134	1194
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	7	1085	424	13	77	81
RTOR Reduction (vph)	0	556	0	6	0	0
Lane Group Flow (vph)	7	529	424	7	77	81
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	34.8	34.8	40.2	35.2	10.5	55.7
Effective Green, g (s)	34.8	34.8	40.2	35.2	10.5	55.7
Actuated g/C Ratio	0.35	0.35	0.40	0.35	0.10	0.55
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	392	604	614	338	118	661
v/s Ratio Prot	0.01		c0.28	0.00	c0.07	0.07
v/s Ratio Perm		c0.30		0.00		
v/c Ratio	0.02	0.88	0.69	0.02	0.65	0.12
Uniform Delay, d1	21.6	30.8	25.0	21.4	43.2	10.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	13.4	3.3	0.0	12.2	0.1
Delay (s)	21.6	44.2	28.3	21.4	55.5	10.8
Level of Service	C	D	C	C	E	B
Approach Delay (s)	44.0		28.1			32.6
Approach LOS	D		C			C

Intersection Summary			
HCM 2000 Control Delay	38.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	100.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	308	281	2	46	68	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.97		1.00	1.00	0.96	
Flpb, ped/bikes	1.00		0.97	1.00	1.00	
Frt	0.94		1.00	1.00	0.93	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1599		1657	1531	2818	
Flt Permitted	0.97		0.63	1.00	1.00	
Satd. Flow (perm)	1599		1104	1531	2818	
Peak-hour factor, PHF	0.67	0.67	0.67	0.67	0.67	0.67
Adj. Flow (vph)	460	419	3	69	101	88
RTOR Reduction (vph)	31	0	0	0	74	0
Lane Group Flow (vph)	848	0	3	69	115	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	35.9		8.6	8.6	8.6	
Effective Green, g (s)	35.9		8.6	8.6	8.6	
Actuated g/C Ratio	0.66		0.16	0.16	0.16	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1053		174	241	444	
v/s Ratio Prot	c0.53			c0.05	0.04	
v/s Ratio Perm			0.00			
v/c Ratio	0.81		0.02	0.29	0.26	
Uniform Delay, d1	6.8		19.4	20.2	20.2	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	4.6		0.0	0.7	0.3	
Delay (s)	11.3		19.4	20.9	20.5	
Level of Service	B		B	C	C	
Approach Delay (s)	11.3			20.8	20.5	
Approach LOS	B			C	C	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	54.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	0	0	0	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.9
Lane Util. Factor						0.95
Frpb, ped/bikes						1.00
Flpb, ped/bikes						1.00
Frt						1.00
Flt Protected						1.00
Satd. Flow (prot)						3421
Flt Permitted						1.00
Satd. Flow (perm)						3421
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	0	359
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	359
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm			Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)						49.9
Effective Green, g (s)						49.9
Actuated g/C Ratio						1.00
Clearance Time (s)						4.9
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)						3421
v/s Ratio Prot						c0.10
v/s Ratio Perm						
v/c Ratio						0.10
Uniform Delay, d1						0.0
Progression Factor						1.00
Incremental Delay, d2						0.1
Delay (s)						0.1
Level of Service						A
Approach Delay (s)	0.0		0.0			0.1
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	0.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	49.9	Sum of lost time (s)	15.3
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	15	0	48	350	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0	
Lane Util. Factor		1.00		0.95	0.95	
Frpb, ped/bikes		0.97		1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	
Frt		0.85		1.00	1.00	
Flt Protected		1.00		1.00	1.00	
Satd. Flow (prot)		1342		2887	2887	
Flt Permitted		1.00		1.00	1.00	
Satd. Flow (perm)		1342		2887	2887	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	18	0	56	412	0
RTOR Reduction (vph)	0	18	0	0	0	0
Lane Group Flow (vph)	0	0	0	56	412	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)		0.6		11.8	11.8	
Effective Green, g (s)		0.6		11.8	11.8	
Actuated g/C Ratio		0.01		0.25	0.25	
Clearance Time (s)		5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0	
Lane Grp Cap (vph)		16		712	712	
v/s Ratio Prot				0.02	c0.14	
v/s Ratio Perm		c0.00				
v/c Ratio		0.01		0.08	0.58	
Uniform Delay, d1		23.3		13.8	15.8	
Progression Factor		1.00		1.00	1.00	
Incremental Delay, d2		0.4		0.0	1.1	
Delay (s)		23.7		13.9	17.0	
Level of Service		C		B	B	
Approach Delay (s)	23.7			13.9	17.0	
Approach LOS	C			B	B	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	25.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	29	74	0	0	278	132
Peak Hour Factor	0.92	0.83	0.83	0.83	0.83	0.92	0.83	0.92	0.83	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0	35	80	0	0	302	143

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	0	0	0	0	115	302	143
Volume Left (vph)	0	0	0	0	35	0	0
Volume Right (vph)	0	0	0	0	0	0	143
Hadj (s)	0.00	0.00	0.00	0.00	0.09	0.03	-0.67
Departure Headway (s)	5.7	5.7	5.7	5.7	5.0	4.6	3.9
Degree Utilization, x	0.00	0.00	0.00	0.00	0.16	0.39	0.16
Capacity (veh/h)	587	587	587	587	710	768	905
Control Delay (s)	7.5	7.5	7.5	7.5	8.9	9.3	6.4
Approach Delay (s)	0.0		0.0		8.9	8.4	
Approach LOS	A		A		A	A	

Intersection Summary			
Delay	8.5		
Level of Service	A		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	100	0	161	0	121	0	0	0	192	120
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)			5.5		5.5		5.0				5.2	
Lane Util. Factor			1.00		1.00		0.97				0.95	
Frpb, ped/bikes			0.97		1.00		1.00				0.99	
Flpb, ped/bikes			1.00		1.00		1.00				1.00	
Frt			0.85		1.00		1.00				0.94	
Flt Protected			1.00		1.00		0.95				1.00	
Satd. Flow (prot)			1130		1365		2515				2417	
Flt Permitted			1.00		1.00		0.95				1.00	
Satd. Flow (perm)			1130		1365		2515				2417	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	118	0	189	0	142	0	0	0	226	141
RTOR Reduction (vph)	0	0	86	0	0	0	0	0	0	0	104	0
Lane Group Flow (vph)	0	0	32	0	189	0	142	0	0	0	263	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm		Perm	Perm	NA	Perm	Prot			Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)			12.7		12.7		6.7				12.4	
Effective Green, g (s)			12.7		12.7		6.7				12.4	
Actuated g/C Ratio			0.27		0.27		0.14				0.26	
Clearance Time (s)			5.5		5.5		5.0				5.2	
Vehicle Extension (s)			3.0		3.0		3.0				3.0	
Lane Grp Cap (vph)			302		364		354				630	
v/s Ratio Prot					c0.14		c0.06				c0.11	
v/s Ratio Perm			0.03									
v/c Ratio			0.10		0.52		0.40				0.42	
Uniform Delay, d1			13.1		14.8		18.6				14.6	
Progression Factor			1.00		1.00		1.00				1.00	
Incremental Delay, d2			0.2		1.3		0.7				0.4	
Delay (s)			13.3		16.1		19.3				15.0	
Level of Service			B		B		B				B	
Approach Delay (s)		13.3			16.1			19.3			15.0	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	47.5	Sum of lost time (s)	15.7
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	98	88	3	4	387	10	5	6	1	11	2	47
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1252	1621	1674		1491	1360	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.72	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1252	1230	1674		1181	1360	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	110	99	3	4	435	11	6	7	1	12	2	53
RTOR Reduction (vph)	0	0	1	0	0	6	0	1	0	0	43	0
Lane Group Flow (vph)	110	99	2	4	435	5	6	7	0	12	12	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	11.7	48.1	48.1	2.5	38.9	38.9	15.0	15.0		15.0	15.0	
Effective Green, g (s)	11.7	48.1	48.1	2.5	38.9	38.9	15.0	15.0		15.0	15.0	
Actuated g/C Ratio	0.15	0.60	0.60	0.03	0.48	0.48	0.19	0.19		0.19	0.19	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	235	1018	865	50	823	604	228	311		219	253	
v/s Ratio Prot	c0.07	0.06		0.00	c0.26			0.00			0.01	
v/s Ratio Perm			0.00			0.00	0.00			c0.01		
v/c Ratio	0.47	0.10	0.00	0.08	0.53	0.01	0.03	0.02		0.05	0.05	
Uniform Delay, d1	31.6	7.0	6.6	37.9	14.5	10.8	26.8	26.8		27.0	26.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	0.2	0.0	0.7	0.6	0.0	0.0	0.0		0.1	0.1	
Delay (s)	33.1	7.1	6.6	38.6	15.1	10.8	26.9	26.8		27.1	27.0	
Level of Service	C	A	A	D	B	B	C	C		C	C	
Approach Delay (s)		20.6			15.2			26.9			27.0	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	80.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	141	6	11	414	13	19	97	14	32	455	101
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1047	1540	3021			3069	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.30	1.00			0.93	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1047	485	3021			2848	1072
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	28	172	7	13	505	16	23	118	17	39	555	123
RTOR Reduction (vph)	0	0	3	0	0	8	0	11	0	0	0	86
Lane Group Flow (vph)	28	172	4	13	505	8	23	124	0	0	594	37
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	2.1	49.2	49.2	0.8	46.9	46.9	28.2	28.2			27.2	27.2
Effective Green, g (s)	2.1	49.2	49.2	0.8	46.9	46.9	28.2	28.2			27.2	27.2
Actuated g/C Ratio	0.02	0.54	0.54	0.01	0.51	0.51	0.31	0.31			0.30	0.30
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	27	655	743	13	624	538	149	934			849	319
v/s Ratio Prot	c0.02	0.14		0.01	c0.42			0.04				
v/s Ratio Perm			0.00			0.01	0.05				c0.21	0.03
v/c Ratio	1.04	0.26	0.01	1.00	0.81	0.02	0.15	0.13			0.70	0.11
Uniform Delay, d1	44.6	11.3	9.7	45.2	18.4	10.8	22.9	22.7			28.4	23.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	184.9	0.2	0.0	249.6	7.6	0.0	0.5	0.1			2.5	0.2
Delay (s)	229.5	11.5	9.7	294.8	26.1	10.9	23.3	22.8			30.9	23.4
Level of Service	F	B	A	F	C	B	C	C			C	C
Approach Delay (s)		40.9			32.2			22.8			29.6	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	91.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	121	56	14	296	224	15	99	12	37	23	6
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.93	1.00	1.00	0.96	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1332	901		1331	1126	886	1070	957	916	1070	1080	
Flt Permitted	0.24	1.00		0.60	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	331	901		834	1126	886	1070	957	916	1070	1080	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	24	146	67	17	357	270	18	119	14	45	28	7
RTOR Reduction (vph)	0	17	0	0	0	124	0	0	11	0	5	0
Lane Group Flow (vph)	24	196	0	17	357	146	18	119	3	45	30	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	30.9	30.9		31.3	31.3	42.8	3.0	15.5	15.5	11.5	24.0	
Effective Green, g (s)	30.9	30.9		31.3	31.3	42.8	3.0	15.5	15.5	11.5	24.0	
Actuated g/C Ratio	0.39	0.39		0.39	0.39	0.54	0.04	0.20	0.20	0.14	0.30	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	142	350		338	443	533	40	186	178	154	326	
v/s Ratio Prot	0.00	c0.22		0.00	c0.32	c0.04	0.02	c0.12		0.04	0.03	
v/s Ratio Perm	0.06			0.02		0.12			0.00			
v/c Ratio	0.17	0.56		0.05	0.81	0.27	0.45	0.64	0.02	0.29	0.09	
Uniform Delay, d1	16.7	18.9		14.9	21.4	9.9	37.4	29.4	25.8	30.3	19.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	1.9		0.1	10.3	0.3	7.9	7.0	0.0	1.1	0.1	
Delay (s)	17.3	20.9		14.9	31.6	10.2	45.2	36.4	25.8	31.4	20.0	
Level of Service	B	C		B	C	B	D	D	C	C	C	
Approach Delay (s)		20.5			22.2			36.5			26.4	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	79.4	Sum of lost time (s)	20.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	25	19	341	47	1	5	17	9	0	11	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	0.98		0.97	
Flpb, ped/bikes		0.99		0.98	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	1.00			1.00	0.85		0.87	
Flt Protected		0.97		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1422		1677	1795			1779	1494		1294	
Flt Permitted		0.80		0.69	1.00			0.75	1.00		1.00	
Satd. Flow (perm)		1168		1210	1795			1350	1494		1294	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	99	32	24	437	60	1	6	22	12	0	14	364
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	9	0	287	0
Lane Group Flow (vph)	0	149	0	437	60	0	0	28	3	0	91	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm		NA	
Protected Phases		2			6							
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		32.6		32.6	32.6			15.4	15.4		15.4	
Effective Green, g (s)		32.6		32.6	32.6			15.4	15.4		15.4	
Actuated g/C Ratio		0.45		0.45	0.45			0.21	0.21		0.21	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		525		544	808			287	317		275	
v/s Ratio Prot					0.03						c0.07	
v/s Ratio Perm		0.13		c0.36				0.02	0.00			
v/c Ratio		0.28		0.80	0.07			0.10	0.01		0.33	
Uniform Delay, d1		12.5		17.1	11.3			22.9	22.5		24.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3		8.4	0.0			0.1	0.0		0.7	
Delay (s)		12.8		25.5	11.4			23.1	22.5		24.9	
Level of Service		B		C	B			C	C		C	
Approach Delay (s)		12.8			23.8			22.9			24.9	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	72.4	Sum of lost time (s)	14.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	80	25	23	299	14	82	72	6	34	133	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.98	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.99		1.00	0.99		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1680	3272		1679	3391		1260	2485		1260	2301	
Flt Permitted	0.49	1.00		0.67	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	866	3272		1188	3391		1260	2485		1260	2301	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	42	96	30	28	360	17	99	87	7	41	160	148
RTOR Reduction (vph)	0	20	0	0	4	0	0	4	0	0	96	0
Lane Group Flow (vph)	42	106	0	28	373	0	99	90	0	41	212	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		12.9	35.9		8.9	31.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		12.9	35.9		8.9	31.9	
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.14	0.40		0.10	0.35	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	285	1079		392	1119		180	991		124	815	
v/s Ratio Prot		0.03			c0.11		c0.08	0.04		0.03	c0.09	
v/s Ratio Perm	0.05			0.02								
v/c Ratio	0.15	0.10		0.07	0.33		0.55	0.09		0.33	0.26	
Uniform Delay, d1	21.2	20.9		20.7	22.7		35.9	16.9		37.8	20.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.0		0.1	0.2		3.6	0.2		1.6	0.2	
Delay (s)	21.5	20.9		20.8	22.9		39.5	17.1		39.3	20.8	
Level of Service	C	C		C	C		D	B		D	C	
Approach Delay (s)		21.1			22.7			28.5			23.0	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	143	11	3	589	3	13	0	4	6	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.97		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3384		1711	3419			1681		1711	1531	
Flt Permitted	0.41	1.00		0.65	1.00			0.80		0.75	1.00	
Satd. Flow (perm)	734	3384		1164	3419			1403		1343	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	155	12	3	640	3	14	0	4	7	0	11
RTOR Reduction (vph)	0	7	0	0	1	0	0	13	0	0	8	0
Lane Group Flow (vph)	7	160	0	3	642	0	0	5	0	7	3	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.7	12.7		12.7	12.7			7.8		7.8	7.8	
Effective Green, g (s)	12.7	12.7		12.7	12.7			7.8		7.8	7.8	
Actuated g/C Ratio	0.42	0.42		0.42	0.42			0.26		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	305	1409		484	1423			358		343	391	
v/s Ratio Prot		0.05			c0.19						0.00	
v/s Ratio Perm	0.01			0.00				0.00		c0.01		
v/c Ratio	0.02	0.11		0.01	0.45			0.01		0.02	0.01	
Uniform Delay, d1	5.2	5.5		5.2	6.4			8.5		8.5	8.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.0		0.0	0.2			0.0		0.0	0.0	
Delay (s)	5.3	5.5		5.2	6.6			8.5		8.5	8.5	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		5.5			6.6			8.5			8.5	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	30.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	32.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	75	0	0	530	14	65	31	121	0	0	502
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			1.00		1.00	0.88				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3398			5112		1711	3012				2694
Flt Permitted		0.89			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3061			5112		1711	3012				2694
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	14	87	0	0	616	16	76	36	141	0	0	584
RTOR Reduction (vph)	0	0	0	0	4	0	0	83	0	0	0	553
Lane Group Flow (vph)	0	101	0	0	628	0	76	94	0	0	0	31
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1447			1782		697	1228				141
v/s Ratio Prot		0.00			c0.12		c0.04	0.03				c0.01
v/s Ratio Perm		0.03										
v/c Ratio		0.07			0.35		0.11	0.08				0.22
Uniform Delay, d1		11.2			18.4		13.9	13.7				34.5
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.5		0.3	0.1				3.5
Delay (s)		11.2			18.9		14.3	13.9				38.0
Level of Service		B			B		B	B				D
Approach Delay (s)		11.2			18.9			14.0			38.0	
Approach LOS		B			B			B			D	

Intersection Summary			
HCM 2000 Control Delay	24.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.
4/22/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	87	144	912	184	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.96	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1629	1426	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1629	1426	3319	1801		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	104	171	1086	219	0	0
RTOR Reduction (vph)	9	9	0	0	0	0
Lane Group Flow (vph)	136	121	1086	219	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	24.8	24.8	25.2	60.0		
Effective Green, g (s)	24.8	24.8	25.2	60.0		
Actuated g/C Ratio	0.41	0.41	0.42	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	673	589	1393	1801		
v/s Ratio Prot	0.08		c0.33	0.12		
v/s Ratio Perm		c0.08				
v/c Ratio	0.20	0.20	0.78	0.12		
Uniform Delay, d1	11.3	11.3	15.0	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.1	0.2	2.8	0.0		
Delay (s)	11.4	11.5	17.8	0.0		
Level of Service	B	B	B	A		
Approach Delay (s)	11.4			14.9	0.0	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	69	111	4	66	3	120	113	2	5	197	82
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	6.7	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.95		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.97	1.00		0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1183	1960		1152	1267		1215	2422		1215	2268	
Flt Permitted	0.44	1.00		0.63	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	550	1960		759	1267		1215	2422		1215	2268	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	43	77	123	4	73	3	133	126	2	6	219	91
RTOR Reduction (vph)	0	83	0	0	2	0	0	1	0	0	38	0
Lane Group Flow (vph)	43	117	0	4	74	0	133	127	0	6	272	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	22.5	22.5		11.1	11.1		10.8	26.0		4.0	19.2	
Effective Green, g (s)	22.5	22.5		11.1	11.1		10.8	26.0		4.0	19.2	
Actuated g/C Ratio	0.33	0.33		0.16	0.16		0.16	0.38		0.06	0.28	
Clearance Time (s)	6.7	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	223	640		122	204		190	915		70	632	
v/s Ratio Prot	0.01	c0.06			c0.06		c0.11	0.05		0.00	c0.12	
v/s Ratio Perm	0.05			0.01								
v/c Ratio	0.19	0.18		0.03	0.36		0.70	0.14		0.09	0.43	
Uniform Delay, d1	16.5	16.6		24.3	25.7		27.5	14.1		30.7	20.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.1		0.1	1.1		10.7	0.1		0.5	0.5	
Delay (s)	16.9	16.7		24.4	26.8		38.2	14.1		31.2	20.8	
Level of Service	B	B		C	C		D	B		C	C	
Approach Delay (s)		16.7			26.7			26.4			21.0	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	68.8	Sum of lost time (s)	23.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	94	225	390	147
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	102	245	424	160
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			537			
pX, platoon unblocked						
vC, conflicting volume	1110	51			102	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1110	51			102	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			72	
cM capacity (veh/h)	146	1006			1488	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	51	51	245	424	160
Volume Left	0	0	0	424	0
Volume Right	0	0	245	0	0
cSH	1700	1700	1700	1488	1700
Volume to Capacity	0.03	0.03	0.14	0.28	0.09
Queue Length 95th (ft)	0	0	0	30	0
Control Delay (s)	0.0	0.0	0.0	8.4	0.0
Lane LOS				A	
Approach Delay (s)	0.0			6.1	
Approach LOS					

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	95	33	0	84	95
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	103	36	0	91	103
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	36				88	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	36				88	36
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	90
cM capacity (veh/h)	1573				904	1029

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	52	52	36	195
Volume Left	0	0	0	91
Volume Right	0	0	0	103
cSH	1700	1700	1700	966
Volume to Capacity	0.03	0.03	0.02	0.20
Queue Length 95th (ft)	0	0	0	19
Control Delay (s)	0.0	0.0	0.0	9.7
Lane LOS				A
Approach Delay (s)	0.0		0.0	9.7
Approach LOS				A

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	63	116	33	81	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	68	126	36	88	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	124				236	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	124				236	36
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	100
cM capacity (veh/h)	1461				697	1029

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	111	84	36	88	0
Volume Left	68	0	0	0	0
Volume Right	0	0	0	88	0
cSH	1461	1700	1700	1700	1700
Volume to Capacity	0.05	0.05	0.02	0.05	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	4.8	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.7		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	6	4	43	8	11	10	159	18	10	183	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.98		1.00	0.98		1.00	0.99	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1542			1529		1540	3031		1540	3059	
Flt Permitted		0.86			0.78		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1350			1237		1540	3031		1540	3059	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	7	4	47	9	12	11	173	20	11	199	9
RTOR Reduction (vph)	0	4	0	0	11	0	0	6	0	0	2	0
Lane Group Flow (vph)	0	15	0	0	57	0	11	187	0	11	206	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		8.0			8.0		1.3	54.1		2.9	55.7	
Effective Green, g (s)		8.0			8.0		1.3	54.1		2.9	55.7	
Actuated g/C Ratio		0.10			0.10		0.02	0.67		0.04	0.69	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		134			123		24	2044		55	2124	
v/s Ratio Prot							c0.01	0.06		c0.01	c0.07	
v/s Ratio Perm		0.01			c0.05							
v/c Ratio		0.11			0.47		0.46	0.09		0.20	0.10	
Uniform Delay, d1		32.9			34.1		39.1	4.5		37.5	4.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			2.8		5.0	0.1		0.7	0.1	
Delay (s)		33.3			36.8		44.1	4.6		38.2	4.1	
Level of Service		C			D		D	A		D	A	
Approach Delay (s)		33.3			36.8			6.7			5.8	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	24.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	190	28	101	0	0	147
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	207	30	110	0	0	160

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	103	103	30	55	55	160
Volume Left (vph)	103	103	0	0	0	0
Volume Right (vph)	0	0	30	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.7	5.7	3.2	5.3	5.3	5.1
Degree Utilization, x	0.16	0.16	0.03	0.08	0.08	0.22
Capacity (veh/h)	599	602	1121	649	648	680
Control Delay (s)	8.6	8.6	5.1	7.6	7.6	9.5
Approach Delay (s)	8.2			7.6		9.5
Approach LOS	A			A		A

Intersection Summary			
Delay	8.5		
Level of Service	A		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	75	74	0	0	314	60	10	153	4	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	80	0	0	341	65	11	166	4	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	162	407	94	88
Volume Left (vph)	82	0	11	0
Volume Right (vph)	0	65	0	4
Hadj (s)	0.13	-0.06	0.09	0.00
Departure Headway (s)	5.0	4.6	5.9	5.8
Degree Utilization, x	0.23	0.52	0.16	0.14
Capacity (veh/h)	672	762	562	570
Control Delay (s)	9.5	12.3	8.8	8.6
Approach Delay (s)	9.5	12.3	8.7	
Approach LOS	A	B	A	

Intersection Summary			
Delay	10.9		
Level of Service	B		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	17	37	7	289	5	39	164	2	0	255	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.94			1.00		1.00	1.00			0.98	
Flpb, ped/bikes		0.99			1.00		1.00	1.00			1.00	
Frt		0.93			1.00		1.00	1.00			0.99	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1210			1610		1540	2258			2191	
Flt Permitted		0.91			0.99		0.95	1.00			1.00	
Satd. Flow (perm)		1116			1603		1540	2258			2191	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	18	39	7	304	5	41	173	2	0	268	24
RTOR Reduction (vph)	0	29	0	0	1	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	43	0	0	315	0	41	175	0	0	288	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		23.0			23.0		5.5	57.1			46.5	
Effective Green, g (s)		23.0			23.0		5.5	57.1			46.5	
Actuated g/C Ratio		0.25			0.25		0.06	0.63			0.51	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		283			407		93	1426			1127	
v/s Ratio Prot							c0.03	0.08			c0.13	
v/s Ratio Perm		0.04			c0.20							
v/c Ratio		0.15			0.77		0.44	0.12			0.26	
Uniform Delay, d1		26.1			31.3		41.0	6.6			12.3	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.3			8.9		3.3	0.2			0.5	
Delay (s)		26.4			40.2		44.3	6.8			12.8	
Level of Service		C			D		D	A			B	
Approach Delay (s)		26.4			40.2			13.9			12.8	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	90.4	Sum of lost time (s)	15.4
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	98	157	0	0	133	144	50	77	187	37	0	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1039	1540	1621	1205	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1039	1540	1621	1205	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	103	165	0	0	140	152	53	81	197	39	0	116
RTOR Reduction (vph)	0	0	0	0	0	93	0	0	171	0	0	107
Lane Group Flow (vph)	103	165	0	0	140	59	53	81	26	39	0	9
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	8.6	42.6			29.0	29.0	9.8	9.8	9.8	6.0		6.0
Effective Green, g (s)	8.6	42.6			29.0	29.0	9.8	9.8	9.8	6.0		6.0
Actuated g/C Ratio	0.12	0.57			0.39	0.39	0.13	0.13	0.13	0.08		0.08
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	178	1762			1200	404	202	213	158	124		97
v/s Ratio Prot	c0.07	0.05			0.05		0.03	c0.05		c0.03		0.01
v/s Ratio Perm						c0.06			0.02			
v/c Ratio	0.58	0.09			0.12	0.15	0.26	0.38	0.16	0.31		0.10
Uniform Delay, d1	31.2	7.2			14.5	14.7	29.0	29.5	28.7	32.3		31.7
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	4.5	0.1			0.2	0.8	0.7	1.1	0.5	1.5		0.4
Delay (s)	35.7	7.3			14.7	15.5	29.7	30.7	29.2	33.7		32.1
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		18.2			15.1			29.6			32.5	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	74.4	Sum of lost time (s)	21.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	25	32	2	34	5	33	12	2	1	13	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.94			0.98		1.00	0.98		1.00	0.91	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3165			1769		1711	1765		1711	1633	
Flt Permitted		0.92			0.99		1.00	1.00		1.00	1.00	
Satd. Flow (perm)		2936			1763		1801	1765		1801	1633	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	27	35	2	37	5	36	13	2	1	14	23
RTOR Reduction (vph)	0	11	0	0	2	0	0	2	0	0	21	0
Lane Group Flow (vph)	0	72	0	0	42	0	36	13	0	1	16	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		27.0			27.0		3.2	3.2		3.2	3.2	
Effective Green, g (s)		27.0			27.0		3.2	3.2		3.2	3.2	
Actuated g/C Ratio		0.69			0.69		0.08	0.08		0.08	0.08	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2022			1214		147	144		147	133	
v/s Ratio Prot								0.01			0.01	
v/s Ratio Perm		c0.02			0.02		c0.02			0.00		
v/c Ratio		0.04			0.03		0.24	0.09		0.01	0.12	
Uniform Delay, d1		1.9			1.9		16.9	16.7		16.5	16.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			0.1		0.9	0.3		0.0	0.4	
Delay (s)		2.0			2.0		17.7	16.9		16.6	17.1	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.0			2.0			17.5			17.1	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.06		
Actuated Cycle Length (s)	39.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	23.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT WITH M-TR-11C
BASKETBALL GAME
NO SF GIANTS GAME AT AT&T PARK
WEEKDAY LATE EVENING

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	478	425	8	94	764	52	37	469	367	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.90			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	1.00		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3064		2987	3028			5520	1236			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3064		2987	3028			5520	1236			
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	576	512	10	113	920	63	45	565	442	0	0	0
RTOR Reduction (vph)	0	1	0	0	4	0	0	0	285	0	0	0
Lane Group Flow (vph)	576	521	0	113	979	0	0	610	157	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	56.1		9.5	47.4			25.5	25.5			
Effective Green, g (s)	18.2	56.1		9.5	47.4			25.5	25.5			
Actuated g/C Ratio	0.17	0.51		0.09	0.43			0.23	0.23			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1562		257	1304			1279	286			
v/s Ratio Prot	c0.13	0.17		0.04	c0.32							
v/s Ratio Perm								0.11	c0.13			
v/c Ratio	0.78	0.33		0.44	0.75			0.48	0.55			
Uniform Delay, d1	44.0	15.9		47.7	26.3			36.5	37.2			
Progression Factor	0.55	0.27		1.17	0.35			1.00	1.00			
Incremental Delay, d2	4.5	0.5		0.4	0.8			0.3	2.2			
Delay (s)	28.8	4.9		56.1	10.0			36.8	39.3			
Level of Service	C	A		E	A			D	D			
Approach Delay (s)		17.4			14.7			37.9			0.0	
Approach LOS		B			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	842	21	40	725	36	12	30	30	39	181	171
Ideal Flow (vphpl)	1400	1400	1400	1400	1400	1400	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.97			1.00	0.63	1.00	0.86	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.91	1.00	0.67	1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85	1.00	0.96	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1134	3218		1134	2186			1448	853	1027	2448	580
Flt Permitted	0.95	1.00		0.95	1.00			0.83	1.00	0.72	1.00	1.00
Satd. Flow (perm)	1134	3218		1134	2186			1224	853	783	2448	580
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	93	1002	25	48	863	43	14	36	36	46	215	204
RTOR Reduction (vph)	0	2	0	0	2	0	0	0	31	0	38	108
Lane Group Flow (vph)	93	1025	0	48	904	0	0	50	5	46	252	21
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.5	61.7		11.9	57.5			16.5	16.5	17.5	17.5	17.5
Effective Green, g (s)	14.5	61.7		11.9	57.5			16.5	16.5	17.5	17.5	17.5
Actuated g/C Ratio	0.13	0.56		0.11	0.52			0.15	0.15	0.16	0.16	0.16
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	149	1805		122	1142			183	127	124	389	92
v/s Ratio Prot	0.08	c0.32		0.04	c0.41						c0.10	
v/s Ratio Perm								0.04	0.01	0.06		0.04
v/c Ratio	0.62	0.57		0.39	0.79			0.27	0.04	0.37	0.65	0.22
Uniform Delay, d1	45.2	15.6		45.7	21.4			41.4	40.0	41.3	43.4	40.3
Progression Factor	0.86	1.09		0.69	0.48			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.0	0.8		1.4	2.6			0.8	0.1	1.9	3.7	1.2
Delay (s)	44.0	17.7		33.1	12.8			42.2	40.1	43.2	47.1	41.6
Level of Service	D	B		C	B			D	D	D	D	D
Approach Delay (s)		19.9			13.8			41.4			45.2	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	930	62	0	908	28	11
Ideal Flow (vphpl)	1100	1100	1000	1000	1000	1000
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1764			1621	810	714
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	1764			1621	810	714
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	1107	74	0	1081	33	13
RTOR Reduction (vph)	2	0	0	0	0	12
Lane Group Flow (vph)	1179	0	0	1081	33	1
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	91.2			91.2	7.5	7.5
Effective Green, g (s)	91.2			91.2	7.5	7.5
Actuated g/C Ratio	0.83			0.83	0.07	0.07
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1462			1343	55	48
v/s Ratio Prot	c0.67			0.67	c0.04	
v/s Ratio Perm						0.00
v/c Ratio	0.81			0.80	0.60	0.02
Uniform Delay, d1	4.9			4.8	49.8	47.8
Progression Factor	1.00			1.53	1.00	1.00
Incremental Delay, d2	4.9			2.5	16.4	0.2
Delay (s)	9.7			9.9	66.2	48.0
Level of Service	A			A	E	D
Approach Delay (s)	9.7			9.9	61.0	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

9/18/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	143	771	99	35	123	323	194	89	208	92
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	1.00
Flpb, ped/bikes		0.99			0.99	1.00			0.79	1.00
Frt		0.99			1.00	0.94			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5762			2834	2410			3238	1122
Flt Permitted		0.99			0.77	1.00			0.95	1.00
Satd. Flow (perm)		5762			2206	2410			3238	1122
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	168	907	116	41	145	380	228	105	245	108
RTOR Reduction (vph)	0	24	0	0	0	24	0	0	0	0
Lane Group Flow (vph)	0	1167	0	0	186	584	0	0	361	97
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Perm	Prot	Prot
Protected Phases		6			4	4			7	7
Permitted Phases	6			4				7		
Actuated Green, G (s)		23.5			21.1	21.1			12.9	12.9
Effective Green, g (s)		25.5			24.1	24.1			15.9	15.9
Actuated g/C Ratio		0.34			0.32	0.32			0.21	0.21
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1959			708	774			686	237
v/s Ratio Prot						c0.24				0.09
v/s Ratio Perm		0.20			0.08				0.11	
v/c Ratio		0.60			0.26	0.75			0.53	0.41
Uniform Delay, d1		20.5			18.9	22.8			26.2	25.5
Progression Factor		1.00			0.49	1.00			1.00	1.00
Incremental Delay, d2		0.5			0.1	4.2			0.7	1.2
Delay (s)		21.0			9.3	27.0			26.9	26.7
Level of Service		C			A	C			C	C
Approach Delay (s)		21.0			9.3	27.0			26.9	
Approach LOS		C			A	C			C	

Intersection Summary			
HCM 2000 Control Delay	22.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

5: Fifth St. & Bryant St. & I-80 EB On-Ramp

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	27	797	210	22	131	112	14	170	20	365
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	1.00		0.87		1.00		1.00	1.00
Flpb, ped/bikes		0.94	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.93		0.85		1.00	1.00
Flt Protected		0.95	0.97		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1147	1877		2248		1188		1327	2553
Flt Permitted		0.95	0.97		1.00		1.00		0.52	0.95
Satd. Flow (perm)		1147	1877		2248		1188		720	2431
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	28	839	221	23	138	118	15	179	21	384
RTOR Reduction (vph)	0	0	6	0	1	0	10	0	0	0
Lane Group Flow (vph)	0	582	523	0	257	0	3	0	181	403
Confl. Peds. (#/hr)	25			60		200				
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Perm	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases		2	2		8			7	7	4
Permitted Phases	2						8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		282	525		524		253		413	1073
v/s Ratio Prot			0.28		c0.11				c0.07	0.06
v/s Ratio Perm		0.51					0.00		0.12	0.10
v/c Ratio		2.06	1.64dl		0.49		0.01		0.44	0.38
Uniform Delay, d1		28.2	27.0		24.9		23.3		17.3	14.4
Progression Factor		1.00	1.00		1.00		1.00		1.08	1.07
Incremental Delay, d2		490.8	38.5		3.3		0.1		2.5	0.8
Delay (s)		519.1	65.4		28.2		23.3		21.1	16.1
Level of Service		F	E		C		C		C	B
Approach Delay (s)			303.1		27.9					17.7
Approach LOS			F		C					B

Intersection Summary			
HCM 2000 Control Delay	180.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	82.0%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

6: Third St. & Channel St.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	10	37	66	711	253	5	362	4	1	61	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1549	1356		2938		1272	2536		1540	3036	
Flt Permitted		0.25	1.00		0.92		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		399	1356		2726		1272	2536		1540	3036	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	104	12	45	80	867	309	6	441	5	1	74	6
RTOR Reduction (vph)	0	0	23	0	26	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	116	22	0	1230	0	6	445	0	1	76	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.6	32.6		32.6		1.0	16.4		0.8	16.5	
Effective Green, g (s)		32.6	32.6		32.6		1.0	16.4		0.8	16.5	
Actuated g/C Ratio		0.50	0.50		0.50		0.02	0.25		0.01	0.25	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		197	672		1352		19	633		18	762	
v/s Ratio Prot							0.00	c0.18		0.00	c0.02	
v/s Ratio Perm		0.29	0.02		c0.45							
v/c Ratio		0.59	0.03		0.91		0.32	0.70		0.06	0.10	
Uniform Delay, d1		11.8	8.5		15.2		32.0	22.4		32.1	18.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		4.4	0.0		9.2		3.5	3.5		0.5	0.1	
Delay (s)		16.2	8.5		24.4		35.5	26.0		32.5	18.9	
Level of Service		B	A		C		D	C		C	B	
Approach Delay (s)		14.1			24.4			26.1			19.1	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	65.7	Sum of lost time (s)	15.9
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	22	3	1	711	9	2	20	61	48	47	8
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.96	1.00	0.95		1.00	0.95	
Flpb, ped/bikes		1.00			1.00	1.00	0.73	1.00		1.00	1.00	
Frt		0.98			1.00	0.85	1.00	0.89		1.00	0.98	
Flt Protected		0.99			1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2534			1450	1186	1007	1227		1377	1353	
Flt Permitted		0.84			1.00	1.00	0.71	1.00		0.95	1.00	
Satd. Flow (perm)		2154			1450	1186	755	1227		1377	1353	
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Adj. Flow (vph)	6	28	4	1	900	11	3	25	77	61	59	10
RTOR Reduction (vph)	0	2	0	0	0	4	0	69	0	0	7	0
Lane Group Flow (vph)	0	36	0	0	901	7	3	33	0	61	62	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		29.4			29.4	37.0	6.4	6.4		7.6	19.0	
Effective Green, g (s)		29.4			29.4	37.0	6.4	6.4		7.6	19.0	
Actuated g/C Ratio		0.50			0.50	0.63	0.11	0.11		0.13	0.33	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		1084			729	852	82	134		179	440	
v/s Ratio Prot						0.00		c0.03		c0.04	0.05	
v/s Ratio Perm		0.02			0.62	0.00	0.00					
v/c Ratio		0.03			1.24	0.01	0.04	0.25		0.34	0.14	
Uniform Delay, d1		7.3			14.5	3.9	23.2	23.8		23.1	13.9	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			117.8	0.0	0.2	1.0		0.4	0.1	
Delay (s)		7.3			132.3	3.9	23.4	24.8		23.5	14.1	
Level of Service		A			F	A	C	C		C	B	
Approach Delay (s)		7.3			130.8			24.7			18.5	
Approach LOS		A			F			C			B	

Intersection Summary			
HCM 2000 Control Delay	105.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	58.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	6	855	356	11	65	68
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1746	1535	847	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1746	1535	847	1134	1194
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	7	1018	424	13	77	81
RTOR Reduction (vph)	0	604	0	6	0	0
Lane Group Flow (vph)	7	414	424	7	77	81
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	26.2	26.2	38.9	33.9	10.1	54.0
Effective Green, g (s)	26.2	26.2	38.9	33.9	10.1	54.0
Actuated g/C Ratio	0.29	0.29	0.43	0.38	0.11	0.60
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	329	507	661	365	126	714
v/s Ratio Prot	0.01		c0.28	0.00	c0.07	0.07
v/s Ratio Perm		c0.24		0.00		
v/c Ratio	0.02	0.82	0.64	0.02	0.61	0.11
Uniform Delay, d1	22.8	29.8	20.2	17.7	38.2	7.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	9.8	2.1	0.0	8.5	0.1
Delay (s)	22.9	39.6	22.3	17.7	46.7	7.9
Level of Service	C	D	C	B	D	A
Approach Delay (s)	39.5		22.2			26.8
Approach LOS	D		C			C

Intersection Summary			
HCM 2000 Control Delay	33.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	308	281	2	61	68	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.97		1.00	1.00	0.96	
Flpb, ped/bikes	1.00		0.97	1.00	1.00	
Frt	0.94		1.00	1.00	0.93	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1598		1655	1531	2821	
Flt Permitted	0.97		0.63	1.00	1.00	
Satd. Flow (perm)	1598		1102	1531	2821	
Peak-hour factor, PHF	0.67	0.67	0.67	0.67	0.67	0.67
Adj. Flow (vph)	460	419	3	91	101	88
RTOR Reduction (vph)	32	0	0	0	73	0
Lane Group Flow (vph)	847	0	3	91	116	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	36.7		9.6	9.6	9.6	
Effective Green, g (s)	36.7		9.6	9.6	9.6	
Actuated g/C Ratio	0.65		0.17	0.17	0.17	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1041		187	261	481	
v/s Ratio Prot	c0.53			c0.06	0.04	
v/s Ratio Perm			0.00			
v/c Ratio	0.81		0.02	0.35	0.24	
Uniform Delay, d1	7.3		19.4	20.6	20.2	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.0		0.0	0.8	0.3	
Delay (s)	12.2		19.5	21.4	20.5	
Level of Service	B		B	C	C	
Approach Delay (s)	12.2			21.3	20.5	
Approach LOS	B			C	C	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	56.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	0	0	0	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.9
Lane Util. Factor						0.95
Frpb, ped/bikes						1.00
Flpb, ped/bikes						1.00
Frt						1.00
Flt Protected						1.00
Satd. Flow (prot)						3421
Flt Permitted						1.00
Satd. Flow (perm)						3421
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	0	359
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	359
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm			Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)						49.9
Effective Green, g (s)						49.9
Actuated g/C Ratio						1.00
Clearance Time (s)						4.9
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)						3421
v/s Ratio Prot						c0.10
v/s Ratio Perm						
v/c Ratio						0.10
Uniform Delay, d1						0.0
Progression Factor						1.00
Incremental Delay, d2						0.1
Delay (s)						0.1
Level of Service						A
Approach Delay (s)	0.0		0.0			0.1
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	0.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	49.9	Sum of lost time (s)	15.3
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	5	0	53	350	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1519	1342		2887	2887	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1519	1342		2887	2887	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	6	0	62	412	0
RTOR Reduction (vph)	0	6	0	0	0	0
Lane Group Flow (vph)	12	0	0	62	412	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	0.6	0.6		11.8	11.8	
Effective Green, g (s)	0.6	0.6		11.8	11.8	
Actuated g/C Ratio	0.01	0.01		0.25	0.25	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	19	16		712	712	
v/s Ratio Prot	c0.01			0.02	c0.14	
v/s Ratio Perm		0.00				
v/c Ratio	0.63	0.00		0.09	0.58	
Uniform Delay, d1	23.5	23.3		13.9	15.8	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	52.7	0.1		0.1	1.1	
Delay (s)	76.2	23.4		13.9	17.0	
Level of Service	E	C		B	B	
Approach Delay (s)	58.6			13.9	17.0	
Approach LOS	E			B	B	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	25.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	29	74	0	0	278	132
Peak Hour Factor	0.92	0.83	0.83	0.83	0.83	0.92	0.83	0.92	0.83	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0	35	80	0	0	302	143

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	0	0	0	0	115	302	143
Volume Left (vph)	0	0	0	0	35	0	0
Volume Right (vph)	0	0	0	0	0	0	143
Hadj (s)	0.00	0.00	0.00	0.00	0.09	0.03	-0.67
Departure Headway (s)	5.7	5.7	5.7	5.7	5.0	4.6	3.9
Degree Utilization, x	0.00	0.00	0.00	0.00	0.16	0.39	0.16
Capacity (veh/h)	587	587	587	587	710	768	905
Control Delay (s)	7.5	7.5	7.5	7.5	8.9	9.3	6.4
Approach Delay (s)	0.0		0.0		8.9	8.4	
Approach LOS	A		A		A	A	

Intersection Summary			
Delay	8.5		
Level of Service	A		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	98	0	161	0	128	0	0	0	192	120
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)			5.5		5.5		5.0				5.2	
Lane Util. Factor			1.00		1.00		0.97				0.95	
Frpb, ped/bikes			0.97		1.00		1.00				0.99	
Flpb, ped/bikes			1.00		1.00		1.00				1.00	
Frt			0.85		1.00		1.00				0.94	
Flt Protected			1.00		1.00		0.95				1.00	
Satd. Flow (prot)			1130		1365		2515				2417	
Flt Permitted			1.00		1.00		0.95				1.00	
Satd. Flow (perm)			1130		1365		2515				2417	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	115	0	189	0	151	0	0	0	226	141
RTOR Reduction (vph)	0	0	84	0	0	0	0	0	0	0	104	0
Lane Group Flow (vph)	0	0	31	0	189	0	151	0	0	0	263	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm		Perm	Perm	NA	Perm	Prot			Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)			12.8		12.8		6.9				12.5	
Effective Green, g (s)			12.8		12.8		6.9				12.5	
Actuated g/C Ratio			0.27		0.27		0.14				0.26	
Clearance Time (s)			5.5		5.5		5.0				5.2	
Vehicle Extension (s)			3.0		3.0		3.0				3.0	
Lane Grp Cap (vph)			301		364		362				630	
v/s Ratio Prot					c0.14		c0.06				c0.11	
v/s Ratio Perm			0.03									
v/c Ratio			0.10		0.52		0.42				0.42	
Uniform Delay, d1			13.2		14.9		18.7				14.7	
Progression Factor			1.00		1.00		1.00				1.00	
Incremental Delay, d2			0.1		1.3		0.8				0.4	
Delay (s)			13.4		16.2		19.4				15.1	
Level of Service			B		B		B				B	
Approach Delay (s)		13.4			16.2			19.4			15.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	47.9	Sum of lost time (s)	15.7
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	98	86	3	4	393	10	5	6	1	11	2	47
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1252	1621	1674		1491	1360	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.72	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1252	1230	1674		1181	1360	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	110	97	3	4	442	11	6	7	1	12	2	53
RTOR Reduction (vph)	0	0	1	0	0	6	0	1	0	0	43	0
Lane Group Flow (vph)	110	97	2	4	442	5	6	7	0	12	12	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	11.7	48.1	48.1	2.5	38.9	38.9	15.0	15.0		15.0	15.0	
Effective Green, g (s)	11.7	48.1	48.1	2.5	38.9	38.9	15.0	15.0		15.0	15.0	
Actuated g/C Ratio	0.15	0.60	0.60	0.03	0.48	0.48	0.19	0.19		0.19	0.19	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	235	1018	865	50	823	604	228	311		219	253	
v/s Ratio Prot	c0.07	0.06		0.00	c0.26			0.00			0.01	
v/s Ratio Perm			0.00			0.00	0.00			c0.01		
v/c Ratio	0.47	0.10	0.00	0.08	0.54	0.01	0.03	0.02		0.05	0.05	
Uniform Delay, d1	31.6	6.9	6.6	37.9	14.6	10.8	26.8	26.8		27.0	26.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	0.2	0.0	0.7	0.7	0.0	0.0	0.0		0.1	0.1	
Delay (s)	33.1	7.1	6.6	38.6	15.2	10.8	26.9	26.8		27.1	27.0	
Level of Service	C	A	A	D	B	B	C	C		C	C	
Approach Delay (s)		20.7			15.3			26.9			27.0	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	80.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	141	6	11	421	13	12	33	14	31	439	93
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1047	1540	2941			3069	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.30	1.00			0.93	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1047	493	2941			2869	1072
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	28	172	7	13	513	16	15	40	17	38	535	113
RTOR Reduction (vph)	0	0	3	0	0	8	0	12	0	0	0	81
Lane Group Flow (vph)	28	172	4	13	513	8	15	45	0	0	573	32
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	2.1	50.6	50.6	0.8	48.3	48.3	26.9	26.9			25.9	25.9
Effective Green, g (s)	2.1	50.6	50.6	0.8	48.3	48.3	26.9	26.9			25.9	25.9
Actuated g/C Ratio	0.02	0.55	0.55	0.01	0.53	0.53	0.29	0.29			0.28	0.28
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	27	673	763	13	642	553	145	866			813	304
v/s Ratio Prot	c0.02	0.14		0.01	c0.42			0.02				
v/s Ratio Perm			0.00			0.01	0.03				c0.20	0.03
v/c Ratio	1.04	0.26	0.01	1.00	0.80	0.02	0.10	0.05			0.70	0.11
Uniform Delay, d1	44.6	10.6	9.1	45.2	17.5	10.2	23.4	23.1			29.3	24.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	184.9	0.2	0.0	249.6	6.9	0.0	0.3	0.0			2.8	0.2
Delay (s)	229.5	10.8	9.1	294.9	24.4	10.2	23.7	23.1			32.1	24.3
Level of Service	F	B	A	F	C	B	C	C			C	C
Approach Delay (s)		40.3			30.5			23.2			30.8	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	91.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	121	56	14	287	224	15	99	12	37	23	6
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.93	1.00	1.00	0.96	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1331	901		1331	1126	886	1070	957	916	1070	1080	
Flt Permitted	0.24	1.00		0.60	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	343	901		834	1126	886	1070	957	916	1070	1080	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	24	146	67	17	346	270	18	119	14	45	28	7
RTOR Reduction (vph)	0	17	0	0	0	125	0	0	11	0	5	0
Lane Group Flow (vph)	24	196	0	17	346	145	18	119	3	45	30	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	30.2	30.2		30.6	30.6	42.1	2.9	15.3	15.3	11.5	23.9	
Effective Green, g (s)	30.2	30.2		30.6	30.6	42.1	2.9	15.3	15.3	11.5	23.9	
Actuated g/C Ratio	0.38	0.38		0.39	0.39	0.54	0.04	0.19	0.19	0.15	0.30	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	145	346		334	438	531	39	186	178	156	328	
v/s Ratio Prot	0.00	c0.22		0.00	c0.31	c0.04	0.02	c0.12		0.04	0.03	
v/s Ratio Perm	0.06			0.02		0.12			0.00			
v/c Ratio	0.17	0.57		0.05	0.79	0.27	0.46	0.64	0.02	0.29	0.09	
Uniform Delay, d1	16.6	19.0		14.9	21.1	9.9	37.0	29.1	25.5	29.9	19.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	2.1		0.1	9.2	0.3	8.4	7.0	0.0	1.0	0.1	
Delay (s)	17.2	21.1		15.0	30.3	10.2	45.4	36.1	25.6	30.9	19.7	
Level of Service	B	C		B	C	B	D	D	C	C	B	
Approach Delay (s)		20.7			21.3			36.2			26.0	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	25	19	331	47	1	5	17	9	0	11	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	0.98		0.97	
Flpb, ped/bikes		0.99		0.98	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	1.00			1.00	0.85		0.87	
Flt Protected		0.97		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1422		1677	1795			1779	1494		1294	
Flt Permitted		0.80		0.69	1.00			0.75	1.00		1.00	
Satd. Flow (perm)		1168		1210	1795			1350	1494		1294	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	99	32	24	424	60	1	6	22	12	0	14	364
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	9	0	287	0
Lane Group Flow (vph)	0	149	0	424	60	0	0	28	3	0	91	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm		NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		32.6		32.6	32.6			15.4	15.4		15.4	
Effective Green, g (s)		32.6		32.6	32.6			15.4	15.4		15.4	
Actuated g/C Ratio		0.45		0.45	0.45			0.21	0.21		0.21	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		525		544	808			287	317		275	
v/s Ratio Prot					0.03						c0.07	
v/s Ratio Perm		0.13		c0.35				0.02	0.00			
v/c Ratio		0.28		0.78	0.07			0.10	0.01		0.33	
Uniform Delay, d1		12.5		16.9	11.3			22.9	22.5		24.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3		7.0	0.0			0.1	0.0		0.7	
Delay (s)		12.8		23.8	11.4			23.1	22.5		24.9	
Level of Service		B		C	B			C	C		C	
Approach Delay (s)		12.8			22.3			22.9			24.9	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	72.4	Sum of lost time (s)	14.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	80	22	23	299	14	82	79	6	34	132	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.98	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.99		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1680	3283		1679	3391		1260	2488		1260	2300	
Flt Permitted	0.49	1.00		0.67	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	866	3283		1191	3391		1260	2488		1260	2300	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	42	96	27	28	360	17	99	95	7	41	159	148
RTOR Reduction (vph)	0	18	0	0	4	0	0	4	0	0	96	0
Lane Group Flow (vph)	42	105	0	28	373	0	99	98	0	41	211	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		12.9	35.9		8.9	31.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		12.9	35.9		8.9	31.9	
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.14	0.40		0.10	0.35	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	285	1083		393	1119		180	992		124	815	
v/s Ratio Prot		0.03			c0.11		c0.08	0.04		0.03	c0.09	
v/s Ratio Perm	0.05			0.02								
v/c Ratio	0.15	0.10		0.07	0.33		0.55	0.10		0.33	0.26	
Uniform Delay, d1	21.2	20.9		20.7	22.7		35.9	16.9		37.8	20.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.0		0.1	0.2		3.6	0.2		1.6	0.2	
Delay (s)	21.5	20.9		20.8	22.9		39.5	17.1		39.3	20.8	
Level of Service	C	C		C	C		D	B		D	C	
Approach Delay (s)		21.1			22.7			28.1			23.0	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	143	11	3	589	3	13	0	4	3	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.97		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3384		1711	3419			1681		1711	1531	
Flt Permitted	0.41	1.00		0.65	1.00			0.80		0.75	1.00	
Satd. Flow (perm)	734	3384		1164	3419			1403		1343	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	155	12	3	640	3	14	0	4	3	0	11
RTOR Reduction (vph)	0	7	0	0	1	0	0	13	0	0	8	0
Lane Group Flow (vph)	7	160	0	3	642	0	0	5	0	3	3	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.6	12.6		12.6	12.6			7.8		7.8	7.8	
Effective Green, g (s)	12.6	12.6		12.6	12.6			7.8		7.8	7.8	
Actuated g/C Ratio	0.41	0.41		0.41	0.41			0.26		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	304	1402		482	1417			359		344	392	
v/s Ratio Prot		0.05			c0.19						0.00	
v/s Ratio Perm	0.01			0.00				c0.00		0.00		
v/c Ratio	0.02	0.11		0.01	0.45			0.01		0.01	0.01	
Uniform Delay, d1	5.3	5.5		5.2	6.4			8.4		8.4	8.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.0		0.0	0.2			0.0		0.0	0.0	
Delay (s)	5.3	5.5		5.2	6.6			8.4		8.4	8.4	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		5.5			6.6			8.4			8.4	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	30.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	32.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	75	0	0	530	14	65	31	121	0	0	444
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			1.00		1.00	0.88				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3398			5112		1711	3012				2694
Flt Permitted		0.89			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3061			5112		1711	3012				2694
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	14	87	0	0	616	16	76	36	141	0	0	516
RTOR Reduction (vph)	0	0	0	0	4	0	0	83	0	0	0	489
Lane Group Flow (vph)	0	101	0	0	628	0	76	94	0	0	0	27
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1447			1782		697	1228				141
v/s Ratio Prot		0.00			c0.12		c0.04	0.03				c0.01
v/s Ratio Perm		0.03										
v/c Ratio		0.07			0.35		0.11	0.08				0.19
Uniform Delay, d1		11.2			18.4		13.9	13.7				34.5
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.5		0.3	0.1				3.0
Delay (s)		11.2			18.9		14.3	13.9				37.5
Level of Service		B			B		B	B				D
Approach Delay (s)		11.2			18.9			14.0			37.5	
Approach LOS		B			B			B			D	

Intersection Summary			
HCM 2000 Control Delay	24.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St. 9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	87	144	849	189	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.96	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1629	1427	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1629	1427	3319	1801		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	104	171	1011	225	0	0
RTOR Reduction (vph)	12	12	0	0	0	0
Lane Group Flow (vph)	133	118	1011	225	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	26.8	26.8	23.2	60.0		
Effective Green, g (s)	26.8	26.8	23.2	60.0		
Actuated g/C Ratio	0.45	0.45	0.39	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	727	637	1283	1801		
v/s Ratio Prot	0.08		c0.30	0.12		
v/s Ratio Perm		c0.08				
v/c Ratio	0.18	0.19	0.79	0.12		
Uniform Delay, d1	10.0	10.0	16.2	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.1	0.1	3.3	0.0		
Delay (s)	10.1	10.2	19.5	0.0		
Level of Service	B	B	B	A		
Approach Delay (s)	10.1			16.0	0.0	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez 9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	69	111	4	66	3	120	113	2	5	196	85
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	6.7	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.95		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.97	1.00		0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1183	1960		1152	1267		1215	2422		1215	2263	
Flt Permitted	0.44	1.00		0.63	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	551	1960		759	1267		1215	2422		1215	2263	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	43	77	123	4	73	3	133	126	2	6	218	94
RTOR Reduction (vph)	0	83	0	0	2	0	0	1	0	0	40	0
Lane Group Flow (vph)	43	117	0	4	74	0	133	127	0	6	272	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	22.6	22.6		11.2	11.2		10.9	26.1		4.1	19.3	
Effective Green, g (s)	22.6	22.6		11.2	11.2		10.9	26.1		4.1	19.3	
Actuated g/C Ratio	0.33	0.33		0.16	0.16		0.16	0.38		0.06	0.28	
Clearance Time (s)	6.7	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	223	641		123	205		191	914		72	632	
v/s Ratio Prot	0.01	c0.06			c0.06		c0.11	0.05		0.00	c0.12	
v/s Ratio Perm	0.05			0.01								
v/c Ratio	0.19	0.18		0.03	0.36		0.70	0.14		0.08	0.43	
Uniform Delay, d1	16.6	16.6		24.4	25.8		27.5	14.1		30.7	20.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.1		0.1	1.1		10.5	0.1		0.5	0.5	
Delay (s)	17.0	16.8		24.5	26.9		38.0	14.2		31.2	20.9	
Level of Service	B	B		C	C		D	B		C	C	
Approach Delay (s)		16.8			26.7			26.3			21.1	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	69.1	Sum of lost time (s)	23.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	94	225	451	147
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	102	245	490	160
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			525			
pX, platoon unblocked						
vC, conflicting volume	1242	51			102	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1242	51			102	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			67	
cM capacity (veh/h)	112	1006			1488	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	51	51	245	490	160
Volume Left	0	0	0	490	0
Volume Right	0	0	245	0	0
cSH	1700	1700	1700	1488	1700
Volume to Capacity	0.03	0.03	0.14	0.33	0.09
Queue Length 95th (ft)	0	0	0	36	0
Control Delay (s)	0.0	0.0	0.0	8.6	0.0
Lane LOS				A	
Approach Delay (s)	0.0			6.5	
Approach LOS					

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	95	34	0	84	95
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	103	37	0	91	103
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	37				89	37
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	37				89	37
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	90
cM capacity (veh/h)	1572				902	1027

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	52	52	37	195
Volume Left	0	0	0	91
Volume Right	0	0	0	103
cSH	1700	1700	1700	964
Volume to Capacity	0.03	0.03	0.02	0.20
Queue Length 95th (ft)	0	0	0	19
Control Delay (s)	0.0	0.0	0.0	9.7
Lane LOS				A
Approach Delay (s)	0.0		0.0	9.7
Approach LOS				A

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	63	116	34	147	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	68	126	37	160	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	197				237	37
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	197				237	37
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	100
cM capacity (veh/h)	1373				694	1027

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	111	84	37	160	0
Volume Left	68	0	0	0	0
Volume Right	0	0	0	160	0
cSH	1373	1700	1700	1700	1700
Volume to Capacity	0.05	0.05	0.02	0.09	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	5.0	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.8		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	22.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	6	4	25	12	18	10	159	18	10	203	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.95		1.00	0.98		1.00	0.99	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1542			1514		1540	3031		1540	3061	
Flt Permitted		0.87			0.85		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1363			1310		1540	3031		1540	3061	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	7	4	27	13	20	11	173	20	11	221	9
RTOR Reduction (vph)	0	4	0	0	18	0	0	5	0	0	2	0
Lane Group Flow (vph)	0	15	0	0	42	0	11	188	0	11	228	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.1			7.1		1.3	55.0		2.9	56.6	
Effective Green, g (s)		7.1			7.1		1.3	55.0		2.9	56.6	
Actuated g/C Ratio		0.09			0.09		0.02	0.69		0.04	0.71	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		120			115		24	2078		55	2160	
v/s Ratio Prot							c0.01	0.06		c0.01	c0.07	
v/s Ratio Perm		0.01			c0.03							
v/c Ratio		0.13			0.36		0.46	0.09		0.20	0.11	
Uniform Delay, d1		33.7			34.4		39.1	4.2		37.5	3.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5			2.0		5.0	0.1		0.7	0.1	
Delay (s)		34.2			36.4		44.1	4.3		38.2	3.9	
Level of Service		C			D		D	A		D	A	
Approach Delay (s)		34.2			36.4			6.5			5.4	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.14		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	23.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	190	28	101	0	0	147
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	207	30	110	0	0	160

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	103	103	30	55	55	160
Volume Left (vph)	103	103	0	0	0	0
Volume Right (vph)	0	0	30	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.7	5.7	3.2	5.3	5.3	5.1
Degree Utilization, x	0.16	0.16	0.03	0.08	0.08	0.22
Capacity (veh/h)	599	602	1121	649	648	680
Control Delay (s)	8.6	8.6	5.1	7.6	7.6	9.5
Approach Delay (s)	8.2			7.6		9.5
Approach LOS	A			A		A

Intersection Summary			
Delay	8.5		
Level of Service	A		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	75	74	0	0	375	60	10	153	4	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	80	0	0	408	65	11	166	4	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	162	473	94	88
Volume Left (vph)	82	0	11	0
Volume Right (vph)	0	65	0	4
Hadj (s)	0.13	-0.05	0.09	0.00
Departure Headway (s)	5.1	4.6	6.1	6.0
Degree Utilization, x	0.23	0.60	0.16	0.15
Capacity (veh/h)	658	760	543	550
Control Delay (s)	9.7	14.4	9.1	8.8
Approach Delay (s)	9.7	14.4	8.9	
Approach LOS	A	B	A	

Intersection Summary			
Delay	12.2		
Level of Service	B		
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↱			↑↱	
Volume (vph)	14	17	37	7	350	5	39	164	2	0	257	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.94			1.00		1.00	1.00			0.98	
Flpb, ped/bikes		0.99			1.00		1.00	1.00			1.00	
Frt		0.93			1.00		1.00	1.00			0.99	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1213			1611		1540	2258			2192	
Flt Permitted		0.91			1.00		0.95	1.00			1.00	
Satd. Flow (perm)		1116			1606		1540	2258			2192	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	15	18	39	7	368	5	41	173	2	0	271	24
RTOR Reduction (vph)	0	28	0	0	1	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	44	0	0	379	0	41	175	0	0	291	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		26.4			26.4		5.5	53.7			43.1	
Effective Green, g (s)		26.4			26.4		5.5	53.7			43.1	
Actuated g/C Ratio		0.29			0.29		0.06	0.59			0.48	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		325			469		93	1341			1045	
v/s Ratio Prot							c0.03	0.08			c0.13	
v/s Ratio Perm		0.04			c0.24							
v/c Ratio		0.14			0.81		0.44	0.13			0.28	
Uniform Delay, d1		23.6			29.7		41.0	8.1			14.3	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.2			9.9		3.3	0.2			0.7	
Delay (s)		23.8			39.6		44.3	8.3			14.9	
Level of Service		C			D		D	A			B	
Approach Delay (s)		23.8			39.6			15.1			14.9	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	25.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	90.4	Sum of lost time (s)	15.4
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑			↑↑	↱	↰	↑	↱	↰		↱
Volume (vph)	98	157	0	0	136	144	50	77	187	37	0	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1039	1540	1621	1205	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1039	1540	1621	1205	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	103	165	0	0	143	152	53	81	197	39	0	116
RTOR Reduction (vph)	0	0	0	0	0	93	0	0	171	0	0	107
Lane Group Flow (vph)	103	165	0	0	143	59	53	81	26	39	0	9
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	8.6	42.6			29.0	29.0	9.8	9.8	9.8	6.0		6.0
Effective Green, g (s)	8.6	42.6			29.0	29.0	9.8	9.8	9.8	6.0		6.0
Actuated g/C Ratio	0.12	0.57			0.39	0.39	0.13	0.13	0.13	0.08		0.08
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	178	1762			1200	404	202	213	158	124		97
v/s Ratio Prot	c0.07	0.05			0.05		0.03	c0.05		c0.03		0.01
v/s Ratio Perm						c0.06			0.02			
v/c Ratio	0.58	0.09			0.12	0.15	0.26	0.38	0.16	0.31		0.10
Uniform Delay, d1	31.2	7.2			14.5	14.7	29.0	29.5	28.7	32.3		31.7
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	4.5	0.1			0.2	0.8	0.7	1.1	0.5	1.5		0.4
Delay (s)	35.7	7.3			14.7	15.5	29.7	30.7	29.2	33.7		32.1
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		18.2			15.1			29.6			32.5	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	74.4	Sum of lost time (s)	21.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
32: Illinois Street & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	25	32	2	34	5	33	12	2	1	13	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.94			0.98		1.00	0.98		1.00	0.91	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3165			1769		1711	1765		1711	1633	
Flt Permitted		0.92			0.99		1.00	1.00		1.00	1.00	
Satd. Flow (perm)		2936			1763		1801	1765		1801	1633	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	27	35	2	37	5	36	13	2	1	14	23
RTOR Reduction (vph)	0	11	0	0	2	0	0	2	0	0	21	0
Lane Group Flow (vph)	0	72	0	0	42	0	36	13	0	1	16	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		27.0			27.0		3.2	3.2		3.2	3.2	
Effective Green, g (s)		27.0			27.0		3.2	3.2		3.2	3.2	
Actuated g/C Ratio		0.69			0.69		0.08	0.08		0.08	0.08	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2022			1214		147	144		147	133	
v/s Ratio Prot								0.01			0.01	
v/s Ratio Perm		c0.02			0.02		c0.02			0.00		
v/c Ratio		0.04			0.03		0.24	0.09		0.01	0.12	
Uniform Delay, d1		1.9			1.9		16.9	16.7		16.5	16.7	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			0.1		0.9	0.3		0.0	0.4	
Delay (s)		2.0			2.0		17.7	16.9		16.6	17.1	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.0			2.0			17.5			17.1	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.06		
Actuated Cycle Length (s)	39.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	23.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT
BASKETBALL GAME
WITH SF GIANTS GAME AT AT&T PARK
WEEKDAY LATE EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	425	146	8	40	439	109	107	776	373	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.90			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.99		1.00	0.97			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (prot)	4480	3037		2987	2920			5485	1239			
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (perm)	4480	3037		2987	2920			5485	1239			
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	512	176	10	48	529	131	129	935	449	0	0	0
RTOR Reduction (vph)	0	3	0	0	11	0	0	0	303	0	0	0
Lane Group Flow (vph)	512	183	0	48	649	0	0	1064	146	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	24.3	49.3		6.1	31.1			35.7	35.7			
Effective Green, g (s)	24.3	49.3		6.1	31.1			35.7	35.7			
Actuated g/C Ratio	0.22	0.45		0.06	0.28			0.32	0.32			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	989	1361		165	825			1780	402			
v/s Ratio Prot	c0.11	0.06		0.02	c0.22							
v/s Ratio Perm								0.19	0.12			
v/c Ratio	0.52	0.13		0.29	0.79			0.60	0.36			
Uniform Delay, d1	37.7	17.8		49.9	36.4			31.1	28.4			
Progression Factor	1.00	1.00		0.96	0.40			1.46	5.78			
Incremental Delay, d2	0.5	0.2		0.3	1.6			0.5	0.5			
Delay (s)	38.2	18.0		48.2	16.2			46.1	164.8			
Level of Service	D	B		D	B			D	F			
Approach Delay (s)		32.8			18.3			81.3			0.0	
Approach LOS		C			B			F			A	

Intersection Summary			
HCM 2000 Control Delay	54.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	87	489	41	56	473	17	34	102	47	43	197	436
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.97		1.00	0.98			1.00	0.62	1.00	0.72	0.46
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.94	1.00	0.72	1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85	1.00	0.92	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4239		1296	2523			1508	842	1101	1943	562
Flt Permitted	0.95	1.00		0.95	1.00			0.55	1.00	0.60	1.00	1.00
Satd. Flow (perm)	1540	4239		1296	2523			837	842	694	1943	562
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	104	582	49	67	563	20	40	121	56	51	235	519
RTOR Reduction (vph)	0	6	0	0	2	0	0	0	44	0	200	199
Lane Group Flow (vph)	104	625	0	67	581	0	0	161	12	51	295	60
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	12.5	63.5		9.9	59.3			26.7	26.7	27.7	27.7	27.7
Effective Green, g (s)	12.5	63.5		9.9	59.3			26.7	26.7	27.7	27.7	27.7
Actuated g/C Ratio	0.10	0.53		0.08	0.49			0.22	0.22	0.23	0.23	0.23
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	160	2243		106	1246			186	187	160	448	129
v/s Ratio Prot	c0.07	0.15		c0.05	c0.23						0.15	
v/s Ratio Perm								c0.19	0.01	0.07		0.11
v/c Ratio	0.65	0.28		0.63	0.47			0.87	0.07	0.32	0.66	0.46
Uniform Delay, d1	51.6	15.6		53.3	20.0			44.9	36.8	38.3	41.9	39.7
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.1	0.3		11.7	0.3			31.7	0.2	1.2	3.5	2.6
Delay (s)	60.7	15.9		65.0	20.2			76.6	37.0	39.5	45.3	42.4
Level of Service	E	B		E	C			E	D	D	D	D
Approach Delay (s)		22.3			24.8			66.4			44.0	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	34.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	112.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

10/21/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	597	80	2	941	99	20
Ideal Flow (vphpl)	1400	1400	1000	1000	1400	1400
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2224			1620	1134	1000
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	2224			1546	1134	1000
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	711	95	2	1120	118	24
RTOR Reduction (vph)	10	0	0	0	0	16
Lane Group Flow (vph)	796	0	0	1122	118	8
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1255			872	377	332
v/s Ratio Prot	0.36				c0.10	
v/s Ratio Perm				c0.73		0.01
v/c Ratio	0.63			1.29	0.31	0.02
Uniform Delay, d1	16.3			23.9	27.3	24.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	2.5			137.7	2.2	0.1
Delay (s)	18.7			161.6	29.5	24.8
Level of Service	B			F	C	C
Approach Delay (s)	18.7			161.6	28.7	
Approach LOS	B			F	C	

Intersection Summary			
HCM 2000 Control Delay	96.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	97.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/22/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	19	302	53	13	179	395	159	98	235	116
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.98			1.00	0.97			0.99	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			0.99	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5745			2872	2470			4071	1122
Flt Permitted		1.00			0.90	1.00			0.95	1.00
Satd. Flow (perm)		5745			2600	2470			4071	1122
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	22	355	62	15	211	465	187	115	276	136
RTOR Reduction (vph)	0	40	0	0	0	50	0	0	0	0
Lane Group Flow (vph)	0	399	0	0	226	602	0	0	406	121
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		20.8			22.4	22.4			14.3	14.3
Effective Green, g (s)		22.8			25.4	25.4			17.3	17.3
Actuated g/C Ratio		0.30			0.34	0.34			0.23	0.23
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1746			880	836			939	258
v/s Ratio Prot						c0.24			0.10	c0.11
v/s Ratio Perm		0.07			0.09					
v/c Ratio		0.23			0.26	0.72			0.43	0.47
Uniform Delay, d1		19.5			18.0	21.7			24.7	24.9
Progression Factor		1.00			0.72	1.00			1.00	1.00
Incremental Delay, d2		0.1			0.1	3.1			0.3	1.3
Delay (s)		19.6			12.9	24.8			25.0	26.2
Level of Service		B			B	C			C	C
Approach Delay (s)		19.6			12.9	24.8			25.3	
Approach LOS		B			B	C			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/22/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	37	831	196	35	155	125	25	166	48	298
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.87		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.93		0.85		1.00	1.00
Flt Protected		0.95	0.97		1.00		1.00		0.95	0.99
Satd. Flow (prot)		1214	1864		2249		1161		1327	2543
Flt Permitted		0.95	0.97		1.00		1.00		0.47	0.91
Satd. Flow (perm)		1214	1864		2249		1161		658	2328
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	39	875	206	37	163	132	26	175	51	314
RTOR Reduction (vph)	0	0	9	0	1	0	18	0	0	0
Lane Group Flow (vph)	0	608	540	0	297	0	5	0	180	360
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		299	521		524		247		396	1044
v/s Ratio Prot		c0.50	0.29		c0.13				c0.08	0.06
v/s Ratio Perm							0.00		0.12	0.09
v/c Ratio		2.03	1.72dl		0.57		0.02		0.45	0.34
Uniform Delay, d1		28.2	27.0		25.4		23.3		18.1	14.2
Progression Factor		1.00	1.00		1.00		1.00		0.74	0.74
Incremental Delay, d2		476.6	49.0		4.4		0.1		2.9	0.7
Delay (s)		504.9	76.0		29.8		23.5		16.4	11.2
Level of Service		F	E		C		C		B	B
Approach Delay (s)			301.4		29.4					12.9
Approach LOS			F		C					B

Intersection Summary			
HCM 2000 Control Delay	180.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Warriors Arena 2015 Existing Plus Project (Basketball Game), Weekday Late Eve, With Giants Game — Synchro 8 Report
Fehr & Peers — Page 5

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	335	1	76	181	19	319	10	531	4	4	437	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1700	1700	1700	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	1.00		1.00	0.99	
Flt Protected		0.95	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1534	1354		2698		1377	2748		1540	3041	
Flt Permitted		0.33	1.00		0.65		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		535	1354		1776		1377	2748		1540	3041	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	409	1	93	221	23	389	12	648	5	5	533	38
RTOR Reduction (vph)	0	0	44	0	183	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	410	49	0	450	0	12	652	0	5	566	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		49.6	49.6		49.6		1.2	27.0		1.0	27.1	
Effective Green, g (s)		49.6	49.6		49.6		1.2	27.0		1.0	27.1	
Actuated g/C Ratio		0.53	0.53		0.53		0.01	0.29		0.01	0.29	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		283	718		942		17	793		16	881	
v/s Ratio Prot							0.01	c0.24		0.00	c0.19	
v/s Ratio Perm		c0.77	0.04		0.25							
v/c Ratio		1.45	0.07		0.48		0.71	0.82		0.31	0.64	
Uniform Delay, d1		21.9	10.7		13.8		46.0	31.0		45.9	29.0	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		220.7	0.0		0.4		72.3	6.9		4.0	1.6	
Delay (s)		242.7	10.7		14.2		118.3	37.9		49.9	30.6	
Level of Service		F	B		B		F	D		D	C	
Approach Delay (s)		199.8			14.2			39.4			30.8	
Approach LOS		F			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	64.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	93.5	Sum of lost time (s)	15.9
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Warriors Arena 2015 Existing Plus Project (Basketball Game), Weekday Late Eve, With Giants Game — Synchro 8 Report
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HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	282	20	5	11	44	4	28	64	65	71	23
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.98	1.00	0.97		1.00	0.94	
Flpb, ped/bikes		1.00			1.00	1.00	0.82	1.00		1.00	1.00	
Frt		0.99			1.00	0.85	1.00	0.90		1.00	0.96	
Flt Protected		1.00			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2566			1428	1202	1127	1254		1377	1316	
Flt Permitted		0.94			0.86	1.00	0.68	1.00		0.95	1.00	
Satd. Flow (perm)		2422			1251	1202	807	1254		1377	1316	
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Adj. Flow (vph)	22	357	25	6	14	56	5	35	81	82	90	29
RTOR Reduction (vph)	0	6	0	0	0	28	0	69	0	0	16	0
Lane Group Flow (vph)	0	398	0	0	20	28	5	47	0	82	103	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		12.9			12.9	21.2	6.1	6.1		8.3	19.4	
Effective Green, g (s)		12.9			12.9	21.2	6.1	6.1		8.3	19.4	
Actuated g/C Ratio		0.30			0.30	0.50	0.14	0.14		0.20	0.46	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		738			381	744	116	180		270	603	
v/s Ratio Prot						0.01		c0.04		c0.06	0.08	
v/s Ratio Perm		c0.16			0.02	0.02	0.01					
v/c Ratio		0.54			0.05	0.04	0.04	0.26		0.30	0.17	
Uniform Delay, d1		12.2			10.4	5.4	15.6	16.1		14.5	6.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			0.1	0.0	0.2	0.8		0.2	0.1	
Delay (s)		13.0			10.4	5.4	15.7	16.9		14.8	6.9	
Level of Service		B			B	A	B	B		B	A	
Approach Delay (s)		13.0			6.7			16.8			10.1	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	42.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	15	907	759	12	64	111
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1746	1535	842	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1746	1535	842	1134	1194
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	18	1080	904	14	76	132
RTOR Reduction (vph)	0	378	0	3	0	0
Lane Group Flow (vph)	18	702	904	11	76	132
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	47.3	47.3	47.2	42.2	11.6	63.8
Effective Green, g (s)	47.3	47.3	47.2	42.2	11.6	63.8
Actuated g/C Ratio	0.39	0.39	0.39	0.35	0.10	0.53
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	442	681	598	328	108	629
v/s Ratio Prot	0.02		c0.59	0.01	c0.07	0.11
v/s Ratio Perm		c0.40		0.01		
v/c Ratio	0.04	1.03	1.51	0.03	0.70	0.21
Uniform Delay, d1	22.9	36.9	36.9	26.0	53.1	15.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	42.7	238.8	0.0	18.7	0.2
Delay (s)	22.9	79.6	275.8	26.1	71.8	15.4
Level of Service	C	E	F	C	E	B
Approach Delay (s)	78.7		272.0			36.0
Approach LOS	E		F			D

Intersection Summary			
HCM 2000 Control Delay	154.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	121.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	332	293	4	21	432	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.96		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.94		1.00	1.00	0.98	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1585		1682	1531	3077	
Flt Permitted	0.97		0.23	1.00	1.00	
Satd. Flow (perm)	1585		404	1531	3077	
Peak-hour factor, PHF	0.67	0.67	0.67	0.67	0.67	0.67
Adj. Flow (vph)	496	437	6	31	645	85
RTOR Reduction (vph)	31	0	0	0	13	0
Lane Group Flow (vph)	902	0	6	31	717	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	45.2		25.6	25.6	25.6	
Effective Green, g (s)	45.2		25.6	25.6	25.6	
Actuated g/C Ratio	0.56		0.32	0.32	0.32	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	886		128	485	974	
v/s Ratio Prot	c0.57			0.02	c0.23	
v/s Ratio Perm			0.01			
v/c Ratio	1.02		0.05	0.06	0.74	
Uniform Delay, d1	17.8		19.1	19.2	24.6	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	34.9		0.2	0.1	2.9	
Delay (s)	52.7		19.3	19.3	27.5	
Level of Service	D		B	B	C	
Approach Delay (s)	52.7			19.3	27.5	
Approach LOS	D			B	C	

Intersection Summary			
HCM 2000 Control Delay	41.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	80.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/22/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	0	0	0	445
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.9
Lane Util. Factor						0.95
Frpb, ped/bikes						1.00
Flpb, ped/bikes						1.00
Frt						1.00
Flt Protected						1.00
Satd. Flow (prot)						3421
Flt Permitted						1.00
Satd. Flow (perm)						3421
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	0	511
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	511
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm			Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)						120.0
Effective Green, g (s)						120.0
Actuated g/C Ratio						1.00
Clearance Time (s)						4.9
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)						3421
v/s Ratio Prot						c0.15
v/s Ratio Perm						
v/c Ratio						0.15
Uniform Delay, d1						0.0
Progression Factor						1.00
Incremental Delay, d2						0.1
Delay (s)						0.1
Level of Service						A
Approach Delay (s)	0.0		0.0			0.1
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	0.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th
4/22/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	15	0	25	725	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0	
Lane Util. Factor		1.00		0.95	0.95	
Frpb, ped/bikes		0.97		1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	
Frt		0.85		1.00	1.00	
Flt Protected		1.00		1.00	1.00	
Satd. Flow (prot)		1338		2887	2887	
Flt Permitted		1.00		1.00	1.00	
Satd. Flow (perm)		1338		2887	2887	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	18	0	29	853	0
RTOR Reduction (vph)	0	18	0	0	0	0
Lane Group Flow (vph)	0	0	0	29	853	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)		0.7		19.7	19.7	
Effective Green, g (s)		0.7		19.7	19.7	
Actuated g/C Ratio		0.01		0.35	0.35	
Clearance Time (s)		5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0	
Lane Grp Cap (vph)		16		1022	1022	
v/s Ratio Prot				0.01	c0.30	
v/s Ratio Perm		c0.00				
v/c Ratio		0.01		0.03	0.83	
Uniform Delay, d1		27.1		11.7	16.5	
Progression Factor		1.00		1.00	1.00	
Incremental Delay, d2		0.4		0.0	6.0	
Delay (s)		27.5		11.7	22.4	
Level of Service		C		B	C	
Approach Delay (s)	27.5			11.7	22.4	
Approach LOS	C			B	C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	55.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	33	74	0	0	301	142
Peak Hour Factor	0.92	0.83	0.83	0.83	0.83	0.92	0.83	0.92	0.83	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0	40	80	0	0	327	154

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	0	0	0	0	120	327	154
Volume Left (vph)	0	0	0	0	40	0	0
Volume Right (vph)	0	0	0	0	0	0	154
Hadj (s)	0.00	0.00	0.00	0.00	0.10	0.03	-0.67
Departure Headway (s)	5.8	5.8	5.8	5.8	5.0	4.6	3.9
Degree Utilization, x	0.00	0.00	0.00	0.00	0.17	0.42	0.17
Capacity (veh/h)	577	577	577	577	705	768	905
Control Delay (s)	7.6	7.6	7.6	7.6	9.0	9.7	6.5
Approach Delay (s)	0.0		0.0		9.0	8.7	
Approach LOS	A		A		A	A	

Intersection Summary			
Delay	8.8		
Level of Service	A		
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰↰	↑↱		↰	↑↱	
Volume (vph)	0	0	120	0	175	0	149	0	0	0	304	141
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)			5.5		5.5		5.0				5.2	
Lane Util. Factor			1.00		1.00		0.97				0.95	
Frpb, ped/bikes			0.96		1.00		1.00				0.99	
Flpb, ped/bikes			1.00		1.00		1.00				1.00	
Frt			0.85		1.00		1.00				0.95	
Flt Protected			1.00		1.00		0.95				1.00	
Satd. Flow (prot)			1118		1365		2515				2452	
Flt Permitted			1.00		1.00		0.95				1.00	
Satd. Flow (perm)			1118		1365		2515				2452	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	141	0	206	0	175	0	0	0	358	166
RTOR Reduction (vph)	0	0	114	0	0	0	0	0	0	0	34	0
Lane Group Flow (vph)	0	0	27	0	206	0	175	0	0	0	490	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm		Perm	Perm	NA	Perm	Prot			Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)			23.4		23.4		13.6				67.3	
Effective Green, g (s)			23.4		23.4		13.6				67.3	
Actuated g/C Ratio			0.19		0.19		0.11				0.56	
Clearance Time (s)			5.5		5.5		5.0				5.2	
Vehicle Extension (s)			3.0		3.0		3.0				3.0	
Lane Grp Cap (vph)			218		266		285				1375	
v/s Ratio Prot					c0.15		c0.07				c0.20	
v/s Ratio Perm			0.02									
v/c Ratio			0.13		0.77		0.61				0.36	
Uniform Delay, d1			39.9		45.8		50.7				14.5	
Progression Factor			1.00		1.00		1.00				1.00	
Incremental Delay, d2			0.3		13.1		3.9				0.2	
Delay (s)			40.1		58.9		54.6				14.6	
Level of Service			D		E		D				B	
Approach Delay (s)		40.1			58.9			54.6			14.6	
Approach LOS		D			E			D			B	

Intersection Summary			
HCM 2000 Control Delay	33.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↱		↰	↑↱	
Volume (vph)	102	94	2	3	447	14	4	6	1	25	2	73
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.91	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1239	1621	1674		1481	1355	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.70	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1239	1198	1674		1173	1355	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	115	106	2	3	502	16	4	7	1	28	2	82
RTOR Reduction (vph)	0	0	1	0	0	9	0	1	0	0	61	0
Lane Group Flow (vph)	115	106	1	3	502	7	4	7	0	28	23	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.9	47.4	47.4	2.7	39.2	39.2	21.9	21.9		21.9	21.9	
Effective Green, g (s)	10.9	47.4	47.4	2.7	39.2	39.2	21.9	21.9		21.9	21.9	
Actuated g/C Ratio	0.13	0.54	0.54	0.03	0.45	0.45	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	203	929	790	50	768	558	301	421		295	341	
v/s Ratio Prot	c0.07	0.06		0.00	c0.29			0.00			0.02	
v/s Ratio Perm			0.00			0.01	0.00			c0.02		
v/c Ratio	0.57	0.11	0.00	0.06	0.65	0.01	0.01	0.02		0.09	0.07	
Uniform Delay, d1	35.8	9.6	9.0	40.9	18.6	13.2	24.4	24.5		25.0	24.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.6	0.2	0.0	0.5	2.0	0.0	0.0	0.0		0.1	0.1	
Delay (s)	39.4	9.9	9.0	41.4	20.6	13.2	24.5	24.5		25.1	24.9	
Level of Service	D	A	A	D	C	B	C	C		C	C	
Approach Delay (s)		25.1			20.5			24.5			24.9	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	87.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	74.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	147	6	11	504	8	29	193	14	35	339	141
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1049	1540	3048			3065	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.37	1.00			0.89	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1049	595	3048			2752	1072
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	15	179	7	13	615	10	35	235	17	43	413	172
RTOR Reduction (vph)	0	0	3	0	0	4	0	6	0	0	0	132
Lane Group Flow (vph)	15	179	4	13	615	6	35	246	0	0	456	40
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	0.7	53.4	53.4	0.8	52.5	52.5	22.0	22.0			21.0	21.0
Effective Green, g (s)	0.7	53.4	53.4	0.8	52.5	52.5	22.0	22.0			21.0	21.0
Actuated g/C Ratio	0.01	0.60	0.60	0.01	0.59	0.59	0.25	0.25			0.24	0.24
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	9	727	824	13	715	617	146	751			647	252
v/s Ratio Prot	c0.01	0.15		0.01	c0.51			0.08				
v/s Ratio Perm			0.00			0.01	0.06				c0.17	0.04
v/c Ratio	1.67	0.25	0.01	1.00	0.86	0.01	0.24	0.33			0.70	0.16
Uniform Delay, d1	44.2	8.4	7.2	44.2	15.3	7.6	26.9	27.5			31.3	27.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	565.3	0.2	0.0	249.6	10.3	0.0	0.9	0.3			3.5	0.3
Delay (s)	609.6	8.6	7.2	293.8	25.6	7.6	27.8	27.8			34.8	27.4
Level of Service	F	A	A	F	C	A	C	C			C	C
Approach Delay (s)		53.4			30.8			27.8			32.7	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	33.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	89.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.
4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	118	59	25	334	315	19	123	9	38	51	13
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.91	1.00	1.00	0.96	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1334	897		1330	1126	875	1070	957	921	1070	1078	
Flt Permitted	0.16	1.00		0.60	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	218	897		833	1126	875	1070	957	921	1070	1078	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	18	142	71	30	402	380	23	148	11	46	61	16
RTOR Reduction (vph)	0	19	0	0	0	188	0	0	8	0	8	0
Lane Group Flow (vph)	18	194	0	30	402	192	23	148	3	46	69	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	31.4	31.4		34.5	34.5	44.0	5.5	22.0	22.0	9.5	26.0	
Effective Green, g (s)	31.4	31.4		34.5	34.5	44.0	5.5	22.0	22.0	9.5	26.0	
Actuated g/C Ratio	0.36	0.36		0.40	0.40	0.50	0.06	0.25	0.25	0.11	0.30	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	93	323		354	445	491	67	241	232	116	321	
v/s Ratio Prot	0.00	c0.22		0.00	c0.36	c0.04	0.02	c0.15		0.04	0.06	
v/s Ratio Perm	0.07			0.03		0.18			0.00			
v/c Ratio	0.19	0.60		0.08	0.90	0.39	0.34	0.61	0.01	0.40	0.21	
Uniform Delay, d1	20.6	22.8		16.5	24.8	13.3	39.1	28.8	24.4	36.2	22.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	3.1		0.1	21.3	0.5	3.1	4.6	0.0	2.2	0.3	
Delay (s)	21.6	25.9		16.6	46.1	13.8	42.2	33.4	24.5	38.4	23.3	
Level of Service	C	C		B	D	B	D	C	C	D	C	
Approach Delay (s)		25.6			29.9			34.0			28.9	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	87.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

10/21/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	36	10	602	154	12	5	17	13	2	10	307
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.97	
Flpb, ped/bikes		0.99		0.97	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.87	
Flt Protected		0.97		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1441		1667	1775			1779	1489		1288	
Flt Permitted		0.73		0.68	1.00			0.77	1.00		1.00	
Satd. Flow (perm)		1083		1188	1775			1390	1489		1287	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	97	46	13	772	197	15	6	22	17	3	13	394
RTOR Reduction (vph)	0	3	0	0	2	0	0	0	14	0	326	0
Lane Group Flow (vph)	0	153	0	772	210	0	0	28	3	0	84	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		52.6		52.6	52.6			15.9	15.9		15.9	
Effective Green, g (s)		52.6		52.6	52.6			15.9	15.9		15.9	
Actuated g/C Ratio		0.57		0.57	0.57			0.17	0.17		0.17	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		614		674	1007			238	255		220	
v/s Ratio Prot					0.12							
v/s Ratio Perm		0.14		c0.65				0.02	0.00		c0.06	
v/c Ratio		0.25		1.15	0.21			0.12	0.01		0.38	
Uniform Delay, d1		10.1		20.1	9.8			32.5	31.9		34.0	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.2		82.2	0.1			0.2	0.0		1.1	
Delay (s)		10.3		102.2	9.9			32.7	31.9		35.1	
Level of Service		B		F	A			C	C		D	
Approach Delay (s)		10.3			82.3			32.4			35.1	
Approach LOS		B			F			C			D	

Intersection Summary			
HCM 2000 Control Delay	61.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	92.7	Sum of lost time (s)	14.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	78	23	31	428	7	100	105	9	34	134	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.99	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.99		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1686	3275		1676	3411		1260	2482		1260	2221	
Flt Permitted	0.34	1.00		0.67	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	609	3275		1190	3411		1260	2482		1260	2221	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	45	94	28	37	516	8	120	127	11	41	161	307
RTOR Reduction (vph)	0	20	0	0	1	0	0	7	0	0	130	0
Lane Group Flow (vph)	45	102	0	37	523	0	120	131	0	41	338	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	180	972		353	1013		212	990		187	841	
v/s Ratio Prot		0.03			c0.15		c0.10	0.05		0.03	c0.15	
v/s Ratio Perm	0.07			0.03								
v/c Ratio	0.25	0.11		0.10	0.52		0.57	0.13		0.22	0.40	
Uniform Delay, d1	26.7	25.5		25.5	29.2		38.2	19.1		37.4	22.7	
Progression Factor	1.00	1.00		1.00	1.00		0.84	0.76		1.00	1.00	
Incremental Delay, d2	3.3	0.2		0.6	1.9		6.9	0.2		2.7	1.4	
Delay (s)	30.0	25.7		26.1	31.1		38.8	14.7		40.1	24.2	
Level of Service	C	C		C	C		D	B		D	C	
Approach Delay (s)		26.9			30.7			25.9			25.5	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱			✢		↰	↱	
Volume (vph)	6	128	11	3	869	3	13	0	4	9	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.97		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3380		1711	3420			1681		1711	1531	
Flt Permitted	0.27	1.00		0.66	1.00			0.80		0.75	1.00	
Satd. Flow (perm)	487	3380		1182	3420			1399		1343	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	139	12	3	945	3	14	0	4	10	0	11
RTOR Reduction (vph)	0	6	0	0	0	0	0	14	0	0	9	0
Lane Group Flow (vph)	7	145	0	3	948	0	0	4	0	10	2	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	18.1	18.1		18.1	18.1			7.9		7.9	7.9	
Effective Green, g (s)	18.1	18.1		18.1	18.1			7.9		7.9	7.9	
Actuated g/C Ratio	0.50	0.50		0.50	0.50			0.22		0.22	0.22	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	244	1699		594	1719			307		294	335	
v/s Ratio Prot		0.04			c0.28						0.00	
v/s Ratio Perm	0.01			0.00				0.00		c0.01		
v/c Ratio	0.03	0.09		0.01	0.55			0.01		0.03	0.01	
Uniform Delay, d1	4.5	4.6		4.5	6.2			11.0		11.0	11.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.0		0.0	0.4			0.0		0.0	0.0	
Delay (s)	4.6	4.7		4.5	6.5			11.0		11.1	11.0	
Level of Service	A	A		A	A			B		B	B	
Approach Delay (s)		4.7			6.5			11.0			11.0	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	36.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	40.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/22/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑			↑↑↱		↰	↑↱				↱↱
Volume (vph)	12	43	0	0	809	14	70	31	126	0	0	449
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			1.00		1.00	0.88				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3384			5119		1711	3009				2694
Flt Permitted		0.85			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2917			5119		1711	3009				2694
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	14	50	0	0	941	16	81	36	147	0	0	522
RTOR Reduction (vph)	0	0	0	0	3	0	0	87	0	0	0	495
Lane Group Flow (vph)	0	64	0	0	954	0	81	96	0	0	0	27
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1387			1784		697	1227				141
v/s Ratio Prot		0.00			c0.19		c0.05	0.03				c0.01
v/s Ratio Perm		0.02										
v/c Ratio		0.05			0.53		0.12	0.08				0.19
Uniform Delay, d1		11.0			19.8		14.0	13.8				34.5
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			1.2		0.3	0.1				3.1
Delay (s)		11.1			21.0		14.3	13.9				37.5
Level of Service		B			C		B	B				D
Approach Delay (s)		11.1			21.0			14.0			37.5	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	55	196	1121	207	0	0
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	*0.85	*0.85	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.91	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1091	1007	2620	1422		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1091	1007	2620	1422		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	65	233	1335	246	0	0
RTOR Reduction (vph)	4	4	0	0	0	0
Lane Group Flow (vph)	150	140	1335	246	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	18.4	18.4	31.6	60.0		
Effective Green, g (s)	18.4	18.4	31.6	60.0		
Actuated g/C Ratio	0.31	0.31	0.53	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	334	308	1379	1422		
v/s Ratio Prot	0.14		c0.51	0.17		
v/s Ratio Perm		c0.14				
v/c Ratio	0.45	0.45	0.97	0.17		
Uniform Delay, d1	16.7	16.8	13.7	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	1.0	1.1	17.0	0.1		
Delay (s)	17.7	17.8	30.7	0.1		
Level of Service	B	B	C	A		
Approach Delay (s)	17.7			25.9	0.0	
Approach LOS	B			C	A	

Intersection Summary			
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	42	85	6	191	1	105	87	5	0	178	276
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5			5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95			0.95	
Frpb, ped/bikes	1.00	0.91		1.00	1.00		1.00	0.99			0.92	
Flpb, ped/bikes	0.97	1.00		0.90	1.00		1.00	1.00			1.00	
Frt	1.00	0.90		1.00	1.00		1.00	0.99			0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1183	1866		1096	1278		1215	2391			2039	
Flt Permitted	0.36	1.00		0.66	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	452	1866		764	1278		1215	2391			2039	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	27	47	94	7	212	1	117	97	6	0	198	307
RTOR Reduction (vph)	0	66	0	0	0	0	0	2	0	0	176	0
Lane Group Flow (vph)	27	75	0	7	213	0	117	101	0	0	329	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.2	36.2		25.1	25.1		16.3	73.0			51.2	
Effective Green, g (s)	36.2	36.2		25.1	25.1		16.3	73.0			51.2	
Actuated g/C Ratio	0.30	0.30		0.21	0.21		0.14	0.61			0.43	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5			5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	171	562		159	267		165	1454			869	
v/s Ratio Prot	0.01	c0.04			c0.17		c0.10	0.04			c0.16	
v/s Ratio Perm	0.04			0.01								
v/c Ratio	0.16	0.13		0.04	0.80		0.71	0.07			0.38	
Uniform Delay, d1	30.6	30.5		37.9	45.0		49.6	9.6			23.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.4	0.1		0.1	15.2		13.1	0.1			1.3	
Delay (s)	31.1	30.6		38.0	60.2		62.6	9.7			24.8	
Level of Service	C	C		D	E		E	A			C	
Approach Delay (s)		30.7			59.5			37.9			24.8	
Approach LOS		C			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	35.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	82	464	444	269
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	89	504	483	292
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			534			
pX, platoon unblocked						
vC, conflicting volume	1347	45			89	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1347	45			89	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			68	
cM capacity (veh/h)	97	1016			1504	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	45	45	504	483	292
Volume Left	0	0	0	483	0
Volume Right	0	0	504	0	0
cSH	1700	1700	1700	1504	1700
Volume to Capacity	0.03	0.03	0.30	0.32	0.17
Queue Length 95th (ft)	0	0	0	35	0
Control Delay (s)	0.0	0.0	0.0	8.5	0.0
Lane LOS				A	
Approach Delay (s)	0.0			5.3	
Approach LOS					

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	60.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	99	79	0	95	112
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	108	86	0	103	122
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	86				140	86
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	86				140	86
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				88	87
cM capacity (veh/h)	1508				839	956

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	54	54	86	225
Volume Left	0	0	0	103
Volume Right	0	0	0	122
cSH	1700	1700	1700	898
Volume to Capacity	0.03	0.03	0.05	0.25
Queue Length 95th (ft)	0	0	0	25
Control Delay (s)	0.0	0.0	0.0	10.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.3
Approach LOS				B

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	91	103	79	273	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	112	86	297	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	383				340	86
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	383				340	86
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				100	100
cM capacity (veh/h)	1172				577	956

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	136	75	86	297	0
Volume Left	99	0	0	0	0
Volume Right	0	0	0	297	0
cSH	1172	1700	1700	1700	1700
Volume to Capacity	0.08	0.04	0.05	0.17	0.00
Queue Length 95th (ft)	7	0	0	0	0
Control Delay (s)	6.3	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	4.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	9	6	89	34	14	26	141	15	10	334	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.99		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1536			1548		1540	3035		1540	3054	
Flt Permitted		0.88			0.79		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1383			1255		1540	3035		1540	3054	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	10	7	97	37	15	28	153	16	11	363	21
RTOR Reduction (vph)	0	6	0	0	3	0	0	4	0	0	2	0
Lane Group Flow (vph)	0	24	0	0	146	0	28	165	0	11	382	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		19.2			19.2		4.8	81.4		4.2	80.8	
Effective Green, g (s)		19.2			19.2		4.8	81.4		4.2	80.8	
Actuated g/C Ratio		0.16			0.16		0.04	0.68		0.04	0.67	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		221			200		61	2058		53	2056	
v/s Ratio Prot							c0.02	0.05		0.01	c0.12	
v/s Ratio Perm		0.02			c0.12							
v/c Ratio		0.11			0.73		0.46	0.08		0.21	0.19	
Uniform Delay, d1		43.1			47.9		56.3	6.6		56.3	7.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			12.4		2.0	0.1		0.7	0.2	
Delay (s)		43.3			60.4		58.3	6.6		57.0	7.5	
Level of Service		D			E		E	A		E	A	
Approach Delay (s)		43.3			60.4			14.0			8.9	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	310	12	75	0	0	116
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	337	13	82	0	0	126

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	168	168	13	41	41	126
Volume Left (vph)	168	168	0	0	0	0
Volume Right (vph)	0	0	13	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.6	5.6	3.2	5.6	5.6	5.3
Degree Utilization, x	0.26	0.26	0.01	0.06	0.06	0.19
Capacity (veh/h)	619	624	1121	605	604	639
Control Delay (s)	9.4	9.4	5.0	7.8	7.8	9.6
Approach Delay (s)	9.2			7.8		9.6
Approach LOS	A			A		A

Intersection Summary			
Delay	9.1		
Level of Service	A		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	40	72	0	0	408	55	10	91	9	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	78	0	0	443	60	11	99	10	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	122	503	60	59
Volume Left (vph)	43	0	11	0
Volume Right (vph)	0	60	0	10
Hadj (s)	0.11	-0.04	0.12	-0.08
Departure Headway (s)	4.9	4.4	6.0	5.8
Degree Utilization, x	0.17	0.61	0.10	0.10
Capacity (veh/h)	700	805	544	561
Control Delay (s)	8.9	14.0	8.5	8.3
Approach Delay (s)	8.9	14.0	8.4	
Approach LOS	A	B	A	

Intersection Summary			
Delay	12.2		
Level of Service	B		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	16	41	30	355	1	32	113	1	0	424	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.91			1.00		1.00	1.00			0.96	
Flpb, ped/bikes		0.99			0.99		1.00	1.00			1.00	
Frt		0.92			1.00		1.00	1.00			0.98	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1171			1599		1540	2259			2147	
Flt Permitted		0.94			0.97		0.95	1.00			1.00	
Satd. Flow (perm)		1111			1563		1540	2259			2147	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	9	17	43	32	374	1	34	119	1	0	446	54
RTOR Reduction (vph)	0	28	0	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	41	0	0	407	0	34	120	0	0	495	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		41.4			41.4		5.7	68.3			57.5	
Effective Green, g (s)		41.4			41.4		5.7	68.3			57.5	
Actuated g/C Ratio		0.34			0.34		0.05	0.57			0.48	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		383			539		73	1285			1028	
v/s Ratio Prot							c0.02	0.05			c0.23	
v/s Ratio Perm		0.04			c0.26							
v/c Ratio		0.11			0.76		0.47	0.09			0.48	
Uniform Delay, d1		26.7			34.8		55.7	11.8			21.2	
Progression Factor		1.00			1.00		1.17	1.38			1.00	
Incremental Delay, d2		0.1			6.0		4.6	0.1			1.6	
Delay (s)		26.8			40.8		69.9	16.3			22.8	
Level of Service		C			D		E	B			C	
Approach Delay (s)		26.8			40.8			28.1			22.8	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	123	0	0	152	423	24	65	143	32	0	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1035	1540	1621	1199	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1035	1540	1621	1199	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	61	129	0	0	160	445	25	68	151	34	0	249
RTOR Reduction (vph)	0	0	0	0	0	255	0	0	133	0	0	223
Lane Group Flow (vph)	61	129	0	0	160	190	25	68	18	34	0	26
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	5.7	43.3			32.6	32.6	9.2	9.2	9.2	8.0		8.0
Effective Green, g (s)	5.7	43.3			32.6	32.6	9.2	9.2	9.2	8.0		8.0
Actuated g/C Ratio	0.07	0.57			0.43	0.43	0.12	0.12	0.12	0.10		0.10
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	114	1742			1312	441	185	194	144	161		126
v/s Ratio Prot	c0.04	0.04			0.05		0.02	c0.04		c0.02		0.02
v/s Ratio Perm						c0.18			0.02			
v/c Ratio	0.54	0.07			0.12	0.43	0.14	0.35	0.13	0.21		0.21
Uniform Delay, d1	34.1	7.5			13.3	15.4	30.1	30.9	30.1	31.4		31.3
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	4.8	0.1			0.2	3.0	0.3	1.1	0.4	0.7		0.8
Delay (s)	38.9	7.6			13.5	18.5	30.4	32.0	30.5	32.0		32.2
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		17.6			17.1			30.9			32.1	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	18	50	0	18	3	24	17	1	1	45	186
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.91			0.98		1.00	0.99		1.00	0.88	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3095			1769		1711	1786		1711	1583	
Flt Permitted		0.92			1.00		0.57	1.00		0.75	1.00	
Satd. Flow (perm)		2879			1769		1031	1786		1341	1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	20	54	0	20	3	26	18	1	1	49	202
RTOR Reduction (vph)	0	23	0	0	1	0	0	1	0	0	164	0
Lane Group Flow (vph)	0	72	0	0	22	0	26	18	0	1	87	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		21.0			21.0		7.0	7.0		7.0	7.0	
Effective Green, g (s)		21.0			21.0		7.0	7.0		7.0	7.0	
Actuated g/C Ratio		0.57			0.57		0.19	0.19		0.19	0.19	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1634			1004		195	337		253	299	
v/s Ratio Prot					0.01			0.01			c0.06	
v/s Ratio Perm		c0.02					0.03			0.00		
v/c Ratio		0.04			0.02		0.13	0.05		0.00	0.29	
Uniform Delay, d1		3.5			3.5		12.5	12.3		12.2	12.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.0		0.3	0.1		0.0	0.5	
Delay (s)		3.6			3.5		12.8	12.4		12.2	13.4	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		3.6			3.5			12.6			13.4	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.11		
Actuated Cycle Length (s)	37.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT WITH M-TR-11C
BASKETBALL GAME
WITH SF GIANTS GAME AT AT&T PARK
WEEKDAY LATE EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰↰	↑↱		↰↰	↑↱			↰↑↑↑	↱			
Volume (vph)	406	145	8	40	439	109	107	697	308	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.98			1.00	0.90			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.99		1.00	0.97			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (prot)	4480	3037		2987	2920			5476	1239			
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00			
Satd. Flow (perm)	4480	3037		2987	2920			5476	1239			
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	489	175	10	48	529	131	129	840	371	0	0	0
RTOR Reduction (vph)	0	3	0	0	14	0	0	0	259	0	0	0
Lane Group Flow (vph)	489	182	0	48	646	0	0	969	112	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	25.1	51.9		6.1	32.9			33.1	33.1			
Effective Green, g (s)	25.1	51.9		6.1	32.9			33.1	33.1			
Actuated g/C Ratio	0.23	0.47		0.06	0.30			0.30	0.30			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	1022	1432		165	873			1647	372			
v/s Ratio Prot	c0.11	0.06		0.02	c0.22							
v/s Ratio Perm								0.18	0.09			
v/c Ratio	0.48	0.13		0.29	0.74			0.59	0.30			
Uniform Delay, d1	36.8	16.3		49.9	34.7			32.7	29.5			
Progression Factor	1.00	1.00		1.01	0.37			1.45	5.98			
Incremental Delay, d2	0.4	0.2		0.3	1.0			0.5	0.4			
Delay (s)	37.1	16.5		50.7	13.9			47.8	177.0			
Level of Service	D	B		D	B			D	F			
Approach Delay (s)		31.5			16.4			83.6			0.0	
Approach LOS		C			B			F			A	

Intersection Summary			
HCM 2000 Control Delay	53.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↱			↰↑	↱	↰	↑↱	↱
Volume (vph)	87	494	41	56	473	17	13	102	22	43	197	436
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.97		1.00	0.98			1.00	0.62	1.00	0.72	0.46
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.97	1.00	0.70	1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85	1.00	0.92	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4241		1296	2523			1570	842	1076	1943	562
Flt Permitted	0.95	1.00		0.95	1.00			0.83	1.00	0.65	1.00	1.00
Satd. Flow (perm)	1540	4241		1296	2523			1313	842	735	1943	562
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	104	588	49	67	563	20	15	121	26	51	235	519
RTOR Reduction (vph)	0	6	0	0	2	0	0	0	20	0	201	200
Lane Group Flow (vph)	104	631	0	67	581	0	0	136	6	51	294	59
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	12.5	63.8		9.9	59.6			26.4	26.4	27.4	27.4	27.4
Effective Green, g (s)	12.5	63.8		9.9	59.6			26.4	26.4	27.4	27.4	27.4
Actuated g/C Ratio	0.10	0.53		0.08	0.50			0.22	0.22	0.23	0.23	0.23
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	160	2254		106	1253			288	185	167	443	128
v/s Ratio Prot	c0.07	0.15		c0.05	c0.23						c0.15	
v/s Ratio Perm								0.10	0.01	0.07		0.11
v/c Ratio	0.65	0.28		0.63	0.46			0.47	0.03	0.31	0.66	0.46
Uniform Delay, d1	51.6	15.5		53.3	19.8			40.7	36.8	38.4	42.1	39.9
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.1	0.3		11.7	0.3			1.2	0.1	1.0	3.7	2.6
Delay (s)	60.7	15.8		65.0	20.0			42.0	36.8	39.4	45.9	42.6
Level of Service	E	B		E	C			D	D	D	D	D
Approach Delay (s)		22.1			24.7			41.1			44.4	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	31.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	112.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

10/21/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	602	80	2	920	99	20
Ideal Flow (vphpl)	1400	1400	1000	1000	1400	1400
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	2224			1620	1134	1000
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	2224			1546	1134	1000
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	717	95	2	1095	118	24
RTOR Reduction (vph)	10	0	0	0	0	16
Lane Group Flow (vph)	802	0	0	1097	118	8
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	1255			872	377	332
v/s Ratio Prot	0.36				c0.10	
v/s Ratio Perm				c0.71		0.01
v/c Ratio	0.64			1.26	0.31	0.02
Uniform Delay, d1	16.3			23.9	27.3	24.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	2.5			125.4	2.2	0.1
Delay (s)	18.8			149.4	29.5	24.8
Level of Service	B			F	C	C
Approach Delay (s)	18.8			149.4	28.7	
Approach LOS	B			F	C	

Intersection Summary			
HCM 2000 Control Delay	89.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

9/18/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	19	302	53	13	179	395	159	98	235	116
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.98			1.00	0.97			0.99	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			0.99	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5745			2872	2470			4071	1122
Flt Permitted		1.00			0.90	1.00			0.95	1.00
Satd. Flow (perm)		5745			2600	2470			4071	1122
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	22	355	62	15	211	465	187	115	276	136
RTOR Reduction (vph)	0	40	0	0	0	50	0	0	0	0
Lane Group Flow (vph)	0	399	0	0	226	602	0	0	406	121
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		20.8			22.4	22.4			14.3	14.3
Effective Green, g (s)		22.8			25.4	25.4			17.3	17.3
Actuated g/C Ratio		0.30			0.34	0.34			0.23	0.23
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1746			880	836			939	258
v/s Ratio Prot						c0.24			0.10	c0.11
v/s Ratio Perm		0.07			0.09					
v/c Ratio		0.23			0.26	0.72			0.43	0.47
Uniform Delay, d1		19.5			18.0	21.7			24.7	24.9
Progression Factor		1.00			0.72	1.00			1.00	1.00
Incremental Delay, d2		0.1			0.1	3.1			0.3	1.3
Delay (s)		19.6			12.9	24.8			25.0	26.2
Level of Service		B			B	C			C	C
Approach Delay (s)		19.6			12.9	24.8			25.3	
Approach LOS		B			B	C			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

9/18/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	37	924	212	35	155	125	25	166	48	298
Ideal Flow (vphpl)	1000	1000	1000	1000	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.87		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.93		0.85		1.00	1.00
Flt Protected		0.95	0.97		1.00		1.00		0.95	0.99
Satd. Flow (prot)		1214	1866		2249		1161		1327	2543
Flt Permitted		0.95	0.97		1.00		1.00		0.47	0.91
Satd. Flow (perm)		1214	1866		2249		1161		658	2328
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	39	973	223	37	163	132	26	175	51	314
RTOR Reduction (vph)	0	0	9	0	1	0	18	0	0	0
Lane Group Flow (vph)	0	671	592	0	297	0	5	0	180	360
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		299	522		524		247		396	1044
v/s Ratio Prot		c0.55	0.32		c0.13				c0.08	0.06
v/s Ratio Perm							0.00		0.12	0.09
v/c Ratio		2.24	1.93dl		0.57		0.02		0.45	0.34
Uniform Delay, d1		28.2	27.0		25.4		23.3		18.1	14.2
Progression Factor		1.00	1.00		1.00		1.00		0.74	0.74
Incremental Delay, d2		570.5	82.1		4.4		0.1		2.9	0.7
Delay (s)		598.8	109.1		29.8		23.5		16.4	11.2
Level of Service		F	F		C		C		B	B
Approach Delay (s)			367.4		29.4					12.9
Approach LOS			F		C					B

Intersection Summary			
HCM 2000 Control Delay	226.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	261	1	75	181	19	319	10	460	4	4	437	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1700	1700	1700	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	1.00		1.00	0.99	
Flt Protected		0.95	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1534	1354		2698		1377	2747		1540	3041	
Flt Permitted		0.34	1.00		0.70		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		545	1354		1921		1377	2747		1540	3041	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	318	1	91	221	23	389	12	561	5	5	533	38
RTOR Reduction (vph)	0	0	41	0	174	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	319	50	0	459	0	12	565	0	5	566	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		49.8	49.8		49.8		1.2	23.6		1.0	23.7	
Effective Green, g (s)		49.8	49.8		49.8		1.2	23.6		1.0	23.7	
Actuated g/C Ratio		0.55	0.55		0.55		0.01	0.26		0.01	0.26	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		300	746		1059		18	717		17	798	
v/s Ratio Prot							0.01	c0.21		0.00	c0.19	
v/s Ratio Perm		c0.59	0.04		0.24							
v/c Ratio		1.06	0.07		0.43		0.67	0.79		0.29	0.71	
Uniform Delay, d1		20.2	9.4		11.9		44.4	31.0		44.3	30.2	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		69.7	0.0		0.3		54.1	5.8		3.5	2.9	
Delay (s)		89.9	9.5		12.2		98.4	36.8		47.8	33.1	
Level of Service		F	A		B		F	D		D	C	
Approach Delay (s)		72.1			12.2			38.1			33.2	
Approach LOS		E			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	35.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.3	Sum of lost time (s)	15.9
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	208	20	5	11	44	4	28	64	64	71	12
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.98	1.00	0.97		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00	0.82	1.00		1.00	1.00	
Frt		0.99			1.00	0.85	1.00	0.90		1.00	0.98	
Flt Protected		1.00			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2554			1428	1205	1135	1256		1377	1373	
Flt Permitted		0.94			0.87	1.00	0.69	1.00		0.95	1.00	
Satd. Flow (perm)		2401			1258	1205	824	1256		1377	1373	
Peak-hour factor, PHF	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Adj. Flow (vph)	22	263	25	6	14	56	5	35	81	81	90	15
RTOR Reduction (vph)	0	8	0	0	0	29	0	69	0	0	8	0
Lane Group Flow (vph)	0	302	0	0	20	27	5	47	0	81	97	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		10.9			10.9	19.0	6.1	6.1		8.1	19.2	
Effective Green, g (s)		10.9			10.9	19.0	6.1	6.1		8.1	19.2	
Actuated g/C Ratio		0.27			0.27	0.47	0.15	0.15		0.20	0.48	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		652			341	721	125	191		278	657	
v/s Ratio Prot						0.01		c0.04		c0.06	0.07	
v/s Ratio Perm		c0.13			0.02	0.01	0.01					
v/c Ratio		0.46			0.06	0.04	0.04	0.25		0.29	0.15	
Uniform Delay, d1		12.2			10.8	5.6	14.5	15.0		13.6	5.9	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5			0.1	0.0	0.1	0.7		0.2	0.1	
Delay (s)		12.7			10.9	5.7	14.6	15.7		13.8	6.0	
Level of Service		B			B	A	B	B		B	A	
Approach Delay (s)		12.7			7.0			15.6			9.4	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	40.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	15	673	787	12	64	111
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1746	1535	846	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1746	1535	846	1134	1194
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	18	801	937	14	76	132
RTOR Reduction (vph)	0	473	0	2	0	0
Lane Group Flow (vph)	18	328	937	12	76	132
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	22.3	22.3	49.4	44.4	10.1	64.5
Effective Green, g (s)	22.3	22.3	49.4	44.4	10.1	64.5
Actuated g/C Ratio	0.23	0.23	0.51	0.46	0.10	0.67
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	261	402	783	431	118	795
v/s Ratio Prot	0.02		c0.61	0.01	c0.07	0.11
v/s Ratio Perm		c0.19		0.01		
v/c Ratio	0.07	0.82	1.20	0.03	0.64	0.17
Uniform Delay, d1	29.1	35.3	23.7	14.4	41.6	6.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	12.0	100.8	0.0	11.4	0.1
Delay (s)	29.2	47.3	124.5	14.4	53.1	6.2
Level of Service	C	D	F	B	D	A
Approach Delay (s)	46.9		122.9			23.3
Approach LOS	D		F			C

Intersection Summary			
HCM 2000 Control Delay	80.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	96.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	301	260	4	36	432	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.97		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.94		1.00	1.00	0.98	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1587		1682	1531	3077	
Flt Permitted	0.97		0.23	1.00	1.00	
Satd. Flow (perm)	1587		404	1531	3077	
Peak-hour factor, PHF	0.67	0.67	0.67	0.67	0.67	0.67
Adj. Flow (vph)	449	388	6	54	645	85
RTOR Reduction (vph)	30	0	0	0	13	0
Lane Group Flow (vph)	807	0	6	54	717	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	45.2		25.6	25.6	25.6	
Effective Green, g (s)	45.2		25.6	25.6	25.6	
Actuated g/C Ratio	0.56		0.32	0.32	0.32	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	887		128	485	974	
v/s Ratio Prot	c0.51			0.04	c0.23	
v/s Ratio Perm			0.01			
v/c Ratio	0.91		0.05	0.11	0.74	
Uniform Delay, d1	16.0		19.1	19.5	24.6	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	13.0		0.2	0.1	2.9	
Delay (s)	28.9		19.3	19.6	27.5	
Level of Service	C		B	B	C	
Approach Delay (s)	28.9			19.6	27.5	
Approach LOS	C			B	C	

Intersection Summary			
HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	80.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	0	0	0	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)						4.9
Lane Util. Factor						0.95
Frpb, ped/bikes						1.00
Flpb, ped/bikes						1.00
Frt						1.00
Flt Protected						1.00
Satd. Flow (prot)						3421
Flt Permitted						1.00
Satd. Flow (perm)						3421
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	0	0	0	0	0	446
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	446
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm			Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)						120.0
Effective Green, g (s)						120.0
Actuated g/C Ratio						1.00
Clearance Time (s)						4.9
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)						3421
v/s Ratio Prot						c0.13
v/s Ratio Perm						
v/c Ratio						0.13
Uniform Delay, d1						0.0
Progression Factor						1.00
Incremental Delay, d2						0.1
Delay (s)						0.1
Level of Service						A
Approach Delay (s)	0.0		0.0			0.1
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	0.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	5	0	30	692	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1515	1339		2887	2887	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1515	1339		2887	2887	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	6	0	35	814	0
RTOR Reduction (vph)	0	6	0	0	0	0
Lane Group Flow (vph)	12	0	0	35	814	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	0.7	0.7		19.1	19.1	
Effective Green, g (s)	0.7	0.7		19.1	19.1	
Actuated g/C Ratio	0.01	0.01		0.35	0.35	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	19	17		1002	1002	
v/s Ratio Prot	c0.01			0.01	c0.28	
v/s Ratio Perm		0.00				
v/c Ratio	0.63	0.00		0.03	0.81	
Uniform Delay, d1	27.0	26.8		11.9	16.3	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	52.7	0.1		0.0	5.1	
Delay (s)	79.8	26.9		11.9	21.4	
Level of Service	E	C		B	C	
Approach Delay (s)	62.1			11.9	21.4	
Approach LOS	E			B	C	

Intersection Summary			
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	27	0	0	0	33	74	0	0	273	129
Peak Hour Factor	0.92	0.83	0.83	0.83	0.83	0.92	0.83	0.92	0.83	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	33	0	0	0	40	80	0	0	297	140

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	0	33	0	0	120	297	140
Volume Left (vph)	0	0	0	0	40	0	0
Volume Right (vph)	0	33	0	0	0	0	140
Hadj (s)	0.00	-0.67	0.00	0.00	0.10	0.03	-0.67
Departure Headway (s)	5.7	5.0	5.8	5.8	5.1	4.7	4.0
Degree Utilization, x	0.00	0.05	0.00	0.00	0.17	0.39	0.16
Capacity (veh/h)	588	646	579	579	691	749	878
Control Delay (s)	7.5	7.1	7.6	7.6	9.1	9.5	6.6
Approach Delay (s)	7.1		0.0		9.1	8.6	
Approach LOS	A		A		A	A	

Intersection Summary			
Delay	8.6		
Level of Service	A		
Intersection Capacity Utilization	48.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	117	0	162	0	155	0	29	0	247	141
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)			5.5		5.5		5.0	5.2			5.2	
Lane Util. Factor			1.00		1.00		0.97	0.95			0.95	
Frpb, ped/bikes			0.96		1.00		1.00	0.96			0.99	
Flpb, ped/bikes			1.00		1.00		1.00	1.00			1.00	
Frt			0.85		1.00		1.00	0.85			0.95	
Flt Protected			1.00		1.00		0.95	1.00			1.00	
Satd. Flow (prot)			1117		1365		2515	2122			2431	
Flt Permitted			1.00		1.00		0.95	1.00			1.00	
Satd. Flow (perm)			1117		1365		2515	2122			2431	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	138	0	191	0	182	0	34	0	291	166
RTOR Reduction (vph)	0	0	113	0	0	0	0	9	0	0	49	0
Lane Group Flow (vph)	0	0	25	0	191	0	182	25	0	0	408	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm		Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)			22.1		22.1		14.0	87.2			68.2	
Effective Green, g (s)			22.1		22.1		14.0	87.2			68.2	
Actuated g/C Ratio			0.18		0.18		0.12	0.73			0.57	
Clearance Time (s)			5.5		5.5		5.0	5.2			5.2	
Vehicle Extension (s)			3.0		3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)			205		251		293	1541			1381	
v/s Ratio Prot					c0.14		c0.07	0.01			c0.17	
v/s Ratio Perm			0.02									
v/c Ratio			0.12		0.76		0.62	0.02			0.30	
Uniform Delay, d1			40.9		46.4		50.5	4.5			13.4	
Progression Factor			1.00		1.00		1.00	1.00			1.00	
Incremental Delay, d2			0.3		12.7		4.1	0.0			0.1	
Delay (s)			41.1		59.2		54.5	4.6			13.6	
Level of Service			D		E		D	A			B	
Approach Delay (s)		41.1			59.2			46.7			13.6	
Approach LOS		D			E			D			B	

Intersection Summary			
HCM 2000 Control Delay	33.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	102	91	2	3	440	14	4	6	1	25	2	64
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.91	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1239	1621	1674		1481	1356	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.71	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1239	1209	1674		1173	1356	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	115	102	2	3	494	16	4	7	1	28	2	72
RTOR Reduction (vph)	0	0	1	0	0	9	0	1	0	0	54	0
Lane Group Flow (vph)	115	102	1	3	494	7	4	7	0	28	20	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.9	47.2	47.2	2.7	39.0	39.0	21.9	21.9		21.9	21.9	
Effective Green, g (s)	10.9	47.2	47.2	2.7	39.0	39.0	21.9	21.9		21.9	21.9	
Actuated g/C Ratio	0.13	0.54	0.54	0.03	0.45	0.45	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	203	927	788	50	766	556	305	422		295	342	
v/s Ratio Prot	c0.07	0.06		0.00	c0.29			0.00			0.01	
v/s Ratio Perm			0.00			0.01	0.00			c0.02		
v/c Ratio	0.57	0.11	0.00	0.06	0.64	0.01	0.01	0.02		0.09	0.06	
Uniform Delay, d1	35.7	9.6	9.0	40.8	18.5	13.2	24.3	24.4		24.9	24.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.6	0.2	0.0	0.5	1.9	0.0	0.0	0.0		0.1	0.1	
Delay (s)	39.3	9.8	9.0	41.3	20.4	13.2	24.4	24.4		25.0	24.7	
Level of Service	D	A	A	D	C	B	C	C		C	C	
Approach Delay (s)		25.3			20.3			24.4			24.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	86.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	147	6	11	489	8	12	60	14	32	331	80
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1050	1540	2992			3066	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.37	1.00			0.92	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1050	601	2992			2830	1072
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	15	179	7	13	596	10	15	73	17	39	404	98
RTOR Reduction (vph)	0	0	3	0	0	4	0	13	0	0	0	76
Lane Group Flow (vph)	15	179	4	13	596	6	15	77	0	0	443	22
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	0.7	53.4	53.4	0.8	52.5	52.5	20.5	20.5			19.5	19.5
Effective Green, g (s)	0.7	53.4	53.4	0.8	52.5	52.5	20.5	20.5			19.5	19.5
Actuated g/C Ratio	0.01	0.61	0.61	0.01	0.60	0.60	0.23	0.23			0.22	0.22
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	9	739	839	14	727	628	140	699			629	238
v/s Ratio Prot	c0.01	0.15		0.01	c0.49			0.03				
v/s Ratio Perm			0.00			0.01	0.02				c0.16	0.02
v/c Ratio	1.67	0.24	0.01	0.93	0.82	0.01	0.11	0.11			0.70	0.09
Uniform Delay, d1	43.5	7.9	6.7	43.4	13.9	7.1	26.4	26.4			31.4	27.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	565.3	0.2	0.0	201.0	7.2	0.0	0.3	0.1			3.6	0.2
Delay (s)	608.8	8.0	6.7	244.4	21.1	7.1	26.7	26.5			35.0	27.2
Level of Service	F	A	A	F	C	A	C	C			D	C
Approach Delay (s)		52.8			25.5			26.5			33.6	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	32.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	87.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	118	59	25	248	307	19	159	9	38	51	13
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.92	1.00	1.00	0.97	1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1333	896		1331	1126	877	1070	957	925	1070	1079	
Flt Permitted	0.19	1.00		0.60	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	263	896		834	1126	877	1070	957	925	1070	1079	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	18	142	71	30	299	370	23	192	11	46	61	16
RTOR Reduction (vph)	0	21	0	0	0	216	0	0	7	0	8	0
Lane Group Flow (vph)	18	192	0	30	299	154	23	192	4	46	69	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	24.3	24.3		25.4	25.4	34.4	6.1	26.9	26.9	9.0	29.8	
Effective Green, g (s)	24.3	24.3		25.4	25.4	34.4	6.1	26.9	26.9	9.0	29.8	
Actuated g/C Ratio	0.29	0.29		0.31	0.31	0.42	0.07	0.33	0.33	0.11	0.36	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	94	263		270	346	418	79	311	301	116	389	
v/s Ratio Prot	0.00	c0.21		0.00	c0.27	c0.04	0.02	c0.20		0.04	0.06	
v/s Ratio Perm	0.05			0.03		0.14			0.00			
v/c Ratio	0.19	0.73		0.11	0.86	0.37	0.29	0.62	0.01	0.40	0.18	
Uniform Delay, d1	22.2	26.2		20.5	27.0	16.6	36.2	23.5	18.9	34.3	18.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	9.7		0.2	19.5	0.6	2.0	3.6	0.0	2.2	0.2	
Delay (s)	23.2	35.9		20.7	46.4	17.2	38.2	27.1	18.9	36.5	18.3	
Level of Service	C	D		C	D	B	D	C	B	D	B	
Approach Delay (s)		34.9			29.8			27.9			25.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	30.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	82.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd. 9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	36	10	559	154	12	5	17	13	2	39	279
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	0.97		0.97	
Flpb, ped/bikes		0.99		0.97	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.99			1.00	0.85		0.88	
Flt Protected		0.97		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)		1441		1667	1775			1779	1489		1310	
Flt Permitted		0.73		0.68	1.00			0.78	1.00		1.00	
Satd. Flow (perm)		1081		1185	1775			1397	1489		1308	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	97	46	13	717	197	15	6	22	17	3	50	358
RTOR Reduction (vph)	0	3	0	0	2	0	0	0	14	0	262	0
Lane Group Flow (vph)	0	153	0	717	210	0	0	28	3	0	149	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		52.4		52.4	52.4			17.7	17.7		17.7	
Effective Green, g (s)		52.4		52.4	52.4			17.7	17.7		17.7	
Actuated g/C Ratio		0.56		0.56	0.56			0.19	0.19		0.19	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		600		658	986			262	279		245	
v/s Ratio Prot					0.12							
v/s Ratio Perm		0.14		c0.60				0.02	0.00		c0.11	
v/c Ratio		0.26		1.09	0.21			0.11	0.01		0.61	
Uniform Delay, d1		10.8		20.9	10.6			31.7	31.2		35.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.2		62.0	0.1			0.2	0.0		4.3	
Delay (s)		11.1		82.9	10.7			31.9	31.2		39.4	
Level of Service		B		F	B			C	C		D	
Approach Delay (s)		11.1			66.4			31.7			39.4	
Approach LOS		B			E			C			D	

Intersection Summary			
HCM 2000 Control Delay	52.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	94.3	Sum of lost time (s)	14.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St. 9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	78	20	29	402	7	100	140	9	34	126	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.98	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1684	3292		1675	3410		1260	2491		1260	2239	
Flt Permitted	0.37	1.00		0.68	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	654	3292		1194	3410		1260	2491		1260	2239	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	45	94	24	35	484	8	120	169	11	41	152	245
RTOR Reduction (vph)	0	17	0	0	1	0	0	5	0	0	135	0
Lane Group Flow (vph)	45	101	0	35	491	0	120	175	0	41	262	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Effective Green, g (s)	29.7	29.7		29.7	29.7		16.9	39.9		14.9	37.9	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.17	0.40		0.15	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	194	977		354	1012		212	993		187	848	
v/s Ratio Prot		0.03			c0.14		c0.10	0.07		0.03	c0.12	
v/s Ratio Perm	0.07			0.03								
v/c Ratio	0.23	0.10		0.10	0.48		0.57	0.18		0.22	0.31	
Uniform Delay, d1	26.5	25.5		25.5	28.9		38.2	19.4		37.4	21.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.8	0.2		0.6	1.7		10.5	0.4		2.7	0.9	
Delay (s)	29.3	25.7		26.0	30.5		48.7	19.8		40.1	22.8	
Level of Service	C	C		C	C		D	B		D	C	
Approach Delay (s)		26.7			30.2			31.4			24.4	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	128	11	3	790	3	13	0	4	6	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.97		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3380		1711	3419			1681		1711	1531	
Flt Permitted	0.31	1.00		0.66	1.00			0.80		0.75	1.00	
Satd. Flow (perm)	555	3380		1182	3419			1401		1343	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	139	12	3	859	3	14	0	4	7	0	11
RTOR Reduction (vph)	0	6	0	0	1	0	0	14	0	0	8	0
Lane Group Flow (vph)	7	145	0	3	861	0	0	4	0	7	3	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.6	16.6		16.6	16.6			7.9		7.9	7.9	
Effective Green, g (s)	16.6	16.6		16.6	16.6			7.9		7.9	7.9	
Actuated g/C Ratio	0.48	0.48		0.48	0.48			0.23		0.23	0.23	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	267	1626		568	1645			320		307	350	
v/s Ratio Prot		0.04			c0.25						0.00	
v/s Ratio Perm	0.01			0.00				0.00		c0.01		
v/c Ratio	0.03	0.09		0.01	0.52			0.01		0.02	0.01	
Uniform Delay, d1	4.7	4.9		4.7	6.2			10.3		10.3	10.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.0		0.0	0.3			0.0		0.0	0.0	
Delay (s)	4.7	4.9		4.7	6.5			10.3		10.3	10.3	
Level of Service	A	A		A	A			B		B	B	
Approach Delay (s)		4.9			6.5			10.3			10.3	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	34.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	43	0	0	730	14	70	31	126	0	0	422
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			1.00		1.00	0.88				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3384			5118		1711	3009				2694
Flt Permitted		0.86			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2937			5118		1711	3009				2694
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	14	50	0	0	849	16	81	36	147	0	0	491
RTOR Reduction (vph)	0	0	0	0	3	0	0	87	0	0	0	465
Lane Group Flow (vph)	0	64	0	0	862	0	81	96	0	0	0	26
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1395			1784		697	1227				141
v/s Ratio Prot		0.00			c0.17		c0.05	0.03				c0.01
v/s Ratio Perm		0.02										
v/c Ratio		0.05			0.48		0.12	0.08				0.18
Uniform Delay, d1		11.0			19.4		14.0	13.8				34.4
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.9		0.3	0.1				2.8
Delay (s)		11.1			20.3		14.3	13.9				37.3
Level of Service		B			C		B	B				D
Approach Delay (s)		11.1			20.3			14.0			37.3	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	23.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	55	196	927	294	0	0
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	*0.85	*0.85	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.91	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1091	1007	2620	1422		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1091	1007	2620	1422		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	65	233	1104	350	0	0
RTOR Reduction (vph)	10	10	0	0	0	0
Lane Group Flow (vph)	144	134	1104	350	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	18.8	18.8	31.2	60.0		
Effective Green, g (s)	18.8	18.8	31.2	60.0		
Actuated g/C Ratio	0.31	0.31	0.52	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	341	315	1362	1422		
v/s Ratio Prot	0.13		c0.42	0.25		
v/s Ratio Perm		c0.13				
v/c Ratio	0.42	0.42	0.81	0.25		
Uniform Delay, d1	16.3	16.3	11.9	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.8	0.9	3.8	0.1		
Delay (s)	17.1	17.2	15.7	0.1		
Level of Service	B	B	B	A		
Approach Delay (s)	17.2			12.0	0.0	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	42	85	0	698	30	105	87	5	0	168	277
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3			5.3		5.5	5.5			5.5	
Lane Util. Factor	1.00	0.95			0.95		1.00	0.95			0.95	
Frpb, ped/bikes	1.00	0.91			0.99		1.00	0.99			0.92	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	
Frt	1.00	0.90			0.99		1.00	0.99			0.91	
Flt Protected	0.95	1.00			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1209	1869			2401		1215	2391			2024	
Flt Permitted	0.22	1.00			1.00		0.95	1.00			1.00	
Satd. Flow (perm)	283	1869			2401		1215	2391			2024	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	27	47	94	0	776	33	117	97	6	0	187	308
RTOR Reduction (vph)	0	44	0	0	2	0	0	4	0	0	247	0
Lane Group Flow (vph)	27	97	0	0	807	0	117	99	0	0	248	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA			NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	64.0	64.0			52.9		16.0	45.2			23.7	
Effective Green, g (s)	64.0	64.0			52.9		16.0	45.2			23.7	
Actuated g/C Ratio	0.53	0.53			0.44		0.13	0.38			0.20	
Clearance Time (s)	5.3	5.3			5.3		5.5	5.5			5.5	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	195	996			1058		162	900			399	
v/s Ratio Prot	c0.01	0.05			c0.34		c0.10	0.04			c0.12	
v/s Ratio Perm	0.07											
v/c Ratio	0.14	0.10			0.76		0.72	0.11			0.62	
Uniform Delay, d1	15.3	13.8			28.3		49.9	24.3			44.0	
Progression Factor	1.00	1.00			1.00		1.00	1.00			2.31	
Incremental Delay, d2	0.3	0.0			3.3		14.7	0.2			6.5	
Delay (s)	15.6	13.8			31.6		64.6	24.6			108.1	
Level of Service	B	B			C		E	C			F	
Approach Delay (s)		14.1			31.6			45.8			108.1	
Approach LOS		B			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	54.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	82	664	468	269
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	89	722	509	292
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			565			
pX, platoon unblocked						
vC, conflicting volume	1399	45			89	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1399	45			89	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			66	
cM capacity (veh/h)	87	1016			1504	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	45	45	722	509	292
Volume Left	0	0	0	509	0
Volume Right	0	0	722	0	0
cSH	1700	1700	1700	1504	1700
Volume to Capacity	0.03	0.03	0.42	0.34	0.17
Queue Length 95th (ft)	0	0	0	38	0
Control Delay (s)	0.0	0.0	0.0	8.6	0.0
Lane LOS				A	
Approach Delay (s)	0.0			5.5	
Approach LOS					

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	99	80	0	95	112
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	108	87	0	103	122
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	87				141	87
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	87				141	87
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				88	87
cM capacity (veh/h)	1507				838	954

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	54	54	87	225
Volume Left	0	0	0	103
Volume Right	0	0	0	122
cSH	1700	1700	1700	897
Volume to Capacity	0.03	0.03	0.05	0.25
Queue Length 95th (ft)	0	0	0	25
Control Delay (s)	0.0	0.0	0.0	10.4
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.4
Approach LOS				B

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	91	103	80	359	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	112	87	390	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	477				341	87
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	477				341	87
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				100	100
cM capacity (veh/h)	1081				572	954

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	136	75	87	390	0
Volume Left	99	0	0	0	0
Volume Right	0	0	0	390	0
cSH	1081	1700	1700	1700	1700
Volume to Capacity	0.09	0.04	0.05	0.23	0.00
Queue Length 95th (ft)	8	0	0	0	0
Control Delay (s)	6.5	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	4.2		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	9	6	109	43	20	26	170	15	10	321	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.98		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1536			1546		1540	3042		1540	3053	
Flt Permitted		0.88			0.79		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1376			1261		1540	3042		1540	3053	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	13	10	7	118	47	22	28	185	16	11	349	21
RTOR Reduction (vph)	0	6	0	0	4	0	0	3	0	0	2	0
Lane Group Flow (vph)	0	24	0	0	183	0	28	198	0	11	368	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		22.5			22.5		4.8	78.5		3.8	77.5	
Effective Green, g (s)		22.5			22.5		4.8	78.5		3.8	77.5	
Actuated g/C Ratio		0.19			0.19		0.04	0.65		0.03	0.65	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		258			236		61	1989		48	1971	
v/s Ratio Prot							c0.02	0.06		0.01	c0.12	
v/s Ratio Perm		0.02			c0.15							
v/c Ratio		0.09			0.78		0.46	0.10		0.23	0.19	
Uniform Delay, d1		40.3			46.3		56.3	7.7		56.7	8.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			14.7		2.0	0.1		0.9	0.2	
Delay (s)		40.5			61.0		58.3	7.8		57.6	8.8	
Level of Service		D			E		E	A		E	A	
Approach Delay (s)		40.5			61.0			14.0			10.2	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	310	12	75	0	0	116
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	337	13	82	0	0	126

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	168	168	13	41	41	126
Volume Left (vph)	168	168	0	0	0	0
Volume Right (vph)	0	0	13	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.6	5.6	3.2	5.6	5.6	5.3
Degree Utilization, x	0.26	0.26	0.01	0.06	0.06	0.19
Capacity (veh/h)	619	624	1121	605	604	639
Control Delay (s)	9.4	9.4	5.0	7.8	7.8	9.6
Approach Delay (s)	9.2			7.8		9.6
Approach LOS	A			A		A

Intersection Summary			
Delay	9.1		
Level of Service	A		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	40	72	0	0	432	55	10	387	9	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	78	0	0	470	60	11	421	10	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	122	529	221	220
Volume Left (vph)	43	0	11	0
Volume Right (vph)	0	60	0	10
Hadj (s)	0.11	-0.03	0.06	0.00
Departure Headway (s)	6.1	5.3	6.3	6.3
Degree Utilization, x	0.21	0.78	0.39	0.38
Capacity (veh/h)	551	668	544	548
Control Delay (s)	10.6	24.1	12.1	12.0
Approach Delay (s)	10.6	24.1	12.0	
Approach LOS	B	C	B	

Intersection Summary			
Delay	17.8		
Level of Service	C		
Intersection Capacity Utilization	53.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	16	41	13	379	1	32	142	1	0	431	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.91			1.00		1.00	1.00			0.96	
Flpb, ped/bikes		0.99			1.00		1.00	1.00			1.00	
Frt		0.92			1.00		1.00	1.00			0.98	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1171			1611		1540	2261			2149	
Flt Permitted		0.94			0.99		0.95	1.00			1.00	
Satd. Flow (perm)		1110			1599		1540	2261			2149	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	9	17	43	14	399	1	34	149	1	0	454	54
RTOR Reduction (vph)	0	28	0	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	41	0	0	414	0	34	150	0	0	503	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		40.8			40.8		5.7	68.9			58.1	
Effective Green, g (s)		40.8			40.8		5.7	68.9			58.1	
Actuated g/C Ratio		0.34			0.34		0.05	0.57			0.48	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		377			543		73	1298			1040	
v/s Ratio Prot							c0.02	0.07			c0.23	
v/s Ratio Perm		0.04			c0.26							
v/c Ratio		0.11			0.76		0.47	0.12			0.48	
Uniform Delay, d1		27.1			35.3		55.7	11.7			20.8	
Progression Factor		1.00			1.00		1.12	1.06			1.00	
Incremental Delay, d2		0.1			6.3		4.6	0.2			1.6	
Delay (s)		27.3			41.6		67.0	12.5			22.5	
Level of Service		C			D		E	B			C	
Approach Delay (s)		27.3			41.6			22.5			22.5	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	29.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	123	0	0	164	623	24	65	143	32	0	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1035	1540	1621	1199	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1035	1540	1621	1199	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	61	129	0	0	173	656	25	68	151	34	0	249
RTOR Reduction (vph)	0	0	0	0	0	353	0	0	133	0	0	223
Lane Group Flow (vph)	61	129	0	0	173	303	25	68	18	34	0	26
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	5.7	43.3			32.6	32.6	9.2	9.2	9.2	8.0		8.0
Effective Green, g (s)	5.7	43.3			32.6	32.6	9.2	9.2	9.2	8.0		8.0
Actuated g/C Ratio	0.07	0.57			0.43	0.43	0.12	0.12	0.12	0.10		0.10
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	114	1742			1312	441	185	194	144	161		126
v/s Ratio Prot	c0.04	0.04			0.06		0.02	c0.04		c0.02		0.02
v/s Ratio Perm						c0.29			0.02			
v/c Ratio	0.54	0.07			0.13	0.69	0.14	0.35	0.13	0.21		0.21
Uniform Delay, d1	34.1	7.5			13.3	17.8	30.1	30.9	30.1	31.4		31.3
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	4.8	0.1			0.2	8.5	0.3	1.1	0.4	0.7		0.8
Delay (s)	38.9	7.6			13.6	26.3	30.4	32.0	30.5	32.0		32.2
Level of Service	D	A			B	C	C	C	C	C		C
Approach Delay (s)		17.6			23.6			30.9			32.1	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	18	50	6	554	9	24	17	1	30	51	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.91			1.00		1.00	0.99		1.00	0.88	
Flt Protected		0.99			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3095			1796		1711	1786		1711	1590	
Flt Permitted		0.86			1.00		0.58	1.00		0.75	1.00	
Satd. Flow (perm)		2676			1793		1036	1786		1341	1590	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	20	54	7	602	10	26	18	1	33	55	196
RTOR Reduction (vph)	0	24	0	0	1	0	0	1	0	0	112	0
Lane Group Flow (vph)	0	71	0	0	618	0	26	18	0	33	139	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		21.0			21.0		7.7	7.7		7.7	7.7	
Effective Green, g (s)		21.0			21.0		7.7	7.7		7.7	7.7	
Actuated g/C Ratio		0.56			0.56		0.20	0.20		0.20	0.20	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1490			998		211	364		273	324	
v/s Ratio Prot								0.01			c0.09	
v/s Ratio Perm		0.03			c0.34		0.03			0.02		
v/c Ratio		0.05			0.62		0.12	0.05		0.12	0.43	
Uniform Delay, d1		3.8			5.6		12.2	12.1		12.2	13.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			2.9		0.3	0.1		0.2	0.9	
Delay (s)		3.9			8.5		12.5	12.1		12.4	14.0	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		3.9			8.5			12.3			13.8	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	37.7	Sum of lost time (s)	9.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT
BASKETBALL GAME
NO SF GIANTS GAME AT AT&T PARK
SATURDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	637	670	58	422	569	78	43	497	162	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.90			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.99		1.00	0.98			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3017		2987	2982			5515	1233			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3017		2987	2982			5515	1233			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	708	744	64	469	632	87	48	552	180	0	0	0
RTOR Reduction (vph)	0	6	0	0	8	0	0	0	147	0	0	0
Lane Group Flow (vph)	708	802	0	469	711	0	0	600	33	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	25.5	41.4		29.5	45.4			20.2	20.2			
Effective Green, g (s)	25.5	41.4		29.5	45.4			20.2	20.2			
Actuated g/C Ratio	0.23	0.38		0.27	0.41			0.18	0.18			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	1038	1135		801	1230			1012	226			
v/s Ratio Prot	0.16	c0.27		0.16	c0.24							
v/s Ratio Perm								0.11	0.03			
v/c Ratio	0.68	0.71		0.59	0.58			0.59	0.15			
Uniform Delay, d1	38.6	29.1		34.9	24.9			41.1	37.7			
Progression Factor	0.58	0.50		0.81	0.28			1.13	3.39			
Incremental Delay, d2	1.4	2.9		0.4	0.3			0.8	0.3			
Delay (s)	23.8	17.4		28.7	7.2			47.3	128.1			
Level of Service	C	B		C	A			D	F			
Approach Delay (s)		20.4			15.7			65.9			0.0	
Approach LOS		C			B			E			A	

Intersection Summary			
HCM 2000 Control Delay	29.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	1277	79	51	517	44	7	49	28	60	555	97
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.98		1.00	0.95			1.00	0.63	1.00	0.99	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00	0.67	1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4288		1296	2436			1574	857	1033	2916	581
Flt Permitted	0.95	1.00		0.95	1.00			0.91	1.00	0.72	1.00	1.00
Satd. Flow (perm)	1540	4288		1296	2436			1449	857	781	2916	581
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	162	1359	84	54	550	47	7	52	30	64	590	103
RTOR Reduction (vph)	0	5	0	0	5	0	0	0	22	0	1	67
Lane Group Flow (vph)	162	1438	0	54	592	0	0	59	8	64	599	26
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	16.0	51.2		9.5	43.1			29.4	29.4	30.4	30.4	30.4
Effective Green, g (s)	16.0	51.2		9.5	43.1			29.4	29.4	30.4	30.4	30.4
Actuated g/C Ratio	0.15	0.47		0.09	0.39			0.27	0.27	0.28	0.28	0.28
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	224	1995		111	954			387	229	215	805	160
v/s Ratio Prot	0.11	c0.34		0.04	c0.24						c0.21	
v/s Ratio Perm								0.04	0.01	0.08		0.04
v/c Ratio	0.72	0.72		0.49	0.62			0.15	0.04	0.30	0.74	0.16
Uniform Delay, d1	44.9	23.7		47.9	26.9			30.8	29.8	31.4	36.2	30.1
Progression Factor	0.92	1.24		0.85	0.69			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.6	1.8		2.8	1.1			0.2	0.1	0.8	3.7	0.5
Delay (s)	49.7	31.1		43.7	19.7			31.0	29.9	32.2	40.0	30.6
Level of Service	D	C		D	B			C	C	C	D	C
Approach Delay (s)		33.0			21.7			30.6			38.2	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	31.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.
4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1458	80	3	618	30	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3052			3078	1540	1357
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	3052			2922	1540	1357
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1602	88	3	679	33	55
RTOR Reduction (vph)	1	0	0	0	0	21
Lane Group Flow (vph)	1689	0	0	682	33	35
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	91.2			91.2	7.5	7.5
Effective Green, g (s)	91.2			91.2	7.5	7.5
Actuated g/C Ratio	0.83			0.83	0.07	0.07
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2530			2422	105	92
v/s Ratio Prot	c0.55				0.02	
v/s Ratio Perm				0.23		c0.03
v/c Ratio	0.67			0.28	0.31	0.38
Uniform Delay, d1	3.6			2.1	48.8	49.0
Progression Factor	1.00			0.15	1.00	1.00
Incremental Delay, d2	1.4			0.1	1.7	2.6
Delay (s)	5.0			0.4	50.5	51.6
Level of Service	A			A	D	D
Approach Delay (s)	5.0			0.4	51.2	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.
4/27/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	262	1267	145	34	172	356	188	403	981	262
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.95			1.00	1.00
Flpb, ped/bikes		0.99			0.99	1.00			1.00	1.00
Frt		0.99			1.00	0.95			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5749			2844	2411			4102	1122
Flt Permitted		0.99			0.78	1.00			0.95	1.00
Satd. Flow (perm)		5749			2224	2411			4102	1122
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	270	1306	149	35	177	367	194	415	1011	270
RTOR Reduction (vph)	0	18	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	1707	0	0	212	558	0	0	1453	243
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		24.0			21.5	21.5			27.0	27.0
Effective Green, g (s)		26.0			24.5	24.5			30.0	30.0
Actuated g/C Ratio		0.29			0.27	0.27			0.33	0.33
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1660			605	656			1367	374
v/s Ratio Prot						c0.23			c0.35	0.22
v/s Ratio Perm		0.30			0.10					
v/c Ratio		1.03			0.35	0.85			1.06	0.65
Uniform Delay, d1		32.0			26.3	31.0			30.0	25.5
Progression Factor		1.55			1.00	1.00			1.00	1.00
Incremental Delay, d2		25.9			0.4	10.3			43.0	3.9
Delay (s)		75.5			26.7	41.3			73.0	29.4
Level of Service		E			C	D			E	C
Approach Delay (s)		75.5			26.7	41.3			66.7	
Approach LOS		E			C	D			E	

Intersection Summary			
HCM 2000 Control Delay	64.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	51	317	276	49	155	105	14	231	55	735
Ideal Flow (vphpl)	1400	1400	1400	1400	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.88		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.98		0.94		0.85		1.00	1.00
Flt Protected		0.95	0.99		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1700	2620		2297		1161		1327	2558
Flt Permitted		0.95	0.99		1.00		1.00		0.44	0.95
Satd. Flow (perm)		1700	2620		2297		1161		621	2444
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	63	391	341	60	191	130	17	285	68	907
RTOR Reduction (vph)	0	0	19	0	1	0	12	0	0	0
Lane Group Flow (vph)	0	337	499	0	322	0	3	0	346	914
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		419	733		535		247		386	1078
v/s Ratio Prot		c0.20	0.19		0.14				0.15	c0.14
v/s Ratio Perm							0.00		c0.24	0.23
v/c Ratio		0.80	0.68		0.60		0.01		0.90	0.85
Uniform Delay, d1		26.5	24.0		25.6		23.3		21.1	19.0
Progression Factor		1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2		15.1	5.1		5.0		0.1		25.9	8.3
Delay (s)		41.6	29.1		30.6		23.4		47.0	27.3
Level of Service		D	C		C		C		D	C
Approach Delay (s)			34.0		30.3					32.7
Approach LOS			C		C					C

Intersection Summary			
HCM 2000 Control Delay	32.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	982	120	8	4	14	9	343	74	137	228	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.97		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.93		1.00	0.97		1.00	0.99	
Flt Protected		1.00	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1619	1353		1455		1272	2390		1540	3055	
Flt Permitted		1.00	1.00		0.62		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1618	1353		914		1272	2390		1540	3055	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	10	1012	124	8	4	14	9	354	76	141	235	10
RTOR Reduction (vph)	0	0	56	0	6	0	0	17	0	0	3	0
Lane Group Flow (vph)	0	1022	68	0	20	0	9	413	0	141	242	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		61.2	61.2		61.2		1.0	22.1		12.7	34.1	
Effective Green, g (s)		61.2	61.2		61.2		1.0	22.1		12.7	34.1	
Actuated g/C Ratio		0.55	0.55		0.55		0.01	0.20		0.11	0.30	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		884	739		499		11	472		174	930	
v/s Ratio Prot							0.01	c0.17		c0.09	0.08	
v/s Ratio Perm		c0.63	0.05		0.02							
v/c Ratio		1.16	0.09		0.04		0.82	0.88		0.81	0.26	
Uniform Delay, d1		25.4	12.1		11.7		55.4	43.6		48.4	29.4	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		83.0	0.1		0.0		162.4	16.4		22.9	0.1	
Delay (s)		108.4	12.1		11.8		217.7	60.0		71.3	29.5	
Level of Service		F	B		B		F	E		E	C	
Approach Delay (s)		97.9			11.8			63.2			44.8	
Approach LOS		F			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	78.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	111.9	Sum of lost time (s)	15.9
Intersection Capacity Utilization	98.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	828	7	2	5	16	5	29	1	282	166	13
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.96	1.00	1.00		1.00	0.97	
Flpb, ped/bikes		1.00			1.00	1.00	0.75	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		1.00			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2598			1432	1187	1037	1440		1377	1398	
Flt Permitted		0.95			0.90	1.00	0.93	1.00		0.95	1.00	
Satd. Flow (perm)		2479			1300	1187	1015	1440		1377	1398	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	8	952	8	2	6	18	6	33	1	324	191	15
RTOR Reduction (vph)	0	0	0	0	0	5	0	1	0	0	4	0
Lane Group Flow (vph)	0	968	0	0	8	13	6	33	0	324	202	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		33.2			33.2	45.6	4.3	4.3		12.4	21.7	
Effective Green, g (s)		33.2			33.2	45.6	4.3	4.3		12.4	21.7	
Actuated g/C Ratio		0.51			0.51	0.70	0.07	0.07		0.19	0.33	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		1268			665	925	67	95		263	467	
v/s Ratio Prot						0.00		0.02		c0.24	c0.14	
v/s Ratio Perm		c0.39			0.01	0.01	0.01					
v/c Ratio		0.76			0.01	0.01	0.09	0.35		1.23	0.43	
Uniform Delay, d1		12.7			7.8	2.9	28.5	29.0		26.3	16.8	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.8			0.0	0.0	0.6	2.2		132.9	0.6	
Delay (s)		15.5			7.8	2.9	29.0	31.2		159.2	17.5	
Level of Service		B			A	A	C	C		F	B	
Approach Delay (s)		15.5			4.4			30.9			104.1	
Approach LOS		B			A			C			F	

Intersection Summary			
HCM 2000 Control Delay	45.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	64.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	20	104	199	25	834	153
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.97	1.00	0.93	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1741	1535	809	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1741	1535	809	1134	1194
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	23	120	229	29	959	176
RTOR Reduction (vph)	0	110	0	24	0	0
Lane Group Flow (vph)	23	10	229	5	959	176
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	7.9	7.9	20.0	15.0	53.0	78.0
Effective Green, g (s)	7.9	7.9	20.0	15.0	53.0	78.0
Actuated g/C Ratio	0.08	0.08	0.21	0.16	0.55	0.81
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	93	143	320	168	626	971
v/s Ratio Prot	c0.02		c0.15	0.00	c0.85	0.15
v/s Ratio Perm		0.01		0.00		
v/c Ratio	0.25	0.07	0.72	0.03	1.53	0.18
Uniform Delay, d1	41.2	40.6	35.3	34.3	21.5	2.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.2	7.4	0.1	247.4	0.1
Delay (s)	42.6	40.8	42.7	34.4	268.8	2.0
Level of Service	D	D	D	C	F	A
Approach Delay (s)	41.1		41.8			227.5
Approach LOS	D		D			F

Intersection Summary			
HCM 2000 Control Delay	178.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	20.0
Intersection Capacity Utilization	98.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	3	1	211	94	43	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.98		1.00	1.00	1.00	
Flpb, ped/bikes	0.97		0.98	1.00	1.00	
Frt	0.97		1.00	1.00	0.99	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	1591		1669	1531	3119	
Flt Permitted	0.96		0.72	1.00	1.00	
Satd. Flow (perm)	1591		1263	1531	3119	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	4	1	251	112	51	4
RTOR Reduction (vph)	1	0	0	0	1	0
Lane Group Flow (vph)	4	0	251	112	54	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	0.8		24.6	24.6	24.6	
Effective Green, g (s)	0.8		24.6	24.6	24.6	
Actuated g/C Ratio	0.02		0.69	0.69	0.69	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	35		877	1063	2167	
v/s Ratio Prot	c0.00			0.07	0.02	
v/s Ratio Perm			c0.20			
v/c Ratio	0.11		0.29	0.11	0.02	
Uniform Delay, d1	17.0		2.1	1.8	1.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.5		0.2	0.0	0.0	
Delay (s)	18.4		2.2	1.8	1.7	
Level of Service	B		A	A	A	
Approach Delay (s)	18.4			2.1	1.7	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	2.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	35.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	10	42	359	54	275	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.94	0.98		1.00	1.00
Flpb, ped/bikes	0.95	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1628	1437	3302		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1628	1437	3302		1711	3421
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	11	45	386	58	296	243
RTOR Reduction (vph)	0	42	11	0	0	0
Lane Group Flow (vph)	11	3	433	0	296	243
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	4.1	4.1	30.4		15.2	50.7
Effective Green, g (s)	4.1	4.1	30.4		15.2	50.7
Actuated g/C Ratio	0.06	0.06	0.47		0.23	0.78
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	102	90	1544		400	2668
v/s Ratio Prot			c0.13		c0.17	0.07
v/s Ratio Perm	c0.01	0.00				
v/c Ratio	0.11	0.03	0.28		0.74	0.09
Uniform Delay, d1	28.7	28.6	10.6		23.1	1.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.5	0.1	0.5		7.0	0.1
Delay (s)	29.2	28.7	11.1		30.1	1.8
Level of Service	C	C	B		C	A
Approach Delay (s)	28.8		11.1			17.3
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	7	7	295	34	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1519	1342		2882	2768	
Flt Permitted	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1519	1342		2739	2768	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	8	8	347	40	12
RTOR Reduction (vph)	0	8	0	0	9	0
Lane Group Flow (vph)	12	0	0	355	43	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	0.6	0.6		11.2	11.2	
Effective Green, g (s)	0.6	0.6		11.2	11.2	
Actuated g/C Ratio	0.01	0.01		0.24	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	19	17		649	656	
v/s Ratio Prot	c0.01				0.02	
v/s Ratio Perm		0.00		c0.13		
v/c Ratio	0.63	0.01		0.55	0.07	
Uniform Delay, d1	23.2	23.0		15.8	13.9	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	52.7	0.1		0.9	0.0	
Delay (s)	75.9	23.1		16.7	14.0	
Level of Service	E	C		B	B	
Approach Delay (s)	54.8			16.7	14.0	
Approach LOS	D			B	B	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	47.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	129	1	20	4	2	5	28	222	8	5	53	38
Peak Hour Factor	0.92	0.79	0.79	0.79	0.79	0.92	0.79	0.92	0.79	0.92	0.92	0.92
Hourly flow rate (vph)	140	1	25	5	3	5	35	241	10	5	58	41

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	140	27	5	8	287	63	41
Volume Left (vph)	140	0	5	0	35	5	0
Volume Right (vph)	0	25	0	5	10	0	41
Hadj (s)	0.53	-0.63	0.53	-0.44	0.04	0.08	-0.67
Departure Headway (s)	6.1	4.9	6.3	5.3	5.2	5.4	4.6
Degree Utilization, x	0.24	0.04	0.01	0.01	0.41	0.09	0.05
Capacity (veh/h)	559	687	525	618	676	634	733
Control Delay (s)	9.7	6.9	8.2	7.2	11.8	7.8	6.7
Approach Delay (s)	9.3		7.6		11.8	7.3	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	10.1		
Level of Service	B		
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	133	99	1	61	6	68	255	16	1	163	71
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1274	1365	1131	1290	1365	1116	2515	2565		1296	2454	
Flt Permitted	0.71	1.00	1.00	0.66	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	955	1365	1131	899	1365	1116	2515	2565		1296	2454	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	171	149	111	1	69	7	76	287	18	1	183	80
RTOR Reduction (vph)	0	0	77	0	0	5	0	5	0	0	53	0
Lane Group Flow (vph)	171	149	34	1	69	2	76	300	0	1	210	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	14.8	14.8	14.8	14.8	14.8	14.8	4.0	16.9		0.9	13.8	
Effective Green, g (s)	14.8	14.8	14.8	14.8	14.8	14.8	4.0	16.9		0.9	13.8	
Actuated g/C Ratio	0.31	0.31	0.31	0.31	0.31	0.31	0.08	0.35		0.02	0.29	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	292	418	346	275	418	341	208	897		24	701	
v/s Ratio Prot		0.11			0.05		0.03	c0.12		0.00	c0.09	
v/s Ratio Perm	c0.18		0.03	0.00		0.00						
v/c Ratio	0.59	0.36	0.10	0.00	0.17	0.01	0.37	0.33		0.04	0.30	
Uniform Delay, d1	14.2	13.0	12.0	11.6	12.2	11.6	20.9	11.6		23.3	13.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.0	0.5	0.1	0.0	0.2	0.0	1.1	0.2		0.7	0.2	
Delay (s)	17.1	13.6	12.1	11.6	12.4	11.6	22.0	11.8		24.0	13.7	
Level of Service	B	B	B	B	B	B	C	B		C	B	
Approach Delay (s)		14.6			12.3			13.8			13.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	48.3	Sum of lost time (s)	15.7
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	145	365	1	2	179	18	3	5	1	17	1	44
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1250	1621	1663		1492	1356	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.73	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1250	1239	1663		1184	1356	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	151	380	1	2	186	19	3	5	1	18	1	46
RTOR Reduction (vph)	0	0	0	0	0	12	0	1	0	0	37	0
Lane Group Flow (vph)	151	380	1	2	186	7	3	5	0	18	10	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	20.5	47.7	47.7	2.5	29.7	29.7	15.0	15.0		15.0	15.0	
Effective Green, g (s)	20.5	47.7	47.7	2.5	29.7	29.7	15.0	15.0		15.0	15.0	
Actuated g/C Ratio	0.26	0.59	0.59	0.03	0.37	0.37	0.19	0.19		0.19	0.19	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	414	1014	862	50	631	462	231	311		221	253	
v/s Ratio Prot	c0.09	c0.22		0.00	0.11			0.00			0.01	
v/s Ratio Perm			0.00			0.01	0.00			c0.02		
v/c Ratio	0.36	0.37	0.00	0.04	0.29	0.02	0.01	0.02		0.08	0.04	
Uniform Delay, d1	24.5	8.5	6.6	37.7	17.8	16.0	26.6	26.6		26.9	26.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	1.1	0.0	0.3	0.3	0.0	0.0	0.0		0.2	0.1	
Delay (s)	25.1	9.5	6.6	38.0	18.1	16.0	26.6	26.6		27.1	26.8	
Level of Service	C	A	A	D	B	B	C	C		C	C	
Approach Delay (s)		13.9			18.1			26.6			26.8	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	387	3	5	217	5	11	482	104	21	14	39
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1046	1540	2997			2989	1073
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.73	1.00			0.74	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1046	1182	2997			2271	1073
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	18	435	3	6	244	6	12	542	117	24	16	44
RTOR Reduction (vph)	0	0	2	0	0	3	0	17	0	0	0	29
Lane Group Flow (vph)	18	435	1	6	244	3	12	642	0	0	40	15
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	2.1	32.1	32.1	0.9	29.9	29.9	24.5	24.5			23.5	23.5
Effective Green, g (s)	2.1	32.1	32.1	0.9	29.9	29.9	24.5	24.5			23.5	23.5
Actuated g/C Ratio	0.03	0.46	0.46	0.01	0.42	0.42	0.35	0.35			0.33	0.33
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	36	553	627	19	515	443	410	1041			757	357
v/s Ratio Prot	c0.01	c0.36		0.00	0.20			c0.21				
v/s Ratio Perm			0.00			0.00	0.01				0.02	0.01
v/c Ratio	0.50	0.79	0.00	0.32	0.47	0.01	0.03	0.62			0.05	0.04
Uniform Delay, d1	33.7	16.3	10.5	34.5	14.6	11.7	15.2	19.1			15.9	15.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	10.5	7.3	0.0	9.3	0.7	0.0	0.0	1.1			0.0	0.0
Delay (s)	44.2	23.6	10.5	43.8	15.3	11.7	15.2	20.2			16.0	15.9
Level of Service	D	C	B	D	B	B	B	C			B	B
Approach Delay (s)		24.3			15.9			20.1			16.0	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	70.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	300	60	8	197	62	31	91	8	97	40	24
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.92	1.00	1.00	0.95	1.00	0.97	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1320	927		1335	1126	882	1070	957	908	1070	1034	
Flt Permitted	0.45	1.00		0.39	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	625	927		544	1126	882	1070	957	908	1070	1034	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	24	353	71	9	232	73	36	107	9	114	47	28
RTOR Reduction (vph)	0	7	0	0	0	30	0	0	8	0	24	0
Lane Group Flow (vph)	24	417	0	9	232	43	36	107	1	114	51	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	37.1	37.1		36.4	36.4	46.0	9.3	11.5	11.5	9.6	11.8	
Effective Green, g (s)	37.1	37.1		36.4	36.4	46.0	9.3	11.5	11.5	9.6	11.8	
Actuated g/C Ratio	0.47	0.47		0.46	0.46	0.58	0.12	0.15	0.15	0.12	0.15	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	305	436		257	520	570	126	139	132	130	154	
v/s Ratio Prot	0.00	c0.45		0.00	c0.21	0.01	0.03	c0.11		c0.11	0.05	
v/s Ratio Perm	0.04			0.02		0.04			0.00			
v/c Ratio	0.08	0.96		0.04	0.45	0.07	0.29	0.77	0.01	0.88	0.33	
Uniform Delay, d1	11.7	20.1		15.1	14.4	7.1	31.7	32.4	28.8	34.0	30.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	31.9		0.1	0.6	0.1	1.3	22.2	0.0	43.7	1.3	
Delay (s)	11.8	51.9		15.2	15.0	7.2	33.0	54.6	28.8	77.7	31.3	
Level of Service	B	D		B	B	A	C	D	C	E	C	
Approach Delay (s)		49.8			13.2			48.0			59.3	
Approach LOS		D			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	40.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	78.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd. — 4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	224	270	27	26	54	7	22	24	30	5	24	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	0.99			1.00	0.97		0.98	
Flpb, ped/bikes		0.99		0.99	1.00			0.99	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.91	
Flt Protected		0.98		0.95	1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1469		1696	1760			1745	1492		1357	
Flt Permitted		0.83		0.42	1.00			0.86	1.00		0.99	
Satd. Flow (perm)		1238		758	1760			1529	1492		1342	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	280	338	34	32	68	9	28	30	38	6	30	75
RTOR Reduction (vph)	0	1	0	0	4	0	0	0	31	0	62	0
Lane Group Flow (vph)	0	651	0	32	73	0	0	58	7	0	49	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		43.1		43.1	43.1			14.6	14.6		14.6	
Effective Green, g (s)		43.1		43.1	43.1			14.6	14.6		14.6	
Actuated g/C Ratio		0.52		0.52	0.52			0.18	0.18		0.18	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		649		397	923			271	265		238	
v/s Ratio Prot					0.04							
v/s Ratio Perm		c0.53		0.04				c0.04	0.00		0.04	
v/c Ratio		1.00		0.08	0.08			0.21	0.03		0.21	
Uniform Delay, d1		19.5		9.7	9.7			28.8	27.9		28.8	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		35.9		0.1	0.0			0.4	0.0		0.4	
Delay (s)		55.4		9.8	9.7			29.2	27.9		29.2	
Level of Service		E		A	A			C	C		C	
Approach Delay (s)		55.4			9.7			28.7			29.2	
Approach LOS		E			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	44.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	82.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St. — 4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	468	21	22	101	13	16	280	41	12	179	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.97	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1666	3394		1695	3344		1260	2459		1260	2390	
Flt Permitted	0.67	1.00		0.34	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1173	3394		607	3344		1260	2459		1260	2390	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	53	538	24	25	116	15	18	322	47	14	206	83
RTOR Reduction (vph)	0	3	0	0	9	0	0	10	0	0	40	0
Lane Group Flow (vph)	53	559	0	25	122	0	18	359	0	14	249	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	30.1	30.1		30.1	30.1		6.8	43.9		2.6	39.7	
Effective Green, g (s)	30.1	30.1		30.1	30.1		6.8	43.9		2.6	39.7	
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.07	0.48		0.03	0.43	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	383	1109		198	1092		93	1172		35	1030	
v/s Ratio Prot		c0.16			0.04		0.01	c0.15		0.01	c0.10	
v/s Ratio Perm	0.05			0.04								
v/c Ratio	0.14	0.50		0.13	0.11		0.19	0.31		0.40	0.24	
Uniform Delay, d1	21.9	25.0		21.8	21.7		40.1	14.8		44.0	16.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.3	0.0		1.0	0.7		7.3	0.1	
Delay (s)	22.0	25.3		22.1	21.7		41.1	15.4		51.3	16.8	
Level of Service	C	C		C	C		D	B		D	B	
Approach Delay (s)		25.1			21.8			16.6			18.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	92.1	Sum of lost time (s)	15.5
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	558	11	2	184	1	13	0	1	2	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00			0.99		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3411		1711	3419			1705		1711	1621	
Flt Permitted	0.63	1.00		0.42	1.00			0.78		0.75	1.00	
Satd. Flow (perm)	1126	3411		751	3419			1388		1346	1621	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	607	12	2	200	1	14	0	1	2	1	2
RTOR Reduction (vph)	0	2	0	0	1	0	0	11	0	0	1	0
Lane Group Flow (vph)	2	617	0	2	200	0	0	4	0	2	2	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.4	12.4		12.4	12.4			7.7		7.7	7.7	
Effective Green, g (s)	12.4	12.4		12.4	12.4			7.7		7.7	7.7	
Actuated g/C Ratio	0.41	0.41		0.41	0.41			0.26		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	463	1405		309	1408			355		344	414	
v/s Ratio Prot		c0.18			0.06						0.00	
v/s Ratio Perm	0.00			0.00				c0.00		0.00		
v/c Ratio	0.00	0.44		0.01	0.14			0.01		0.01	0.00	
Uniform Delay, d1	5.2	6.4		5.2	5.5			8.4		8.3	8.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.2		0.0	0.0			0.0		0.0	0.0	
Delay (s)	5.2	6.6		5.2	5.6			8.4		8.4	8.3	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		6.6			5.6			8.4			8.3	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	30.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	85	0	0	254	12	155	574	494	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.93				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3401			5097		1711	3184				2694
Flt Permitted		0.92			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3150			5097		1711	3184				2694
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	14	106	0	0	318	15	194	718	618	0	0	31
RTOR Reduction (vph)	0	0	0	0	7	0	0	205	0	0	0	29
Lane Group Flow (vph)	0	120	0	0	326	0	194	1131	0	0	0	2
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1484			1777		697	1298				141
v/s Ratio Prot		c0.00			c0.06		0.11	c0.36				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.08			0.18		0.28	0.87				0.01
Uniform Delay, d1		11.2			17.2		15.0	20.7				34.1
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.2		1.0	8.2				0.1
Delay (s)		11.3			17.4		16.0	28.9				34.3
Level of Service		B			B		B	C				C
Approach Delay (s)		11.3			17.4			27.3			34.3	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

21: I-280 SB On-Ramp & Mariposa St.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	96	169	195	239	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.95	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1620	1428	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1620	1428	3319	1801		
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	117	206	238	291	0	0
RTOR Reduction (vph)	18	50	0	0	0	0
Lane Group Flow (vph)	153	102	238	291	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	40.4	40.4	9.6	60.0		
Effective Green, g (s)	40.4	40.4	9.6	60.0		
Actuated g/C Ratio	0.67	0.67	0.16	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	1090	961	531	1801		
v/s Ratio Prot	0.09		c0.07	c0.16		
v/s Ratio Perm		0.07				
v/c Ratio	0.14	0.11	0.45	0.16		
Uniform Delay, d1	3.5	3.4	22.8	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.1	0.0	0.6	0.0		
Delay (s)	3.6	3.5	23.4	0.0		
Level of Service	A	A	C	A		
Approach Delay (s)	3.5			10.6	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	7.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

22: Third St. & Cesar Chavez

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	33	105	2	25	0	85	212	0	6	163	55
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.98	1.00		0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	1.00		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1189	1902		1159	1279		1215	2431		1215	2297	
Flt Permitted	0.40	1.00		0.83	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	496	1902		1017	1279		1215	2431		1215	2297	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	69	37	118	2	28	0	96	238	0	7	183	62
RTOR Reduction (vph)	0	86	0	0	0	0	0	0	0	0	25	0
Lane Group Flow (vph)	69	69	0	2	28	0	96	238	0	7	220	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	15.4	15.4		4.8	4.8		6.0	23.7		2.0	19.7	
Effective Green, g (s)	15.4	15.4		4.8	4.8		6.0	23.7		2.0	19.7	
Actuated g/C Ratio	0.27	0.27		0.08	0.08		0.10	0.41		0.03	0.34	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	197	510		85	106		127	1003		42	788	
v/s Ratio Prot	c0.03	0.04			0.02		c0.08	0.10		0.01	c0.10	
v/s Ratio Perm	c0.06			0.00								
v/c Ratio	0.35	0.13		0.02	0.26		0.76	0.24		0.17	0.28	
Uniform Delay, d1	16.6	15.9		24.1	24.6		25.0	11.0		26.9	13.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.1		0.1	1.3		22.3	0.1		1.9	0.2	
Delay (s)	17.7	16.1		24.3	26.0		47.2	11.1		28.8	13.9	
Level of Service	B	B		C	C		D	B		C	B	
Approach Delay (s)		16.6			25.9			21.5			14.3	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	57.4	Sum of lost time (s)	21.6
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	182	133	106	177
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	198	145	115	192
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			584			
pX, platoon unblocked						
vC, conflicting volume	621	99			198	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	621	99			198	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			92	
cM capacity (veh/h)	384	938			1372	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	99	99	145	115	192
Volume Left	0	0	0	115	0
Volume Right	0	0	145	0	0
cSH	1700	1700	1700	1372	1700
Volume to Capacity	0.06	0.06	0.09	0.08	0.11
Queue Length 95th (ft)	0	0	0	7	0
Control Delay (s)	0.0	0.0	0.0	7.9	0.0
Lane LOS				A	
Approach Delay (s)	0.0			2.9	
Approach LOS					

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	20.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	93	56	0	117	81
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	101	61	0	127	88
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	61				111	61
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	61				111	61
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				85	91
cM capacity (veh/h)	1541				874	992

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	51	51	61	215
Volume Left	0	0	0	127
Volume Right	0	0	0	88
cSH	1700	1700	1700	918
Volume to Capacity	0.03	0.03	0.04	0.23
Queue Length 95th (ft)	0	0	0	23
Control Delay (s)	0.0	0.0	0.0	10.1
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.1
Approach LOS				B

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	65	145	56	63	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	158	61	68	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	129				281	61
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	129				281	61
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	100
cM capacity (veh/h)	1454				652	992

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	123	105	61	68	0
Volume Left	71	0	0	0	0
Volume Right	0	0	0	68	0
cSH	1454	1700	1700	1700	1700
Volume to Capacity	0.05	0.06	0.04	0.04	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	4.5	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.4		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	17	8	19	27	16	32	300	19	14	213	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.97		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1546			1541		1540	3051		1540	3031	
Flt Permitted		0.90			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1413			1376		1540	3051		1540	3031	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	18	9	21	29	17	35	326	21	15	232	27
RTOR Reduction (vph)	0	8	0	0	15	0	0	3	0	0	6	0
Lane Group Flow (vph)	0	34	0	0	52	0	35	344	0	15	253	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.4			7.4		4.5	55.3		2.3	53.1	
Effective Green, g (s)		7.4			7.4		4.5	55.3		2.3	53.1	
Actuated g/C Ratio		0.09			0.09		0.06	0.69		0.03	0.66	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		130			126		86	2103		44	2006	
v/s Ratio Prot							c0.02	c0.11		c0.01	0.08	
v/s Ratio Perm		0.02			c0.04							
v/c Ratio		0.26			0.41		0.41	0.16		0.34	0.13	
Uniform Delay, d1		33.9			34.3		36.6	4.4		38.2	5.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1			2.2		1.1	0.2		1.7	0.1	
Delay (s)		34.9			36.5		37.7	4.5		39.9	5.1	
Level of Service		C			D		D	A		D	A	
Approach Delay (s)		34.9			36.5			7.6			7.0	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	32.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	213	27	116	0	0	117
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	232	29	126	0	0	127

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	116	116	29	63	63	127
Volume Left (vph)	116	116	0	0	0	0
Volume Right (vph)	0	0	29	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.7	5.7	3.2	5.3	5.3	5.1
Degree Utilization, x	0.18	0.18	0.03	0.09	0.09	0.18
Capacity (veh/h)	604	608	1121	644	643	666
Control Delay (s)	8.8	8.8	5.1	7.7	7.7	9.3
Approach Delay (s)	8.3			7.7		9.3
Approach LOS	A			A		A

Intersection Summary			
Delay	8.4		
Level of Service	A		
Intersection Capacity Utilization	18.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	71	0	0	48	61	15	194	7	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	54	77	0	0	52	66	16	211	8	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	132	118	122	113
Volume Left (vph)	54	0	16	0
Volume Right (vph)	0	66	0	8
Hadj (s)	0.12	-0.30	0.10	-0.01
Departure Headway (s)	4.7	4.3	5.2	5.1
Degree Utilization, x	0.17	0.14	0.18	0.16
Capacity (veh/h)	718	780	665	678
Control Delay (s)	8.7	8.1	8.1	7.8
Approach Delay (s)	8.7	8.1	8.0	
Approach LOS	A	A	A	

Intersection Summary			
Delay	8.2		
Level of Service	A		
Intersection Capacity Utilization	25.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	17	42	4	26	1	51	303	3	0	224	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.93			1.00		1.00	1.00			0.96	
Flpb, ped/bikes		0.97			0.99		1.00	1.00			1.00	
Frt		0.93			1.00		1.00	1.00			0.98	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1178			1580		1540	2259			2140	
Flt Permitted		0.90			0.97		0.95	1.00			1.00	
Satd. Flow (perm)		1074			1539		1540	2259			2140	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	18	44	4	27	1	54	319	3	0	236	35
RTOR Reduction (vph)	0	40	0	0	1	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	44	0	0	31	0	54	322	0	0	267	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		8.7			8.7		7.8	81.0			68.1	
Effective Green, g (s)		8.7			8.7		7.8	81.0			68.1	
Actuated g/C Ratio		0.09			0.09		0.08	0.81			0.68	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		93			133		120	1829			1457	
v/s Ratio Prot							c0.04	0.14			c0.12	
v/s Ratio Perm		c0.04			0.02							
v/c Ratio		0.47			0.23		0.45	0.18			0.18	
Uniform Delay, d1		43.5			42.5		44.1	2.1			5.8	
Progression Factor		1.00			1.00		1.00	1.00			0.46	
Incremental Delay, d2		3.7			0.9		2.7	0.2			0.2	
Delay (s)		47.2			43.4		46.7	2.3			2.9	
Level of Service		D			D		D	A			A	
Approach Delay (s)		47.2			43.4			8.7			2.9	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	118	271	0	0	95	118	78	79	130	40	0	137
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1035	1540	1621	1201	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1035	1540	1621	1201	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	124	285	0	0	100	124	82	83	137	42	0	144
RTOR Reduction (vph)	0	0	0	0	0	79	0	0	120	0	0	129
Lane Group Flow (vph)	124	285	0	0	100	45	82	83	17	42	0	15
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	9.8	42.3			27.5	27.5	9.7	9.7	9.7	8.0		8.0
Effective Green, g (s)	9.8	42.3			27.5	27.5	9.7	9.7	9.7	8.0		8.0
Actuated g/C Ratio	0.13	0.56			0.36	0.36	0.13	0.13	0.13	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	198	1713			1114	374	196	206	153	162		126
v/s Ratio Prot	c0.08	c0.09			0.03		c0.05	0.05		c0.03		0.01
v/s Ratio Perm						0.04			0.01			
v/c Ratio	0.63	0.17			0.09	0.12	0.42	0.40	0.11	0.26		0.12
Uniform Delay, d1	31.4	8.2			16.0	16.2	30.6	30.5	29.3	31.3		30.8
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	6.1	0.2			0.2	0.7	1.4	1.3	0.3	0.9		0.4
Delay (s)	37.4	8.4			16.2	16.8	32.0	31.8	29.7	32.1		31.2
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		17.2			16.5			30.9			31.4	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	14	34	0	15	0	16	20	2	0	29	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5			4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00			1.00	
Frt		0.92			1.00		1.00	0.99			0.94	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3103			1801		1711	1778			1697	
Flt Permitted		0.93			1.00		1.00	1.00			1.00	
Satd. Flow (perm)		2910			1801		1801	1778			1697	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	15	37	0	16	0	17	22	2	0	32	20
RTOR Reduction (vph)	0	10	0	0	0	0	0	2	0	0	19	0
Lane Group Flow (vph)	0	57	0	0	16	0	17	22	0	0	33	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		27.9			27.9		1.6	1.6			1.6	
Effective Green, g (s)		27.9			27.9		1.6	1.6			1.6	
Actuated g/C Ratio		0.72			0.72		0.04	0.04			0.04	
Clearance Time (s)		4.5			4.5		4.5	4.5			4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		2108			1305		74	73			70	
v/s Ratio Prot					0.01			0.01			c0.02	
v/s Ratio Perm		c0.02					0.01					
v/c Ratio		0.03			0.01		0.23	0.30			0.47	
Uniform Delay, d1		1.5			1.5		17.9	17.9			18.0	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.0			0.0		1.6	2.3			4.9	
Delay (s)		1.5			1.5		19.4	20.2			22.9	
Level of Service		A			A		B	C			C	
Approach Delay (s)		1.5			1.5			19.9			22.9	
Approach LOS		A			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.05		
Actuated Cycle Length (s)	38.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT WITH M-TR-11C
BASKETBALL GAME
NO SF GIANTS GAME AT AT&T PARK
SATURDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	637	670	58	408	573	78	43	497	162	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.90			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.99		1.00	0.98			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3018		2987	2983			5515	1233			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3018		2987	2983			5515	1233			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	708	744	64	453	637	87	48	552	180	0	0	0
RTOR Reduction (vph)	0	6	0	0	8	0	0	0	147	0	0	0
Lane Group Flow (vph)	708	802	0	453	716	0	0	600	33	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	25.4	42.5		28.4	45.5			20.2	20.2			
Effective Green, g (s)	25.4	42.5		28.4	45.5			20.2	20.2			
Actuated g/C Ratio	0.23	0.39		0.26	0.41			0.18	0.18			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	1034	1166		771	1233			1012	226			
v/s Ratio Prot	0.16	c0.27		0.15	c0.24							
v/s Ratio Perm								0.11	0.03			
v/c Ratio	0.68	0.69		0.59	0.58			0.59	0.15			
Uniform Delay, d1	38.6	28.2		35.7	24.9			41.1	37.7			
Progression Factor	0.67	0.57		0.84	0.27			1.13	3.39			
Incremental Delay, d2	1.5	2.6		0.4	0.3			0.8	0.3			
Delay (s)	27.2	18.6		30.5	7.1			47.3	128.1			
Level of Service	C	B		C	A			D	F			
Approach Delay (s)		22.6			16.1			65.9			0.0	
Approach LOS		C			B			E			A	

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	1277	79	51	521	44	7	49	28	60	538	97
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.98		1.00	0.95			1.00	0.63	1.00	0.99	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00	0.67	1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4288		1296	2437			1573	857	1033	2915	581
Flt Permitted	0.95	1.00		0.95	1.00			0.92	1.00	0.72	1.00	1.00
Satd. Flow (perm)	1540	4288		1296	2437			1450	857	781	2915	581
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	162	1359	84	54	554	47	7	52	30	64	572	103
RTOR Reduction (vph)	0	5	0	0	5	0	0	0	22	0	1	68
Lane Group Flow (vph)	162	1438	0	54	596	0	0	59	8	64	581	25
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	16.1	52.0		9.5	43.8			28.6	28.6	29.6	29.6	29.6
Effective Green, g (s)	16.1	52.0		9.5	43.8			28.6	28.6	29.6	29.6	29.6
Actuated g/C Ratio	0.15	0.47		0.09	0.40			0.26	0.26	0.27	0.27	0.27
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	225	2027		111	970			377	222	210	784	156
v/s Ratio Prot	0.11	c0.34		0.04	c0.24						c0.20	
v/s Ratio Perm								0.04	0.01	0.08		0.04
v/c Ratio	0.72	0.71		0.49	0.61			0.16	0.04	0.30	0.74	0.16
Uniform Delay, d1	44.8	23.0		47.9	26.4			31.4	30.4	32.0	36.7	30.7
Progression Factor	1.00	1.00		0.86	0.69			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	2.1		2.8	1.0			0.2	0.1	0.8	3.8	0.5
Delay (s)	55.3	25.1		43.8	19.2			31.6	30.5	32.8	40.5	31.2
Level of Service	E	C		D	B			C	C	C	D	C
Approach Delay (s)		28.2			21.2			31.2			38.6	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	29.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.
9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1458	80	3	622	30	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.98
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3050			3078	1540	1354
Flt Permitted	1.00			0.95	0.95	1.00
Satd. Flow (perm)	3050			2923	1540	1354
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1602	88	3	684	33	55
RTOR Reduction (vph)	2	0	0	0	0	20
Lane Group Flow (vph)	1688	0	0	687	33	35
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Actuated Green, G (s)	75.3			75.3	13.2	13.2
Effective Green, g (s)	75.3			75.3	13.2	13.2
Actuated g/C Ratio	0.78			0.78	0.14	0.14
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	2379			2280	210	185
v/s Ratio Prot	c0.55				0.02	
v/s Ratio Perm				0.23		c0.03
v/c Ratio	0.71			0.30	0.16	0.19
Uniform Delay, d1	5.2			3.0	36.7	36.9
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	1.8			0.3	0.4	0.5
Delay (s)	7.0			3.4	37.1	37.4
Level of Service	A			A	D	D
Approach Delay (s)	7.0			3.4	37.3	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	7.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	96.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.
9/18/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	262	1267	145	34	172	356	188	390	998	262
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.95			1.00	1.00
Flpb, ped/bikes		0.99			0.99	1.00			1.00	1.00
Frt		0.99			1.00	0.95			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		5749			2844	2411			4102	1122
Flt Permitted		0.99			0.78	1.00			0.95	1.00
Satd. Flow (perm)		5749			2224	2411			4102	1122
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	270	1306	149	35	177	367	194	402	1029	270
RTOR Reduction (vph)	0	18	0	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	1707	0	0	212	559	0	0	1458	243
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		24.0			21.5	21.5			27.0	27.0
Effective Green, g (s)		26.0			24.5	24.5			30.0	30.0
Actuated g/C Ratio		0.29			0.27	0.27			0.33	0.33
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1660			605	656			1367	374
v/s Ratio Prot						c0.23			c0.36	0.22
v/s Ratio Perm		0.30			0.10					
v/c Ratio		1.03			0.35	0.85			1.07	0.65
Uniform Delay, d1		32.0			26.3	31.0			30.0	25.5
Progression Factor		1.55			1.00	1.00			1.00	1.00
Incremental Delay, d2		25.9			0.4	10.4			44.2	3.9
Delay (s)		75.5			26.7	41.4			74.2	29.4
Level of Service		E			C	D			E	C
Approach Delay (s)		75.5			26.7	41.4			67.8	
Approach LOS		E			C	D			E	

Intersection Summary			
HCM 2000 Control Delay	65.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	102.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

9/18/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	51	317	276	49	155	105	14	231	55	722
Ideal Flow (vphpl)	1400	1400	1400	1400	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.88		0.98		1.00	1.00
Flpb, ped/bikes		0.94	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.98		0.94		0.85		1.00	1.00
Flt Protected		0.95	0.99		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1606	2620		2297		1161		1327	2558
Flt Permitted		0.95	0.99		1.00		1.00		0.44	0.95
Satd. Flow (perm)		1606	2620		2297		1161		621	2444
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	63	391	341	60	191	130	17	285	68	891
RTOR Reduction (vph)	0	0	19	0	1	0	12	0	0	0
Lane Group Flow (vph)	0	337	499	0	322	0	3	0	346	898
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Perm	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases		2	2		8			7	7	4
Permitted Phases	2						8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		396	733		535		247		386	1078
v/s Ratio Prot			0.19		0.14				0.15	c0.14
v/s Ratio Perm		0.21					0.00		c0.24	0.22
v/c Ratio		0.85	0.68		0.60		0.01		0.90	0.83
Uniform Delay, d1		26.9	24.0		25.6		23.3		21.1	18.8
Progression Factor		1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2		20.0	5.1		5.0		0.1		25.9	7.6
Delay (s)		46.9	29.1		30.6		23.4		47.0	26.4
Level of Service		D	C		C		C		D	C
Approach Delay (s)			36.1		30.3					32.1
Approach LOS			D		C					C

Intersection Summary			
HCM 2000 Control Delay	33.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	916	119	8	4	14	9	343	69	128	225	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1570	1570	1570	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.97		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.93		1.00	0.97		1.00	1.00	
Flt Protected		1.00	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1619	1353		1455		1272	2399		1540	3062	
Flt Permitted		1.00	1.00		0.70		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1617	1353		1038		1272	2399		1540	3062	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	10	944	123	8	4	14	9	354	71	132	232	7
RTOR Reduction (vph)	0	0	56	0	6	0	0	16	0	0	2	0
Lane Group Flow (vph)	0	954	67	0	20	0	9	409	0	132	237	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		61.2	61.2		61.2		1.0	21.9		12.7	33.9	
Effective Green, g (s)		61.2	61.2		61.2		1.0	21.9		12.7	33.9	
Actuated g/C Ratio		0.55	0.55		0.55		0.01	0.20		0.11	0.30	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		885	741		568		11	470		175	929	
v/s Ratio Prot							0.01	c0.17		c0.09	0.08	
v/s Ratio Perm		c0.59	0.05		0.02							
v/c Ratio		1.08	0.09		0.03		0.82	0.87		0.75	0.26	
Uniform Delay, d1		25.2	12.0		11.6		55.3	43.5		48.0	29.4	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		53.5	0.1		0.0		162.4	16.0		15.0	0.1	
Delay (s)		78.8	12.1		11.7		217.6	59.5		63.0	29.5	
Level of Service		E	B		B		F	E		E	C	
Approach Delay (s)		71.2			11.7			62.8			41.4	
Approach LOS		E			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	62.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	111.7	Sum of lost time (s)	15.9
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	773	7	2	2	16	5	29	1	271	164	10
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	0.98	
Flpb, ped/bikes		1.00			1.00	1.00	0.76	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		1.00			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2598			1414	1190	1053	1440		1377	1412	
Flt Permitted		0.95			0.85	1.00	0.98	1.00		0.95	1.00	
Satd. Flow (perm)		2479			1232	1190	1082	1440		1377	1412	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	8	889	8	2	2	18	6	33	1	311	189	11
RTOR Reduction (vph)	0	1	0	0	0	6	0	1	0	0	3	0
Lane Group Flow (vph)	0	904	0	0	4	12	6	33	0	311	197	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		29.5			29.5	42.2	4.1	4.1		12.7	21.8	
Effective Green, g (s)		29.5			29.5	42.2	4.1	4.1		12.7	21.8	
Actuated g/C Ratio		0.48			0.48	0.69	0.07	0.07		0.21	0.36	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		1192			592	916	72	96		285	502	
v/s Ratio Prot						0.00		0.02		c0.23	c0.14	
v/s Ratio Perm		c0.36			0.00	0.01	0.01					
v/c Ratio		0.76			0.01	0.01	0.08	0.34		1.09	0.39	
Uniform Delay, d1		13.0			8.3	3.0	26.8	27.3		24.3	14.8	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.8			0.0	0.0	0.5	2.2		79.9	0.5	
Delay (s)		15.8			8.3	3.0	27.3	29.5		104.2	15.3	
Level of Service		B			A	A	C	C		F	B	
Approach Delay (s)		15.8			4.0			29.1			69.4	
Approach LOS		B			A			C			E	

Intersection Summary			
HCM 2000 Control Delay	34.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	61.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	20	104	199	25	791	153
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.97	1.00	0.93	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1741	1535	809	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1741	1535	809	1134	1194
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	23	120	229	29	909	176
RTOR Reduction (vph)	0	110	0	24	0	0
Lane Group Flow (vph)	23	10	229	5	909	176
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	7.9	7.9	20.0	15.0	53.0	78.0
Effective Green, g (s)	7.9	7.9	20.0	15.0	53.0	78.0
Actuated g/C Ratio	0.08	0.08	0.21	0.16	0.55	0.81
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	93	143	320	168	626	971
v/s Ratio Prot	c0.02		c0.15	0.00	c0.80	0.15
v/s Ratio Perm		0.01		0.00		
v/c Ratio	0.25	0.07	0.72	0.03	1.45	0.18
Uniform Delay, d1	41.2	40.6	35.3	34.3	21.5	2.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.2	7.4	0.1	212.3	0.1
Delay (s)	42.6	40.8	42.7	34.4	233.7	2.0
Level of Service	D	D	D	C	F	A
Approach Delay (s)	41.1		41.8			196.2
Approach LOS	D		D			F

Intersection Summary			
HCM 2000 Control Delay	154.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	20.0
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	3	1	208	92	43	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.98		1.00	1.00	1.00	
Flpb, ped/bikes	0.97		0.98	1.00	1.00	
Frt	0.97		1.00	1.00	0.99	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	1591		1669	1531	3119	
Flt Permitted	0.96		0.72	1.00	1.00	
Satd. Flow (perm)	1591		1263	1531	3119	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	4	1	248	110	51	4
RTOR Reduction (vph)	1	0	0	0	1	0
Lane Group Flow (vph)	4	0	248	110	54	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	0.8		24.5	24.5	24.5	
Effective Green, g (s)	0.8		24.5	24.5	24.5	
Actuated g/C Ratio	0.02		0.69	0.69	0.69	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	36		876	1062	2164	
v/s Ratio Prot	c0.00			0.07	0.02	
v/s Ratio Perm			c0.20			
v/c Ratio	0.11		0.28	0.10	0.02	
Uniform Delay, d1	16.9		2.1	1.8	1.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.4		0.2	0.0	0.0	
Delay (s)	18.3		2.2	1.8	1.7	
Level of Service	B		A	A	A	
Approach Delay (s)	18.3			2.1	1.7	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	2.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	35.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	10	42	354	53	272	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.94	0.98		1.00	1.00
Flpb, ped/bikes	0.95	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1628	1437	3303		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1628	1437	3303		1711	3421
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	11	45	381	57	292	243
RTOR Reduction (vph)	0	42	11	0	0	0
Lane Group Flow (vph)	11	3	427	0	292	243
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	4.1	4.1	30.5		15.1	50.7
Effective Green, g (s)	4.1	4.1	30.5		15.1	50.7
Actuated g/C Ratio	0.06	0.06	0.47		0.23	0.78
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	102	90	1549		397	2668
v/s Ratio Prot			c0.13		c0.17	0.07
v/s Ratio Perm	c0.01	0.00				
v/c Ratio	0.11	0.03	0.28		0.74	0.09
Uniform Delay, d1	28.7	28.6	10.5		23.1	1.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.5	0.1	0.4		6.9	0.1
Delay (s)	29.2	28.7	11.0		30.0	1.8
Level of Service	C	C	B		C	A
Approach Delay (s)	28.8		11.0			17.2
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	7	7	290	34	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1519	1342		2882	2768	
Flt Permitted	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1519	1342		2739	2768	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	8	8	341	40	12
RTOR Reduction (vph)	0	8	0	0	9	0
Lane Group Flow (vph)	12	0	0	349	43	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	0.6	0.6		11.1	11.1	
Effective Green, g (s)	0.6	0.6		11.1	11.1	
Actuated g/C Ratio	0.01	0.01		0.24	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	19	17		645	652	
v/s Ratio Prot	c0.01				0.02	
v/s Ratio Perm		0.00		c0.13		
v/c Ratio	0.63	0.01		0.54	0.07	
Uniform Delay, d1	23.1	23.0		15.8	14.0	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	52.7	0.1		0.9	0.0	
Delay (s)	75.9	23.1		16.7	14.0	
Level of Service	E	C		B	B	
Approach Delay (s)	54.8			16.7	14.0	
Approach LOS	D			B	B	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	47.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	24.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	127	1	20	4	2	5	28	220	8	5	53	38
Peak Hour Factor	0.92	0.79	0.79	0.79	0.79	0.92	0.79	0.92	0.79	0.92	0.92	0.92
Hourly flow rate (vph)	138	1	25	5	3	5	35	239	10	5	58	41

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	138	27	5	8	285	63	41
Volume Left (vph)	138	0	5	0	35	5	0
Volume Right (vph)	0	25	0	5	10	0	41
Hadj (s)	0.53	-0.63	0.53	-0.44	0.04	0.08	-0.67
Departure Headway (s)	6.1	4.9	6.3	5.3	5.2	5.4	4.6
Degree Utilization, x	0.23	0.04	0.01	0.01	0.41	0.09	0.05
Capacity (veh/h)	560	688	527	619	677	636	735
Control Delay (s)	9.7	6.9	8.1	7.2	11.7	7.7	6.7
Approach Delay (s)	9.2		7.5		11.7	7.3	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	10.1		
Level of Service	B		
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰↰	↑↱		↰	↑↱	
Volume (vph)	147	132	104	1	61	6	67	255	16	1	163	71
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1274	1365	1131	1290	1365	1116	2515	2565		1296	2454	
Flt Permitted	0.71	1.00	1.00	0.66	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	955	1365	1131	900	1365	1116	2515	2565		1296	2454	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	165	148	117	1	69	7	75	287	18	1	183	80
RTOR Reduction (vph)	0	0	82	0	0	5	0	5	0	0	53	0
Lane Group Flow (vph)	165	148	35	1	69	2	75	300	0	1	210	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	14.4	14.4	14.4	14.4	14.4	14.4	4.0	16.8		0.9	13.7	
Effective Green, g (s)	14.4	14.4	14.4	14.4	14.4	14.4	4.0	16.8		0.9	13.7	
Actuated g/C Ratio	0.30	0.30	0.30	0.30	0.30	0.30	0.08	0.35		0.02	0.29	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	287	411	340	271	411	336	210	901		24	703	
v/s Ratio Prot		0.11			0.05		0.03	c0.12		0.00	c0.09	
v/s Ratio Perm	c0.17		0.03	0.00		0.00						
v/c Ratio	0.57	0.36	0.10	0.00	0.17	0.01	0.36	0.33		0.04	0.30	
Uniform Delay, d1	14.1	13.1	12.0	11.7	12.3	11.7	20.7	11.4		23.0	13.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.8	0.5	0.1	0.0	0.2	0.0	1.0	0.2		0.7	0.2	
Delay (s)	16.9	13.6	12.2	11.7	12.5	11.7	21.7	11.6		23.7	13.5	
Level of Service	B	B	B	B	B	B	C	B		C	B	
Approach Delay (s)		14.5			12.4			13.6			13.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	15.7
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↱		↰	↱	
Volume (vph)	140	364	1	2	179	17	3	5	1	17	1	44
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1250	1621	1663		1492	1356	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.73	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1250	1239	1663		1184	1356	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	146	379	1	2	186	18	3	5	1	18	1	46
RTOR Reduction (vph)	0	0	0	0	0	11	0	1	0	0	37	0
Lane Group Flow (vph)	146	379	1	2	186	7	3	5	0	18	10	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	20.5	47.7	47.7	2.5	29.7	29.7	15.0	15.0		15.0	15.0	
Effective Green, g (s)	20.5	47.7	47.7	2.5	29.7	29.7	15.0	15.0		15.0	15.0	
Actuated g/C Ratio	0.26	0.59	0.59	0.03	0.37	0.37	0.19	0.19		0.19	0.19	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	414	1014	862	50	631	462	231	311		221	253	
v/s Ratio Prot	c0.09	c0.22		0.00	0.11			0.00			0.01	
v/s Ratio Perm			0.00			0.01	0.00			c0.02		
v/c Ratio	0.35	0.37	0.00	0.04	0.29	0.01	0.01	0.02		0.08	0.04	
Uniform Delay, d1	24.4	8.5	6.6	37.7	17.8	16.0	26.6	26.6		26.9	26.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	1.1	0.0	0.3	0.3	0.0	0.0	0.0		0.2	0.1	
Delay (s)	24.9	9.5	6.6	38.0	18.1	16.0	26.6	26.6		27.1	26.8	
Level of Service	C	A	A	D	B	B	C	C		C	C	
Approach Delay (s)		13.8			18.1			26.6			26.8	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	385	3	5	217	4	11	444	99	21	14	39
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.97	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1047	1540	2995			2989	1073
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.73	1.00			0.74	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1047	1182	2995			2276	1073
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	16	433	3	6	244	4	12	499	111	24	16	44
RTOR Reduction (vph)	0	0	2	0	0	2	0	18	0	0	0	30
Lane Group Flow (vph)	16	433	1	6	244	2	12	592	0	0	40	14
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	0.9	31.6	31.6	0.9	30.6	30.6	22.3	22.3			21.3	21.3
Effective Green, g (s)	0.9	31.6	31.6	0.9	30.6	30.6	22.3	22.3			21.3	21.3
Actuated g/C Ratio	0.01	0.47	0.47	0.01	0.45	0.45	0.33	0.33			0.31	0.31
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	16	566	642	20	548	472	388	985			715	337
v/s Ratio Prot	c0.01	c0.36		0.00	0.20			c0.20				
v/s Ratio Perm			0.00			0.00	0.01				0.02	0.01
v/c Ratio	1.00	0.77	0.00	0.30	0.45	0.00	0.03	0.60			0.06	0.04
Uniform Delay, d1	33.4	15.0	9.7	33.1	12.8	10.2	15.4	19.0			16.2	16.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	225.0	6.1	0.0	8.3	0.6	0.0	0.0	1.0			0.0	0.1
Delay (s)	258.4	21.1	9.7	41.4	13.4	10.2	15.5	20.1			16.3	16.2
Level of Service	F	C	A	D	B	B	B	C			B	B
Approach Delay (s)		29.5			14.0			20.0			16.2	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	67.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	297	60	8	197	62	31	91	8	97	40	24
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.92	1.00	1.00	0.95	1.00	0.97	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1320	927		1334	1126	882	1070	957	908	1070	1034	
Flt Permitted	0.45	1.00		0.39	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	625	927		551	1126	882	1070	957	908	1070	1034	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	24	349	71	9	232	73	36	107	9	114	47	28
RTOR Reduction (vph)	0	7	0	0	0	30	0	0	8	0	24	0
Lane Group Flow (vph)	24	413	0	9	232	43	36	107	1	114	51	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	37.1	37.1		36.4	36.4	46.0	9.3	11.5	11.5	9.6	11.8	
Effective Green, g (s)	37.1	37.1		36.4	36.4	46.0	9.3	11.5	11.5	9.6	11.8	
Actuated g/C Ratio	0.47	0.47		0.46	0.46	0.58	0.12	0.15	0.15	0.12	0.15	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	305	436		260	520	570	126	139	132	130	154	
v/s Ratio Prot	0.00	c0.45		0.00	c0.21	0.01	0.03	c0.11		c0.11	0.05	
v/s Ratio Perm	0.04			0.02		0.04			0.00			
v/c Ratio	0.08	0.95		0.03	0.45	0.07	0.29	0.77	0.01	0.88	0.33	
Uniform Delay, d1	11.7	19.9		15.0	14.4	7.1	31.7	32.4	28.8	34.0	30.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	29.8		0.1	0.6	0.1	1.3	22.2	0.0	43.7	1.3	
Delay (s)	11.8	49.7		15.0	15.0	7.2	33.0	54.6	28.8	77.7	31.3	
Level of Service	B	D		B	B	A	C	D	C	E	C	
Approach Delay (s)		47.7			13.2			48.0			59.3	
Approach LOS		D			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	39.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	78.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	222	265	27	26	54	7	22	24	30	5	24	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	0.99			1.00	0.97		0.98	
Flpb, ped/bikes		0.99		0.99	1.00			0.99	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.91	
Flt Protected		0.98		0.95	1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1468		1696	1760			1745	1492		1357	
Flt Permitted		0.82		0.43	1.00			0.86	1.00		0.99	
Satd. Flow (perm)		1236		764	1760			1529	1492		1342	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	278	331	34	32	68	9	28	30	38	6	30	75
RTOR Reduction (vph)	0	1	0	0	4	0	0	0	31	0	62	0
Lane Group Flow (vph)	0	642	0	32	73	0	0	58	7	0	49	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		43.1		43.1	43.1			14.6	14.6		14.6	
Effective Green, g (s)		43.1		43.1	43.1			14.6	14.6		14.6	
Actuated g/C Ratio		0.52		0.52	0.52			0.18	0.18		0.18	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		648		401	923			271	265		238	
v/s Ratio Prot					0.04							
v/s Ratio Perm		c0.52		0.04				c0.04	0.00		0.04	
v/c Ratio		0.99		0.08	0.08			0.21	0.03		0.21	
Uniform Delay, d1		19.3		9.7	9.7			28.8	27.9		28.8	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		32.7		0.1	0.0			0.4	0.0		0.4	
Delay (s)		52.0		9.8	9.7			29.2	27.9		29.2	
Level of Service		D		A	A			C	C		C	
Approach Delay (s)		52.0			9.7			28.7			29.2	
Approach LOS		D			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	42.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	82.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	463	21	22	101	13	16	279	39	12	184	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.97	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1666	3394		1695	3344		1260	2461		1260	2392	
Flt Permitted	0.67	1.00		0.34	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1173	3394		615	3344		1260	2461		1260	2392	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	53	532	24	25	116	15	18	321	45	14	211	83
RTOR Reduction (vph)	0	3	0	0	9	0	0	9	0	0	38	0
Lane Group Flow (vph)	53	553	0	25	122	0	18	357	0	14	256	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	30.1	30.1		30.1	30.1		6.8	43.9		2.6	39.7	
Effective Green, g (s)	30.1	30.1		30.1	30.1		6.8	43.9		2.6	39.7	
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.07	0.48		0.03	0.43	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	383	1109		200	1092		93	1173		35	1031	
v/s Ratio Prot		c0.16			0.04		0.01	c0.14		0.01	c0.11	
v/s Ratio Perm	0.05			0.04								
v/c Ratio	0.14	0.50		0.12	0.11		0.19	0.30		0.40	0.25	
Uniform Delay, d1	21.9	24.9		21.8	21.7		40.1	14.7		44.0	16.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.3	0.0		1.0	0.7		7.3	0.1	
Delay (s)	22.0	25.3		22.0	21.7		41.1	15.4		51.3	16.8	
Level of Service	C	C		C	C		D	B		D	B	
Approach Delay (s)		25.0			21.8			16.6			18.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	92.1	Sum of lost time (s)	15.5
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	553	11	2	184	1	13	0	1	2	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00			0.99		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3411		1711	3419			1705		1711	1621	
Flt Permitted	0.63	1.00		0.42	1.00			0.78		0.75	1.00	
Satd. Flow (perm)	1126	3411		756	3419			1388		1346	1621	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	601	12	2	200	1	14	0	1	2	1	2
RTOR Reduction (vph)	0	2	0	0	1	0	0	11	0	0	1	0
Lane Group Flow (vph)	2	611	0	2	200	0	0	4	0	2	2	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.3	12.3		12.3	12.3			7.7		7.7	7.7	
Effective Green, g (s)	12.3	12.3		12.3	12.3			7.7		7.7	7.7	
Actuated g/C Ratio	0.41	0.41		0.41	0.41			0.26		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	461	1398		309	1401			356		345	416	
v/s Ratio Prot		c0.18			0.06						0.00	
v/s Ratio Perm	0.00			0.00				c0.00		0.00		
v/c Ratio	0.00	0.44		0.01	0.14			0.01		0.01	0.00	
Uniform Delay, d1	5.2	6.4		5.2	5.5			8.3		8.3	8.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.2		0.0	0.0			0.0		0.0	0.0	
Delay (s)	5.2	6.6		5.2	5.6			8.3		8.3	8.3	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		6.6			5.6			8.3			8.3	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	30.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	85	0	0	254	12	155	531	489	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.93				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3401			5097		1711	3175				2694
Flt Permitted		0.92			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3150			5097		1711	3175				2694
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	14	106	0	0	318	15	194	664	611	0	0	31
RTOR Reduction (vph)	0	0	0	0	7	0	0	219	0	0	0	29
Lane Group Flow (vph)	0	120	0	0	326	0	194	1056	0	0	0	2
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1484			1777		697	1295				141
v/s Ratio Prot		c0.00			c0.06		0.11	c0.33				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.08			0.18		0.28	0.82				0.01
Uniform Delay, d1		11.2			17.2		15.0	20.0				34.1
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.2		1.0	5.7				0.1
Delay (s)		11.3			17.4		16.0	25.7				34.3
Level of Service		B			B		B	C				C
Approach Delay (s)		11.3			17.4			24.4			34.3	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	96	169	195	239	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.95	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1620	1428	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1620	1428	3319	1801		
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	117	206	238	291	0	0
RTOR Reduction (vph)	18	50	0	0	0	0
Lane Group Flow (vph)	153	102	238	291	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	40.4	40.4	9.6	60.0		
Effective Green, g (s)	40.4	40.4	9.6	60.0		
Actuated g/C Ratio	0.67	0.67	0.16	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	1090	961	531	1801		
v/s Ratio Prot	0.09		c0.07	c0.16		
v/s Ratio Perm		0.07				
v/c Ratio	0.14	0.11	0.45	0.16		
Uniform Delay, d1	3.5	3.4	22.8	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.1	0.0	0.6	0.0		
Delay (s)	3.6	3.5	23.4	0.0		
Level of Service	A	A	C	A		
Approach Delay (s)	3.5			10.6	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	7.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	36	105	2	25	0	85	211	0	6	163	55
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.98	1.00		0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	1.00		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1189	1906		1156	1279		1215	2431		1215	2294	
Flt Permitted	0.38	1.00		0.75	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	472	1906		918	1279		1215	2431		1215	2294	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	120	40	118	2	28	0	96	237	0	7	183	62
RTOR Reduction (vph)	0	80	0	0	0	0	0	0	0	0	28	0
Lane Group Flow (vph)	120	78	0	2	28	0	96	237	0	7	217	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	19.7	19.7		5.3	5.3		8.4	22.8		2.2	16.6	
Effective Green, g (s)	19.7	19.7		5.3	5.3		8.4	22.8		2.2	16.6	
Actuated g/C Ratio	0.32	0.32		0.09	0.09		0.14	0.37		0.04	0.27	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	259	615		79	111		167	908		43	624	
v/s Ratio Prot	c0.07	0.04			0.02		c0.08	0.10		0.01	c0.09	
v/s Ratio Perm	c0.08			0.00								
v/c Ratio	0.46	0.13		0.03	0.25		0.57	0.26		0.16	0.35	
Uniform Delay, d1	15.8	14.6		25.5	26.0		24.6	13.3		28.5	17.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.1		0.1	1.2		4.7	0.2		1.8	0.3	
Delay (s)	17.1	14.7		25.6	27.2		29.3	13.4		30.3	18.2	
Level of Service	B	B		C	C		C	B		C	B	
Approach Delay (s)		15.7			27.1			18.0			18.5	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	61.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	115	133	106	173
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	125	145	115	188
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			534			
pX, platoon unblocked						
vC, conflicting volume	543	62			125	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	543	62			125	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			92	
cM capacity (veh/h)	432	989			1459	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	62	62	145	115	188
Volume Left	0	0	0	115	0
Volume Right	0	0	145	0	0
cSH	1700	1700	1700	1459	1700
Volume to Capacity	0.04	0.04	0.09	0.08	0.11
Queue Length 95th (ft)	0	0	0	6	0
Control Delay (s)	0.0	0.0	0.0	7.7	0.0
Lane LOS				A	
Approach Delay (s)	0.0			2.9	
Approach LOS					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	20.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	94	56	0	191	81
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	102	61	0	208	88
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	61				112	61
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	61				112	61
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				76	91
cM capacity (veh/h)	1541				873	992

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	51	51	61	296
Volume Left	0	0	0	208
Volume Right	0	0	0	88
cSH	1700	1700	1700	905
Volume to Capacity	0.03	0.03	0.04	0.33
Queue Length 95th (ft)	0	0	0	36
Control Delay (s)	0.0	0.0	0.0	10.9
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.9
Approach LOS				B

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	27.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	65	220	56	63	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	239	61	68	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	129				322	61
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	129				322	61
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	100
cM capacity (veh/h)	1454				615	992

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	150	159	61	68	0
Volume Left	71	0	0	0	0
Volume Right	0	0	0	68	0
cSH	1454	1700	1700	1700	1700
Volume to Capacity	0.05	0.09	0.04	0.04	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	3.8	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.8		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	20	8	19	27	16	32	297	67	19	213	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.97		1.00	0.97		1.00	0.98	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1552			1541		1540	2994		1540	3031	
Flt Permitted		0.90			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1428			1374		1540	2994		1540	3031	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	22	9	21	29	17	35	323	73	21	232	27
RTOR Reduction (vph)	0	8	0	0	15	0	0	14	0	0	6	0
Lane Group Flow (vph)	0	38	0	0	52	0	35	382	0	21	253	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.4			7.4		4.5	52.4		5.2	53.1	
Effective Green, g (s)		7.4			7.4		4.5	52.4		5.2	53.1	
Actuated g/C Ratio		0.09			0.09		0.06	0.65		0.06	0.66	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		131			126		86	1956		99	2006	
v/s Ratio Prot							c0.02	c0.13		c0.01	0.08	
v/s Ratio Perm		0.03			c0.04							
v/c Ratio		0.29			0.41		0.41	0.20		0.21	0.13	
Uniform Delay, d1		33.9			34.3		36.6	5.5		35.6	5.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.2			2.2		1.1	0.2		0.4	0.1	
Delay (s)		35.2			36.5		37.7	5.7		35.9	5.1	
Level of Service		D			D		D	A		D	A	
Approach Delay (s)		35.2			36.5			8.3			7.4	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	34.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	213	27	101	0	0	117
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	232	29	110	0	0	127

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	116	116	29	55	55	127
Volume Left (vph)	116	116	0	0	0	0
Volume Right (vph)	0	0	29	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.6	5.6	3.2	5.3	5.3	5.1
Degree Utilization, x	0.18	0.18	0.03	0.08	0.08	0.18
Capacity (veh/h)	609	613	1121	644	643	670
Control Delay (s)	8.7	8.7	5.1	7.6	7.6	9.2
Approach Delay (s)	8.3			7.6		9.2
Approach LOS	A			A		A

Intersection Summary			
Delay	8.4		
Level of Service	A		
Intersection Capacity Utilization	18.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	71	0	0	48	61	15	238	7	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	54	77	0	0	52	66	16	259	8	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	132	118	146	137
Volume Left (vph)	54	0	16	0
Volume Right (vph)	0	66	0	8
Hadj (s)	0.12	-0.30	0.09	0.00
Departure Headway (s)	4.9	4.5	5.2	5.1
Degree Utilization, x	0.18	0.15	0.21	0.19
Capacity (veh/h)	699	756	666	677
Control Delay (s)	8.9	8.2	8.4	8.1
Approach Delay (s)	8.9	8.2	8.3	
Approach LOS	A	A	A	

Intersection Summary			
Delay	8.4		
Level of Service	A		
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	17	42	4	26	1	51	348	3	0	224	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.93			1.00		1.00	1.00			0.96	
Flpb, ped/bikes		0.97			0.99		1.00	1.00			1.00	
Frt		0.93			1.00		1.00	1.00			0.98	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1178			1580		1540	2261			2140	
Flt Permitted		0.90			0.97		0.95	1.00			1.00	
Satd. Flow (perm)		1074			1539		1540	2261			2140	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	18	44	4	27	1	54	366	3	0	236	35
RTOR Reduction (vph)	0	40	0	0	1	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	44	0	0	31	0	54	369	0	0	267	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		8.7			8.7		7.8	81.0			68.1	
Effective Green, g (s)		8.7			8.7		7.8	81.0			68.1	
Actuated g/C Ratio		0.09			0.09		0.08	0.81			0.68	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		93			133		120	1831			1457	
v/s Ratio Prot							c0.04	c0.16			0.12	
v/s Ratio Perm		c0.04			0.02							
v/c Ratio		0.47			0.23		0.45	0.20			0.18	
Uniform Delay, d1		43.5			42.5		44.1	2.2			5.8	
Progression Factor		1.00			1.00		1.00	1.00			0.46	
Incremental Delay, d2		3.7			0.9		2.7	0.2			0.2	
Delay (s)		47.2			43.4		46.7	2.4			2.9	
Level of Service		D			D		D	A			A	
Approach Delay (s)		47.2			43.4			8.1			2.9	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	118	273	0	0	95	118	78	79	176	40	0	137
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1034	1540	1621	1201	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1034	1540	1621	1201	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	124	287	0	0	100	124	82	83	185	42	0	144
RTOR Reduction (vph)	0	0	0	0	0	79	0	0	160	0	0	129
Lane Group Flow (vph)	124	287	0	0	100	45	82	83	25	42	0	15
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	9.8	42.3			27.5	27.5	10.2	10.2	10.2	8.0		8.0
Effective Green, g (s)	9.8	42.3			27.5	27.5	10.2	10.2	10.2	8.0		8.0
Actuated g/C Ratio	0.13	0.55			0.36	0.36	0.13	0.13	0.13	0.10		0.10
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	197	1702			1106	371	205	216	160	161		126
v/s Ratio Prot	c0.08	c0.09			0.03		c0.05	0.05		c0.03		0.01
v/s Ratio Perm						0.04			0.02			
v/c Ratio	0.63	0.17			0.09	0.12	0.40	0.38	0.15	0.26		0.12
Uniform Delay, d1	31.6	8.4			16.2	16.4	30.3	30.3	29.3	31.5		31.1
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	6.2	0.2			0.2	0.7	1.3	1.1	0.5	0.9		0.4
Delay (s)	37.8	8.6			16.4	17.1	31.6	31.4	29.8	32.4		31.5
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		17.4			16.8			30.6			31.7	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	14	34	0	15	0	16	20	2	0	29	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5			4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00			1.00	
Frt		0.92			1.00		1.00	0.99			0.94	
Flt Protected		0.99			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		3110			1801		1711	1778			1697	
Flt Permitted		0.92			1.00		1.00	1.00			1.00	
Satd. Flow (perm)		2903			1801		1801	1778			1697	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	15	37	0	16	0	17	22	2	0	32	20
RTOR Reduction (vph)	0	10	0	0	0	0	0	2	0	0	19	0
Lane Group Flow (vph)	0	60	0	0	16	0	17	22	0	0	33	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		27.9			27.9		1.6	1.6			1.6	
Effective Green, g (s)		27.9			27.9		1.6	1.6			1.6	
Actuated g/C Ratio		0.72			0.72		0.04	0.04			0.04	
Clearance Time (s)		4.5			4.5		4.5	4.5			4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		2103			1305		74	73			70	
v/s Ratio Prot					0.01			0.01			c0.02	
v/s Ratio Perm		c0.02					0.01					
v/c Ratio		0.03			0.01		0.23	0.30			0.47	
Uniform Delay, d1		1.5			1.5		17.9	17.9			18.0	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.0			0.0		1.6	2.3			4.9	
Delay (s)		1.5			1.5		19.4	20.2			22.9	
Level of Service		A			A		B	C			C	
Approach Delay (s)		1.5			1.5			19.9			22.9	
Approach LOS		A			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.05		
Actuated Cycle Length (s)	38.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

EXISTING 2015 PLUS PROJECT
BASKETBALL GAME
WITH SF GIANTS GAME AT AT&T PARK
SATURDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	462	634	215	465	575	87	26	433	91	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.97		1.00	0.99			1.00	0.89			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.96		1.00	0.98			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	2884		2987	2974			5533	1232			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	2884		2987	2974			5533	1232			
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	570	783	265	574	710	107	32	535	112	0	0	0
RTOR Reduction (vph)	0	30	0	0	9	0	0	0	93	0	0	0
Lane Group Flow (vph)	570	1018	0	574	808	0	0	567	19	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	22.7	38.8		33.7	49.8			18.6	18.6			
Effective Green, g (s)	22.7	38.8		33.7	49.8			18.6	18.6			
Actuated g/C Ratio	0.21	0.35		0.31	0.45			0.17	0.17			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	924	1017		915	1346			935	208			
v/s Ratio Prot	0.13	c0.35		0.19	c0.27							
v/s Ratio Perm								0.10	0.02			
v/c Ratio	0.62	1.00		0.63	0.60			0.61	0.09			
Uniform Delay, d1	39.7	35.6		32.8	22.6			42.3	38.6			
Progression Factor	1.00	1.00		0.74	0.36			1.09	6.15			
Incremental Delay, d2	1.2	28.4		0.8	0.5			1.0	0.2			
Delay (s)	40.9	64.0		25.1	8.7			47.3	237.4			
Level of Service	D	E		C	A			D	F			
Approach Delay (s)		55.8			15.4			78.7			0.0	
Approach LOS		E			B			E			A	

Intersection Summary			
HCM 2000 Control Delay	44.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	1034	45	50	492	59	11	72	40	237	694	241
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.98		1.00	0.93			1.00	0.63	1.00	0.98	0.46
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00	0.68	1.00	1.00
Frt	1.00	0.99		1.00	0.98			1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4324		1296	2376			1583	844	1043	2882	563
Flt Permitted	0.95	1.00		0.95	1.00			0.88	1.00	0.70	1.00	1.00
Satd. Flow (perm)	1540	4324		1296	2376			1396	844	764	2882	563
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	123	1175	51	57	559	67	12	82	45	269	789	274
RTOR Reduction (vph)	0	4	0	0	7	0	0	0	28	0	2	98
Lane Group Flow (vph)	123	1222	0	57	619	0	0	94	17	269	814	149
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	13.0	43.1		11.3	39.8			45.7	45.7	46.7	46.7	46.7
Effective Green, g (s)	13.0	43.1		11.3	39.8			45.7	45.7	46.7	46.7	46.7
Actuated g/C Ratio	0.11	0.36		0.09	0.33			0.38	0.38	0.39	0.39	0.39
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	166	1553		122	788			531	321	297	1121	219
v/s Ratio Prot	0.08	c0.28		0.04	c0.26						0.28	
v/s Ratio Perm								0.07	0.02	c0.35		0.26
v/c Ratio	0.74	0.79		0.47	0.79			0.18	0.05	0.91	0.73	0.68
Uniform Delay, d1	51.9	34.3		51.5	36.2			24.7	23.5	34.6	31.2	30.4
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.2	4.1		2.8	5.2			0.2	0.1	29.0	2.4	8.1
Delay (s)	68.1	38.5		54.3	41.4			24.8	23.5	63.6	33.6	38.5
Level of Service	E	D		D	D			C	C	E	C	D
Approach Delay (s)		41.2			42.5			24.4			40.6	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	40.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1150	105	0	744	48	37
Ideal Flow (vphpl)	1000	1000	1000	1000	1000	1000
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1598			1621	810	714
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	1598			1621	810	714
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1264	115	0	818	53	41
RTOR Reduction (vph)	3	0	0	0	0	35
Lane Group Flow (vph)	1376	0	0	818	53	6
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	83.8			83.8	14.9	14.9
Effective Green, g (s)	83.8			83.8	14.9	14.9
Actuated g/C Ratio	0.76			0.76	0.14	0.14
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1217			1234	109	96
v/s Ratio Prot	c0.86			0.50	c0.07	
v/s Ratio Perm						0.01
v/c Ratio	1.13			0.66	0.49	0.06
Uniform Delay, d1	13.1			6.3	44.0	41.4
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	69.5			1.4	3.4	0.3
Delay (s)	82.6			7.7	47.4	41.7
Level of Service	F			A	D	D
Approach Delay (s)	82.6			7.7	44.9	
Approach LOS	F			A	D	

Intersection Summary			
HCM 2000 Control Delay	54.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/27/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	31	352	98	28	284	654	209	497	1065	249
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.97			1.00	0.97			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.97			1.00	0.96			1.00	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5634			2870	2501			4106	1122
Flt Permitted		1.00			0.76	1.00			0.95	1.00
Satd. Flow (perm)		5634			2186	2501			4106	1122
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	33	371	103	29	299	688	220	523	1121	262
RTOR Reduction (vph)	0	70	0	0	0	31	0	0	0	0
Lane Group Flow (vph)	0	437	0	0	328	877	0	0	1670	236
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		13.3			22.0	22.0			22.2	22.2
Effective Green, g (s)		15.3			25.0	25.0			25.2	25.2
Actuated g/C Ratio		0.20			0.33	0.33			0.34	0.34
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1149			728	833			1379	376
v/s Ratio Prot						c0.35			c0.41	0.21
v/s Ratio Perm		0.08			0.15					
v/c Ratio		0.38			0.45	1.05			1.21	0.63
Uniform Delay, d1		25.8			19.6	25.0			24.9	21.0
Progression Factor		1.00			0.89	1.00			1.00	1.00
Incremental Delay, d2		0.2			0.1	46.1			101.9	3.3
Delay (s)		26.0			17.7	71.1			126.8	24.2
Level of Service		C			B	E			F	C
Approach Delay (s)		26.0			17.7	71.1			114.1	
Approach LOS		C			B	E			F	

Intersection Summary			
HCM 2000 Control Delay	82.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	98.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/27/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	70	408	558	56	242	215	40	322	61	799
Ideal Flow (vphpl)	1400	1400	1400	1400	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.87		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.93		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1700	2661		2224		1161		1327	2553
Flt Permitted		0.95	1.00		1.00		1.00		0.29	0.93
Satd. Flow (perm)		1700	2661		2224		1161		401	2382
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	74	434	594	60	257	229	43	343	65	850
RTOR Reduction (vph)	0	0	12	0	1	0	31	0	0	0
Lane Group Flow (vph)	0	456	694	0	489	0	8	0	367	891
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		419	745		518		247		328	1060
v/s Ratio Prot		c0.27	0.26		0.22				c0.19	0.14
v/s Ratio Perm							0.01		c0.30	0.22
v/c Ratio		1.09	0.93		0.94		0.03		1.12	0.84
Uniform Delay, d1		28.2	26.3		28.3		23.4		24.1	18.9
Progression Factor		1.00	1.00		1.00		1.00		0.79	0.75
Incremental Delay, d2		69.9	19.9		27.9		0.3		57.8	0.8
Delay (s)		98.1	46.2		56.2		23.6		76.9	15.1
Level of Service		F	D		E		C		E	B
Approach Delay (s)			66.6		53.8					33.1
Approach LOS			E		D					C

Intersection Summary			
HCM 2000 Control Delay	50.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	28	137	0	3	3	20	427	25	99	333	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1700	1700	1700	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	0.99	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.93		1.00	0.99		1.00	0.97	
Flt Protected		0.97	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1546	1348		1485		1377	2703		1540	2951	
Flt Permitted		0.79	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1268	1348		1485		1377	2703		1540	2951	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	65	31	154	0	3	3	22	480	28	111	374	109
RTOR Reduction (vph)	0	0	136	0	3	0	0	2	0	0	10	0
Lane Group Flow (vph)	0	96	18	0	3	0	22	506	0	111	473	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm		NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		14.2	14.2		14.2		4.6	74.9		15.0	85.6	
Effective Green, g (s)		14.2	14.2		14.2		4.6	74.9		15.0	85.6	
Actuated g/C Ratio		0.12	0.12		0.12		0.04	0.62		0.12	0.71	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		150	159		175		52	1687		192	2105	
v/s Ratio Prot					0.00		0.02	c0.19		c0.07	0.16	
v/s Ratio Perm		c0.08	0.01									
v/c Ratio		0.64	0.11		0.02		0.42	0.30		0.58	0.22	
Uniform Delay, d1		50.5	47.3		46.7		56.4	10.4		49.5	5.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		9.0	0.3		0.0		2.0	0.5		2.6	0.1	
Delay (s)		59.4	47.6		46.8		58.4	10.9		52.1	5.9	
Level of Service		E	D		D		E	B		D	A	
Approach Delay (s)		52.1			46.8			12.9			14.6	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	35	9	3	73	44	1	36	5	182	219	142
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.99	1.00	0.99		1.00	0.89	
Flpb, ped/bikes		1.00			1.00	1.00	0.87	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.98		1.00	0.94	
Flt Protected		1.00			1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2505			1447	1218	1198	1412		1377	1218	
Flt Permitted		0.93			0.99	1.00	0.71	1.00		0.95	1.00	
Satd. Flow (perm)		2349			1430	1218	901	1412		1377	1218	
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	4	47	12	4	97	59	1	48	7	243	292	189
RTOR Reduction (vph)	0	10	0	0	0	24	0	6	0	0	22	0
Lane Group Flow (vph)	0	53	0	0	101	35	1	49	0	243	459	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		8.1			8.1	29.6	5.6	5.6		21.5	32.1	
Effective Green, g (s)		8.1			8.1	29.6	5.6	5.6		21.5	32.1	
Actuated g/C Ratio		0.16			0.16	0.59	0.11	0.11		0.43	0.64	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		379			230	839	100	157		589	778	
v/s Ratio Prot						0.02		0.03		0.18	c0.38	
v/s Ratio Perm		0.02			c0.07	0.01	0.00					
v/c Ratio		0.14			0.44	0.04	0.01	0.31		0.41	0.59	
Uniform Delay, d1		18.1			19.0	4.3	19.8	20.5		10.0	5.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			1.3	0.0	0.0	1.1		0.2	1.2	
Delay (s)		18.2			20.3	4.3	19.9	21.7		10.1	6.4	
Level of Service		B			C	A	B	C		B	A	
Approach Delay (s)		18.2			14.4			21.6			7.7	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	50.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/27/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	26	136	318	19	827	192
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1743	1535	851	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1743	1535	851	1134	1194
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	33	174	408	24	1060	246
RTOR Reduction (vph)	0	155	0	11	0	0
Lane Group Flow (vph)	33	19	408	13	1060	246
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	8.4	8.4	34.2	29.2	20.1	59.3
Effective Green, g (s)	8.4	8.4	34.2	29.2	20.1	59.3
Actuated g/C Ratio	0.11	0.11	0.44	0.38	0.26	0.76
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	122	188	675	374	293	911
v/s Ratio Prot	c0.03		c0.27	0.01	c0.93	0.21
v/s Ratio Perm		0.01		0.01		
v/c Ratio	0.27	0.10	0.60	0.04	3.62	0.27
Uniform Delay, d1	31.8	31.2	16.6	15.3	28.8	2.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.2	1.5	0.0	1186.4	0.2
Delay (s)	33.0	31.5	18.1	15.4	1215.2	2.9
Level of Service	C	C	B	B	F	A
Approach Delay (s)	31.7		18.0			986.9
Approach LOS	C		B			F

Intersection Summary			
HCM 2000 Control Delay	670.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.66		
Actuated Cycle Length (s)	77.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	103.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	6	3	284	93	63	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.95		1.00	1.00	0.99	
Flpb, ped/bikes	0.97		0.97	1.00	1.00	
Frt	0.95		1.00	1.00	0.98	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1533		1665	1531	3064	
Flt Permitted	0.97		0.68	1.00	1.00	
Satd. Flow (perm)	1533		1193	1531	3064	
Peak-hour factor, PHF	0.66	0.66	0.66	0.66	0.66	0.66
Adj. Flow (vph)	9	5	430	141	95	18
RTOR Reduction (vph)	5	0	0	0	5	0
Lane Group Flow (vph)	9	0	430	141	108	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	0.9		30.4	30.4	30.4	
Effective Green, g (s)	0.9		30.4	30.4	30.4	
Actuated g/C Ratio	0.02		0.74	0.74	0.74	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	33		878	1126	2255	
v/s Ratio Prot	c0.01			0.09	0.04	
v/s Ratio Perm			c0.36			
v/c Ratio	0.28		0.49	0.13	0.05	
Uniform Delay, d1	19.9		2.2	1.6	1.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	4.5		0.4	0.1	0.0	
Delay (s)	24.4		2.7	1.6	1.5	
Level of Service	C		A	A	A	
Approach Delay (s)	24.4			2.4	1.5	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	2.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	41.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

4/27/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	15	48	358	80	291	321
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.92	0.99		1.00	1.00
Flpb, ped/bikes	0.91	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.97		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1558	1410	3284		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1558	1410	3284		1711	3421
Peak-hour factor, PHF	0.77	0.77	0.77	0.77	0.77	0.77
Adj. Flow (vph)	19	62	465	104	378	417
RTOR Reduction (vph)	0	59	17	0	0	0
Lane Group Flow (vph)	19	3	553	0	378	417
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	6.4	6.4	65.0		33.3	103.4
Effective Green, g (s)	6.4	6.4	65.0		33.3	103.4
Actuated g/C Ratio	0.05	0.05	0.54		0.28	0.86
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	83	75	1778		474	2947
v/s Ratio Prot			c0.17		c0.22	0.12
v/s Ratio Perm	c0.01	0.00				
v/c Ratio	0.23	0.04	0.31		0.80	0.14
Uniform Delay, d1	54.4	53.9	15.2		40.2	1.3
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.4	0.2	0.5		9.1	0.1
Delay (s)	55.8	54.1	15.6		49.3	1.4
Level of Service	E	D	B		D	A
Approach Delay (s)	54.5		15.6			24.2
Approach LOS	D		B			C

Intersection Summary			
HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	7	7	367	56	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.98	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1518	1341		2883	2807	
Flt Permitted	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1518	1341		2743	2807	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	8	8	432	66	12
RTOR Reduction (vph)	0	8	0	0	9	0
Lane Group Flow (vph)	12	0	0	440	69	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	0.6	0.6		13.3	13.3	
Effective Green, g (s)	0.6	0.6		13.3	13.3	
Actuated g/C Ratio	0.01	0.01		0.27	0.27	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	18	16		738	755	
v/s Ratio Prot	c0.01				0.02	
v/s Ratio Perm		0.00		c0.16		
v/c Ratio	0.67	0.01		0.60	0.09	
Uniform Delay, d1	24.3	24.1		15.7	13.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	66.1	0.2		1.3	0.1	
Delay (s)	90.4	24.3		17.0	13.6	
Level of Service	F	C		B	B	
Approach Delay (s)	63.9			17.0	13.6	
Approach LOS	E			B	B	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	49.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	130	2	56	5	2	5	46	225	9	5	53	38
Peak Hour Factor	0.92	0.91	0.91	0.91	0.91	0.92	0.91	0.92	0.91	0.92	0.92	0.92
Hourly flow rate (vph)	141	2	62	5	2	5	51	245	10	5	58	41

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	141	64	5	8	305	63	41
Volume Left (vph)	141	0	5	0	51	5	0
Volume Right (vph)	0	62	0	5	10	0	41
Hadj (s)	0.53	-0.64	0.53	-0.46	0.05	0.08	-0.67
Departure Headway (s)	6.1	5.0	6.4	5.4	5.3	5.5	4.8
Degree Utilization, x	0.24	0.09	0.01	0.01	0.45	0.10	0.05
Capacity (veh/h)	553	680	514	603	663	618	711
Control Delay (s)	9.9	7.2	8.3	7.3	12.5	7.9	6.8
Approach Delay (s)	9.1		7.7		12.5	7.5	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	10.4		
Level of Service	B		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	111	157	112	1	65	20	127	307	23	8	194	133
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.94	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1252	1365	1120	1284	1365	1091	2515	2556		1296	2409	
Flt Permitted	0.71	1.00	1.00	0.52	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	930	1365	1120	708	1365	1091	2515	2556		1296	2409	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	135	191	137	1	79	24	155	374	28	10	237	162
RTOR Reduction (vph)	0	0	109	0	0	19	0	3	0	0	79	0
Lane Group Flow (vph)	135	191	28	1	79	5	155	399	0	10	320	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	20.1	20.1	20.1	20.1	20.1	20.1	11.3	59.0		1.9	49.6	
Effective Green, g (s)	20.1	20.1	20.1	20.1	20.1	20.1	11.3	59.0		1.9	49.6	
Actuated g/C Ratio	0.21	0.21	0.21	0.21	0.21	0.21	0.12	0.61		0.02	0.51	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	193	283	232	147	283	226	293	1559		25	1235	
v/s Ratio Prot		0.14			0.06		c0.06	0.16		0.01	c0.13	
v/s Ratio Perm	c0.15		0.03	0.00		0.00						
v/c Ratio	0.70	0.67	0.12	0.01	0.28	0.02	0.53	0.26		0.40	0.26	
Uniform Delay, d1	35.5	35.3	31.1	30.4	32.2	30.5	40.2	8.7		46.8	13.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.6	6.2	0.2	0.0	0.5	0.0	1.7	0.4		10.2	0.1	
Delay (s)	46.1	41.5	31.4	30.4	32.7	30.5	41.9	9.1		57.0	13.3	
Level of Service	D	D	C	C	C	C	D	A		E	B	
Approach Delay (s)		39.8			32.2			18.2			14.4	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	24.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	96.7	Sum of lost time (s)	15.7
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	81	350	1	1	296	27	3	5	1	28	1	56
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.91	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1241	1621	1669		1483	1353	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.72	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1241	1220	1669		1175	1353	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	91	393	1	1	333	30	3	6	1	31	1	63
RTOR Reduction (vph)	0	0	0	0	0	17	0	1	0	0	47	0
Lane Group Flow (vph)	91	393	1	1	333	13	3	6	0	31	17	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	11.0	46.4	46.4	2.7	38.1	38.1	21.9	21.9		21.9	21.9	
Effective Green, g (s)	11.0	46.4	46.4	2.7	38.1	38.1	21.9	21.9		21.9	21.9	
Actuated g/C Ratio	0.13	0.54	0.54	0.03	0.44	0.44	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	920	782	50	755	549	310	425		299	344	
v/s Ratio Prot	c0.06	c0.23		0.00	0.20			0.00			0.01	
v/s Ratio Perm			0.00			0.01	0.00			c0.03		
v/c Ratio	0.44	0.43	0.00	0.02	0.44	0.02	0.01	0.01		0.10	0.05	
Uniform Delay, d1	34.7	11.8	9.1	40.4	16.6	13.5	23.9	24.0		24.5	24.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	1.5	0.0	0.2	0.4	0.0	0.0	0.0		0.2	0.1	
Delay (s)	36.1	13.3	9.1	40.5	17.0	13.5	24.0	24.0		24.7	24.3	
Level of Service	D	B	A	D	B	B	C	C		C	C	
Approach Delay (s)		17.6			16.8			24.0			24.4	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	376	32	47	280	28	11	272	42	15	191	20
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1048	1540	3018			3068	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.59	1.00			0.90	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1048	960	3018			2785	1072
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	89	470	40	59	350	35	14	340	52	19	239	25
RTOR Reduction (vph)	0	0	19	0	0	18	0	13	0	0	0	20
Lane Group Flow (vph)	89	470	21	59	350	17	14	379	0	0	258	5
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	7.5	37.9	37.9	5.2	34.6	34.6	15.8	15.8			14.8	14.8
Effective Green, g (s)	7.5	37.9	37.9	5.2	34.6	34.6	15.8	15.8			14.8	14.8
Actuated g/C Ratio	0.10	0.53	0.53	0.07	0.48	0.48	0.22	0.22			0.21	0.21
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	126	640	726	111	584	504	210	663			573	220
v/s Ratio Prot	c0.07	c0.39		0.04	0.29			c0.13				
v/s Ratio Perm			0.02			0.02	0.01				0.09	0.00
v/c Ratio	0.71	0.73	0.03	0.53	0.60	0.03	0.07	0.57			0.45	0.02
Uniform Delay, d1	31.1	13.1	8.2	32.2	13.6	9.8	22.2	25.0			25.0	22.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	16.5	4.4	0.0	4.8	1.7	0.0	0.1	1.2			0.6	0.0
Delay (s)	47.6	17.5	8.2	37.0	15.3	9.9	22.3	26.2			25.6	22.8
Level of Service	D	B	A	D	B	A	C	C			C	C
Approach Delay (s)		21.3			17.7			26.1			25.3	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	71.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	348	58	7	194	110	48	158	3	127	45	20
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.91	1.00	1.00	0.96	1.00	0.97	
Flpb, ped/bikes	0.98	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1315	931		1335	1126	870	1070	957	916	1070	1042	
Flt Permitted	0.46	1.00		0.31	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	642	931		430	1126	870	1070	957	916	1070	1042	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	17	405	67	8	226	128	56	184	3	148	52	23
RTOR Reduction (vph)	0	5	0	0	0	51	0	0	2	0	17	0
Lane Group Flow (vph)	17	467	0	8	226	77	56	184	1	148	58	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	52.1	52.1		51.2	51.2	65.2	24.7	21.0	21.0	14.0	10.3	
Effective Green, g (s)	52.1	52.1		51.2	51.2	65.2	24.7	21.0	21.0	14.0	10.3	
Actuated g/C Ratio	0.48	0.48		0.47	0.47	0.60	0.23	0.19	0.19	0.13	0.10	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	320	449		210	534	566	245	186	178	138	99	
v/s Ratio Prot	0.00	c0.50		0.00	c0.20	0.02	c0.05	c0.19		c0.14	0.06	
v/s Ratio Perm	0.02			0.02		0.07			0.00			
v/c Ratio	0.05	1.04		0.04	0.42	0.14	0.23	0.99	0.00	1.07	0.58	
Uniform Delay, d1	15.1	27.8		24.5	18.6	9.2	33.8	43.3	35.0	46.9	46.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	53.2		0.1	0.5	0.1	0.5	62.2	0.0	97.3	8.5	
Delay (s)	15.2	81.0		24.5	19.1	9.3	34.3	105.5	35.0	144.2	55.2	
Level of Service	B	F		C	B	A	C	F	C	F	E	
Approach Delay (s)		78.7			15.8			88.2			114.3	
Approach LOS		E			B			F			F	

Intersection Summary			
HCM 2000 Control Delay	69.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	107.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	228	346	34	42	63	9	35	39	60	9	41	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	0.99			1.00	0.97		0.98	
Flpb, ped/bikes		0.99		0.99	1.00			0.99	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.93	
Flt Protected		0.98		0.95	1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1473		1697	1757			1746	1491		1387	
Flt Permitted		0.84		0.40	1.00			0.85	1.00		0.98	
Satd. Flow (perm)		1265		718	1757			1520	1491		1360	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	253	384	38	47	70	10	39	43	67	10	46	67
RTOR Reduction (vph)	0	2	0	0	4	0	0	0	53	0	53	0
Lane Group Flow (vph)	0	673	0	47	76	0	0	82	14	0	70	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		42.5		42.5	42.5			16.9	16.9		16.9	
Effective Green, g (s)		42.5		42.5	42.5			16.9	16.9		16.9	
Actuated g/C Ratio		0.51		0.51	0.51			0.20	0.20		0.20	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		643		365	893			307	301		274	
v/s Ratio Prot					0.04							
v/s Ratio Perm		c0.53		0.07				c0.05	0.01		0.05	
v/c Ratio		1.05		0.13	0.08			0.27	0.04		0.26	
Uniform Delay, d1		20.5		10.8	10.6			28.1	26.9		28.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		48.3		0.2	0.0			0.5	0.1		0.5	
Delay (s)		68.9		11.0	10.6			28.6	26.9		28.6	
Level of Service		E		B	B			C	C		C	
Approach Delay (s)		68.9			10.7			27.8			28.6	
Approach LOS		E			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	51.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	83.6	Sum of lost time (s)	14.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	93	572	45	20	123	15	54	349	14	21	204	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1668	3375		1700	3347		1260	2498		1260	2387	
Flt Permitted	0.65	1.00		0.17	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1138	3375		297	3347		1260	2498		1260	2387	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	111	681	54	24	146	18	64	415	17	25	243	98
RTOR Reduction (vph)	0	5	0	0	9	0	0	2	0	0	43	0
Lane Group Flow (vph)	111	730	0	24	155	0	64	430	0	25	298	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	33.9	33.9		33.9	33.9		37.1	67.0		5.6	35.5	
Effective Green, g (s)	33.9	33.9		33.9	33.9		37.1	67.0		5.6	35.5	
Actuated g/C Ratio	0.28	0.28		0.28	0.28		0.30	0.55		0.05	0.29	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	316	937		82	930		383	1371		57	694	
v/s Ratio Prot		c0.22			0.05		0.05	c0.17		0.02	c0.13	
v/s Ratio Perm	0.10			0.08								
v/c Ratio	0.35	0.78		0.29	0.17		0.17	0.31		0.44	0.43	
Uniform Delay, d1	35.3	40.6		34.6	33.4		31.1	15.0		56.7	35.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	4.1		2.0	0.1		0.2	0.6		5.3	0.4	
Delay (s)	35.9	44.7		36.6	33.4		31.3	15.6		62.0	35.5	
Level of Service	D	D		D	C		C	B		E	D	
Approach Delay (s)		43.6			33.8			17.6			37.3	
Approach LOS		D			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	34.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	122.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	729	11	2	247	1	13	0	1	2	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00			0.99		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3414		1711	3419			1705		1711	1621	
Flt Permitted	0.59	1.00		0.34	1.00			0.78		0.75	1.00	
Satd. Flow (perm)	1055	3414		608	3419			1386		1346	1621	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	792	12	2	268	1	14	0	1	2	1	2
RTOR Reduction (vph)	0	2	0	0	1	0	0	12	0	0	2	0
Lane Group Flow (vph)	2	802	0	2	268	0	0	3	0	2	1	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	15.8	15.8		15.8	15.8			7.8		7.8	7.8	
Effective Green, g (s)	15.8	15.8		15.8	15.8			7.8		7.8	7.8	
Actuated g/C Ratio	0.47	0.47		0.47	0.47			0.23		0.23	0.23	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	496	1605		285	1607			321		312	376	
v/s Ratio Prot		c0.24			0.08						0.00	
v/s Ratio Perm	0.00			0.00				c0.00		0.00		
v/c Ratio	0.00	0.50		0.01	0.17			0.01		0.01	0.00	
Uniform Delay, d1	4.7	6.2		4.7	5.1			9.9		9.9	9.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.2		0.0	0.0			0.0		0.0	0.0	
Delay (s)	4.7	6.4		4.7	5.2			9.9		9.9	9.9	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		6.4			5.2			9.9			9.9	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	33.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	74	0	0	302	21	209	440	665	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.91				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3399			5082		1711	3112				2694
Flt Permitted		0.92			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3147			5082		1711	3112				2694
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	12	81	0	0	332	23	230	484	731	0	0	27
RTOR Reduction (vph)	0	0	0	0	10	0	0	361	0	0	0	26
Lane Group Flow (vph)	0	93	0	0	345	0	230	854	0	0	0	1
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1483			1772		697	1269				141
v/s Ratio Prot		c0.00			c0.07		0.13	c0.27				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.06			0.19		0.33	0.67				0.01
Uniform Delay, d1		11.1			17.3		15.4	18.4				34.1
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.2		1.3	2.9				0.1
Delay (s)		11.2			17.5		16.7	21.2				34.3
Level of Service		B			B		B	C				C
Approach Delay (s)		11.2			17.5			20.5			34.3	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	85	175	211	325	0	0
Ideal Flow (vphpl)	1000	1000	1000	1000	1000	1000
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	*0.85	*0.85	*0.60	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.94	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	755	672	1080	948		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	755	672	1080	948		
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	98	201	243	374	0	0
RTOR Reduction (vph)	29	71	0	0	0	0
Lane Group Flow (vph)	127	72	243	374	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	30.2	30.2	19.8	60.0		
Effective Green, g (s)	30.2	30.2	19.8	60.0		
Actuated g/C Ratio	0.50	0.50	0.33	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	380	338	356	948		
v/s Ratio Prot	0.17		c0.22	c0.39		
v/s Ratio Perm		0.11				
v/c Ratio	0.33	0.21	0.68	0.39		
Uniform Delay, d1	8.9	8.3	17.4	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.5	0.3	5.3	0.3		
Delay (s)	9.4	8.6	22.7	0.3		
Level of Service	A	A	C	A		
Approach Delay (s)	9.0			9.1	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	79	150	2	84	4	115	285	5	3	203	97
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.96	
Flpb, ped/bikes	0.95	1.00		0.92	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90		1.00	0.99		1.00	1.00		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1157	1872		1116	1260		1215	2419		1215	2218	
Flt Permitted	0.47	1.00		0.58	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	572	1872		684	1260		1215	2419		1215	2218	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	133	95	181	2	101	5	139	343	6	4	245	117
RTOR Reduction (vph)	0	124	0	0	2	0	0	1	0	0	40	0
Lane Group Flow (vph)	133	152	0	2	104	0	139	348	0	4	322	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	37.5	37.5		15.3	15.3		19.1	61.8		4.4	47.1	
Effective Green, g (s)	37.5	37.5		15.3	15.3		19.1	61.8		4.4	47.1	
Actuated g/C Ratio	0.31	0.31		0.13	0.13		0.16	0.51		0.04	0.39	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	261	585		87	160		193	1245		44	870	
v/s Ratio Prot	c0.07	0.08			c0.08		c0.11	0.14		0.00	c0.15	
v/s Ratio Perm	0.09			0.00								
v/c Ratio	0.51	0.26		0.02	0.65		0.72	0.28		0.09	0.37	
Uniform Delay, d1	32.3	30.9		45.8	49.8		47.9	16.5		55.9	25.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.6	0.2		0.1	9.1		12.4	0.6		0.9	1.2	
Delay (s)	33.8	31.1		45.9	59.0		60.3	17.0		56.8	27.1	
Level of Service	C	C		D	E		E	B		E	C	
Approach Delay (s)		32.0			58.7			29.4			27.4	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps
9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	124	298	185	209
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	135	324	201	227
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			537			
pX, platoon unblocked						
vC, conflicting volume	764	67			135	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	764	67			135	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			86	
cM capacity (veh/h)	293	982			1447	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	67	67	324	201	227
Volume Left	0	0	0	201	0
Volume Right	0	0	324	0	0
cSH	1700	1700	1700	1447	1700
Volume to Capacity	0.04	0.04	0.19	0.14	0.13
Queue Length 95th (ft)	0	0	0	12	0
Control Delay (s)	0.0	0.0	0.0	7.9	0.0
Lane LOS				A	
Approach Delay (s)	0.0			3.7	
Approach LOS					

Intersection Summary				
Average Delay	1.8			
Intersection Capacity Utilization	35.4%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp
9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	106	48	0	130	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	115	52	0	141	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	52				110	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	52				110	52
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				84	94
cM capacity (veh/h)	1552				876	1004

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	58	58	52	207
Volume Left	0	0	0	141
Volume Right	0	0	0	65
cSH	1700	1700	1700	912
Volume to Capacity	0.03	0.03	0.03	0.23
Queue Length 95th (ft)	0	0	0	22
Control Delay (s)	0.0	0.0	0.0	10.1
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.1
Approach LOS				B

Intersection Summary				
Average Delay	5.6			
Intersection Capacity Utilization	22.1%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	69	167	48	54	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	75	182	52	59	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	111				293	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	111				293	52
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	100
cM capacity (veh/h)	1477				640	1004

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	136	121	52	59	0
Volume Left	75	0	0	0	0
Volume Right	0	0	0	59	0
cSH	1477	1700	1700	1700	1700
Volume to Capacity	0.05	0.07	0.03	0.03	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	4.4	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.3		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	17.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	11	12	11	18	27	25	372	19	24	241	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.94		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1520			1502		1540	3056		1540	3022	
Flt Permitted		0.87			0.94		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1349			1419		1540	3056		1540	3022	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	12	13	12	20	29	27	404	21	26	262	37
RTOR Reduction (vph)	0	12	0	0	27	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	27	0	0	34	0	27	423	0	26	295	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.5			7.5		4.7	89.7		7.6	92.6	
Effective Green, g (s)		7.5			7.5		4.7	89.7		7.6	92.6	
Actuated g/C Ratio		0.06			0.06		0.04	0.75		0.06	0.77	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		84			88		60	2284		97	2331	
v/s Ratio Prot							c0.02	c0.14		c0.02	0.10	
v/s Ratio Perm		0.02			c0.02							
v/c Ratio		0.32			0.38		0.45	0.19		0.27	0.13	
Uniform Delay, d1		53.8			54.0		56.4	4.4		53.5	3.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.2			2.8		1.9	0.2		0.5	0.1	
Delay (s)		56.0			56.8		58.3	4.6		54.1	3.6	
Level of Service		E			E		E	A		D	A	
Approach Delay (s)		56.0			56.8			7.8			7.6	
Approach LOS		E			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	202	9	88	0	0	99
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	220	10	96	0	0	108

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	110	110	10	48	48	108
Volume Left (vph)	110	110	0	0	0	0
Volume Right (vph)	0	0	10	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.6	5.6	3.2	5.3	5.3	5.1
Degree Utilization, x	0.17	0.17	0.01	0.07	0.07	0.15
Capacity (veh/h)	620	625	1121	653	652	678
Control Delay (s)	8.5	8.5	5.0	7.5	7.5	9.0
Approach Delay (s)	8.3			7.5		9.0
Approach LOS	A			A		A

Intersection Summary			
Delay	8.3		
Level of Service	A		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	59	0	0	42	28	6	72	7	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	64	0	0	46	30	7	78	8	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	96	76	46	47
Volume Left (vph)	32	0	7	0
Volume Right (vph)	0	30	0	8
Hadj (s)	0.10	-0.21	0.11	-0.08
Departure Headway (s)	4.3	4.0	5.0	4.8
Degree Utilization, x	0.11	0.08	0.06	0.06
Capacity (veh/h)	814	870	694	719
Control Delay (s)	7.9	7.4	7.1	6.9
Approach Delay (s)	7.9	7.4	7.0	
Approach LOS	A	A	A	

Intersection Summary			
Delay	7.4		
Level of Service	A		
Intersection Capacity Utilization	21.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	12	49	3	16	0	50	394	1	0	271	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.89			1.00		1.00	1.00			0.97	
Flpb, ped/bikes		0.98			0.98		1.00	1.00			1.00	
Frt		0.91			1.00		1.00	1.00			0.99	
Flt Protected		0.99			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1120			1584		1540	2266			2168	
Flt Permitted		0.94			0.95		0.95	1.00			1.00	
Satd. Flow (perm)		1062			1521		1540	2266			2168	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	13	52	3	17	0	53	415	1	0	285	28
RTOR Reduction (vph)	0	48	0	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	29	0	0	20	0	53	416	0	0	311	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		8.3			8.3		8.4	101.4			87.9	
Effective Green, g (s)		8.3			8.3		8.4	101.4			87.9	
Actuated g/C Ratio		0.07			0.07		0.07	0.85			0.73	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		73			105		107	1914			1588	
v/s Ratio Prot							c0.03	c0.18			0.14	
v/s Ratio Perm		c0.03			0.01							
v/c Ratio		0.39			0.19		0.50	0.22			0.20	
Uniform Delay, d1		53.4			52.7		53.8	1.8			5.0	
Progression Factor		1.00			1.00		1.03	0.76			1.00	
Incremental Delay, d2		3.5			0.9		3.4	0.3			0.3	
Delay (s)		56.9			53.6		58.9	1.6			5.3	
Level of Service		E			D		E	A			A	
Approach Delay (s)		56.9			53.6			8.1			5.3	
Approach LOS		E			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	155	0	0	98	223	83	90	160	49	0	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1033	1540	1621	1201	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1033	1540	1621	1201	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	115	163	0	0	103	235	87	95	168	52	0	168
RTOR Reduction (vph)	0	0	0	0	0	150	0	0	145	0	0	150
Lane Group Flow (vph)	115	163	0	0	103	85	87	95	23	52	0	18
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	9.5	42.3			27.8	27.8	10.5	10.5	10.5	8.3		8.3
Effective Green, g (s)	9.5	42.3			27.8	27.8	10.5	10.5	10.5	8.3		8.3
Actuated g/C Ratio	0.12	0.55			0.36	0.36	0.14	0.14	0.14	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	189	1689			1110	372	209	220	163	165		129
v/s Ratio Prot	c0.07	0.05			0.03		0.06	c0.06		c0.03		0.02
v/s Ratio Perm						c0.08			0.02			
v/c Ratio	0.61	0.10			0.09	0.23	0.42	0.43	0.14	0.32		0.14
Uniform Delay, d1	32.0	8.3			16.3	17.2	30.5	30.6	29.3	31.8		31.2
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	5.5	0.1			0.2	1.4	1.3	1.4	0.4	1.1		0.5
Delay (s)	37.5	8.4			16.5	18.6	31.8	31.9	29.7	32.9		31.7
Level of Service	D	A			B	B	C	C	C	C		C
Approach Delay (s)		20.4			17.9			30.8			32.0	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	77.1	Sum of lost time (s)	21.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	24	25	2	27	0	38	15	1	6	20	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.96			1.00		1.00	0.99		1.00	0.92	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3204			1795		1711	1785		1711	1652	
Flt Permitted		0.88			0.99		1.00	1.00		1.00	1.00	
Satd. Flow (perm)		2881			1786		1801	1785		1801	1652	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	26	27	2	29	0	41	16	1	7	22	27
RTOR Reduction (vph)	0	9	0	0	0	0	0	1	0	0	25	0
Lane Group Flow (vph)	0	85	0	0	31	0	41	16	0	7	24	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		26.4			26.4		3.2	3.2		3.2	3.2	
Effective Green, g (s)		26.4			26.4		3.2	3.2		3.2	3.2	
Actuated g/C Ratio		0.68			0.68		0.08	0.08		0.08	0.08	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1970			1221		149	147		149	136	
v/s Ratio Prot								0.01			0.01	
v/s Ratio Perm		c0.03			0.02		c0.02			0.00		
v/c Ratio		0.04			0.03		0.28	0.11		0.05	0.18	
Uniform Delay, d1		2.0			2.0		16.6	16.4		16.3	16.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			0.0		1.0	0.3		0.1	0.6	
Delay (s)		2.0			2.0		17.6	16.7		16.4	17.1	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.0			2.0			17.4			17.0	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.07		
Actuated Cycle Length (s)	38.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	25.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Existing 2015 plus Project with M-TR-11c
Basketball Game
With SF Giants Game at AT&T Park
Saturday Evening

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	462	634	95	400	595	87	26	433	91	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.89			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00			
Frt	1.00	0.98		1.00	0.98			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	2978		2987	2977			5533	1232			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	2978		2987	2977			5533	1232			
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	570	783	117	494	735	107	32	535	112	0	0	0
RTOR Reduction (vph)	0	11	0	0	8	0	0	0	93	0	0	0
Lane Group Flow (vph)	570	889	0	494	834	0	0	567	19	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	21.9	41.4		31.1	50.6			18.6	18.6			
Effective Green, g (s)	21.9	41.4		31.1	50.6			18.6	18.6			
Actuated g/C Ratio	0.20	0.38		0.28	0.46			0.17	0.17			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	891	1120		844	1369			935	208			
v/s Ratio Prot	0.13	c0.30		0.17	c0.28							
v/s Ratio Perm								0.10	0.02			
v/c Ratio	0.64	0.79		0.59	0.61			0.61	0.09			
Uniform Delay, d1	40.4	30.5		33.9	22.3			42.3	38.6			
Progression Factor	1.00	1.00		0.83	0.34			1.09	6.15			
Incremental Delay, d2	1.5	5.8		0.6	0.4			1.0	0.2			
Delay (s)	42.0	36.3		28.7	8.0			47.3	237.4			
Level of Service	D	D		C	A			D	F			
Approach Delay (s)		38.5			15.7			78.7			0.0	
Approach LOS		D			B			E			A	

Intersection Summary			
HCM 2000 Control Delay	37.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	91.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	972	45	50	512	59	11	72	40	179	638	241
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.98		1.00	0.93			1.00	0.63	1.00	0.98	0.46
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00	0.68	1.00	1.00
Frt	1.00	0.99		1.00	0.98			1.00	0.85	1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4318		1296	2383			1580	844	1043	2877	563
Flt Permitted	0.95	1.00		0.95	1.00			0.88	1.00	0.70	1.00	1.00
Satd. Flow (perm)	1540	4318		1296	2383			1402	844	764	2877	563
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	123	1105	51	57	582	67	12	82	45	203	725	274
RTOR Reduction (vph)	0	4	0	0	6	0	0	0	30	0	3	104
Lane Group Flow (vph)	123	1152	0	57	643	0	0	94	15	203	749	143
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	13.2	47.9		10.9	44.0			41.3	41.3	42.3	42.3	42.3
Effective Green, g (s)	13.2	47.9		10.9	44.0			41.3	41.3	42.3	42.3	42.3
Actuated g/C Ratio	0.11	0.40		0.09	0.37			0.34	0.34	0.35	0.35	0.35
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	169	1723		117	873			482	290	269	1014	198
v/s Ratio Prot	0.08	c0.27		0.04	c0.27						0.26	
v/s Ratio Perm								0.07	0.02	c0.27		0.25
v/c Ratio	0.73	0.67		0.49	0.74			0.20	0.05	0.75	0.74	0.72
Uniform Delay, d1	51.7	29.5		51.9	33.0			27.7	26.3	34.3	34.0	33.7
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.5	2.1		3.2	3.3			0.2	0.1	11.4	2.9	12.2
Delay (s)	66.1	31.6		55.1	36.2			27.9	26.4	45.7	36.9	45.9
Level of Service	E	C		E	D			C	C	D	D	D
Approach Delay (s)		34.9			37.7			27.4			40.2	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	110.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

9/18/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1088	105	0	764	48	37
Ideal Flow (vphpl)	1000	1000	1000	1000	1000	1000
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	1597			1621	810	714
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	1597			1621	810	714
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1196	115	0	840	53	41
RTOR Reduction (vph)	4	0	0	0	0	35
Lane Group Flow (vph)	1307	0	0	840	53	6
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	83.8			83.8	14.9	14.9
Effective Green, g (s)	83.8			83.8	14.9	14.9
Actuated g/C Ratio	0.76			0.76	0.14	0.14
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	1216			1234	109	96
v/s Ratio Prot	c0.82			0.52	c0.07	
v/s Ratio Perm						0.01
v/c Ratio	1.08			0.68	0.49	0.06
Uniform Delay, d1	13.1			6.5	44.0	41.4
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	48.6			1.6	3.4	0.3
Delay (s)	61.7			8.0	47.4	41.7
Level of Service	E			A	D	D
Approach Delay (s)	61.7			8.0	44.9	
Approach LOS	E			A	D	

Intersection Summary			
HCM 2000 Control Delay	40.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

9/18/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	31	352	98	28	284	654	209	402	1175	249
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.97			1.00	0.97			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00			1.00	1.00
Frt		0.97			1.00	0.96			1.00	0.85
Flt Protected		1.00			1.00	1.00			0.95	1.00
Satd. Flow (prot)		5634			2870	2501			4106	1122
Flt Permitted		1.00			0.76	1.00			0.95	1.00
Satd. Flow (perm)		5634			2186	2501			4106	1122
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	33	371	103	29	299	688	220	423	1237	262
RTOR Reduction (vph)	0	70	0	0	0	31	0	0	0	0
Lane Group Flow (vph)	0	437	0	0	328	877	0	0	1686	236
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		13.3			22.0	22.0			22.2	22.2
Effective Green, g (s)		15.3			25.0	25.0			25.2	25.2
Actuated g/C Ratio		0.20			0.33	0.33			0.34	0.34
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1149			728	833			1379	376
v/s Ratio Prot						c0.35			c0.41	0.21
v/s Ratio Perm		0.08			0.15					
v/c Ratio		0.38			0.45	1.05			1.22	0.63
Uniform Delay, d1		25.8			19.6	25.0			24.9	21.0
Progression Factor		1.00			0.89	1.00			1.00	1.00
Incremental Delay, d2		0.2			0.1	46.1			106.9	3.3
Delay (s)		26.0			17.7	71.1			131.8	24.2
Level of Service		C			B	E			F	C
Approach Delay (s)		26.0			17.7	71.1			118.6	
Approach LOS		C			B	E			F	

Intersection Summary			
HCM 2000 Control Delay	85.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	70	408	558	56	242	215	40	322	61	704
Ideal Flow (vphpl)	1400	1400	1400	1400	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.87		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.93		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)		1700	2661		2224		1161		1327	2550
Flt Permitted		0.95	1.00		1.00		1.00		0.29	0.90
Satd. Flow (perm)		1700	2661		2224		1161		401	2315
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	74	434	594	60	257	229	43	343	65	749
RTOR Reduction (vph)	0	0	12	0	1	0	31	0	0	0
Lane Group Flow (vph)	0	456	694	0	489	0	8	0	349	808
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		419	745		518		247		328	1042
v/s Ratio Prot		c0.27	0.26		0.22				c0.18	0.13
v/s Ratio Perm							0.01		c0.28	0.21
v/c Ratio		1.09	0.93		0.94		0.03		1.06	0.78
Uniform Delay, d1		28.2	26.3		28.3		23.4		24.1	18.1
Progression Factor		1.00	1.00		1.00		1.00		0.80	0.78
Incremental Delay, d2		69.9	19.9		27.9		0.3		35.5	0.5
Delay (s)		98.1	46.2		56.2		23.6		54.8	14.6
Level of Service		F	D		E		C		D	B
Approach Delay (s)			66.6		53.8					26.8
Approach LOS			E		D					C

Intersection Summary			
HCM 2000 Control Delay	48.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	26	28	133	0	3	3	20	423	25	99	291	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1700	1700	1700	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	0.99	
Flpb, ped/bikes		0.99	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.93		1.00	0.99		1.00	0.96	
Flt Protected		0.98	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1567	1347		1485		1377	2703		1540	2942	
Flt Permitted		0.84	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1353	1347		1485		1377	2703		1540	2942	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	29	31	149	0	3	3	22	475	28	111	327	104
RTOR Reduction (vph)	0	0	136	0	3	0	0	2	0	0	10	0
Lane Group Flow (vph)	0	60	13	0	3	0	22	501	0	111	421	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm		NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		10.7	10.7		10.7		4.6	78.4		15.0	89.1	
Effective Green, g (s)		10.7	10.7		10.7		4.6	78.4		15.0	89.1	
Actuated g/C Ratio		0.09	0.09		0.09		0.04	0.65		0.12	0.74	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		120	120		132		52	1765		192	2184	
v/s Ratio Prot					0.00		0.02	c0.19		c0.07	0.14	
v/s Ratio Perm		c0.04	0.01									
v/c Ratio		0.50	0.11		0.02		0.42	0.28		0.58	0.19	
Uniform Delay, d1		52.1	50.3		49.9		56.4	8.9		49.5	4.6	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.3	0.4		0.1		2.0	0.4		2.6	0.0	
Delay (s)		55.4	50.7		50.0		58.4	9.3		52.1	4.7	
Level of Service		E	D		D		E	A		D	A	
Approach Delay (s)		52.0			50.0			11.3			14.4	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	3	9	3	69	44	1	36	5	178	205	104
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.98			1.00	0.99	1.00	0.99		1.00	0.91	
Flpb, ped/bikes		1.00			1.00	1.00	0.87	1.00		1.00	1.00	
Frt		0.91			1.00	0.85	1.00	0.98		1.00	0.95	
Flt Protected		0.99			1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2300			1447	1218	1192	1411		1377	1257	
Flt Permitted		0.90			0.99	1.00	0.91	1.00		0.95	1.00	
Satd. Flow (perm)		2080			1431	1218	1141	1411		1377	1257	
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	4	4	12	4	92	59	1	48	7	237	273	139
RTOR Reduction (vph)	0	10	0	0	0	24	0	6	0	0	17	0
Lane Group Flow (vph)	0	10	0	0	96	35	1	49	0	237	395	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		7.5			7.5	27.7	4.4	4.4		20.2	29.6	
Effective Green, g (s)		7.5			7.5	27.7	4.4	4.4		20.2	29.6	
Actuated g/C Ratio		0.16			0.16	0.59	0.09	0.09		0.43	0.63	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		331			227	845	106	131		590	789	
v/s Ratio Prot						0.02		0.03		0.17	c0.31	
v/s Ratio Perm		0.00			c0.07	0.01	0.00					
v/c Ratio		0.03			0.42	0.04	0.01	0.37		0.40	0.50	
Uniform Delay, d1		16.7			17.8	4.1	19.4	20.1		9.3	4.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			1.3	0.0	0.0	1.8		0.2	0.5	
Delay (s)		16.8			19.1	4.1	19.4	21.8		9.4	5.2	
Level of Service		B			B	A	B	C		A	A	
Approach Delay (s)		16.8			13.4			21.8			6.8	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	47.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	26	136	318	19	669	189
Ideal Flow (vphpl)	1400	1400	1200	1200	1400	1400
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1134	1743	1535	851	1134	1194
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1134	1743	1535	851	1134	1194
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	33	174	408	24	858	242
RTOR Reduction (vph)	0	155	0	11	0	0
Lane Group Flow (vph)	33	19	408	13	858	242
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	custom	Prot	NA
Protected Phases	4		2 5	5	1	6
Permitted Phases		4		2		
Actuated Green, G (s)	8.4	8.4	34.2	29.2	20.1	59.3
Effective Green, g (s)	8.4	8.4	34.2	29.2	20.1	59.3
Actuated g/C Ratio	0.11	0.11	0.44	0.38	0.26	0.76
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	122	188	675	374	293	911
v/s Ratio Prot	c0.03		c0.27	0.01	c0.76	0.20
v/s Ratio Perm		0.01		0.01		
v/c Ratio	0.27	0.10	0.60	0.04	2.93	0.27
Uniform Delay, d1	31.8	31.2	16.6	15.3	28.8	2.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.2	1.5	0.0	877.0	0.2
Delay (s)	33.0	31.5	18.1	15.4	905.8	2.9
Level of Service	C	C	B	B	F	A
Approach Delay (s)	31.7		18.0			707.1
Approach LOS	C		B			F

Intersection Summary			
HCM 2000 Control Delay	455.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.42		
Actuated Cycle Length (s)	77.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	90.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.
9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	6	3	265	93	63	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.95		1.00	1.00	0.99	
Flpb, ped/bikes	0.97		0.97	1.00	1.00	
Frt	0.95		1.00	1.00	0.98	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1536		1666	1531	3064	
Flt Permitted	0.97		0.68	1.00	1.00	
Satd. Flow (perm)	1536		1194	1531	3064	
Peak-hour factor, PHF	0.66	0.66	0.66	0.66	0.66	0.66
Adj. Flow (vph)	9	5	402	141	95	18
RTOR Reduction (vph)	5	0	0	0	5	0
Lane Group Flow (vph)	9	0	402	141	108	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	0.9		29.4	29.4	29.4	
Effective Green, g (s)	0.9		29.4	29.4	29.4	
Actuated g/C Ratio	0.02		0.73	0.73	0.73	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	34		871	1116	2235	
v/s Ratio Prot	c0.01			0.09	0.04	
v/s Ratio Perm			c0.34			
v/c Ratio	0.27		0.46	0.13	0.05	
Uniform Delay, d1	19.4		2.2	1.6	1.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	4.2		0.4	0.1	0.0	
Delay (s)	23.6		2.6	1.7	1.5	
Level of Service	C		A	A	A	
Approach Delay (s)	23.6			2.4	1.5	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	2.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	40.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	43.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.
9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	15	48	354	75	280	293
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.92	0.99		1.00	1.00
Flpb, ped/bikes	0.91	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.97		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1558	1410	3291		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1558	1410	3291		1711	3421
Peak-hour factor, PHF	0.77	0.77	0.77	0.77	0.77	0.77
Adj. Flow (vph)	19	62	460	97	364	381
RTOR Reduction (vph)	0	59	15	0	0	0
Lane Group Flow (vph)	19	3	542	0	364	381
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	6.4	6.4	65.0		33.3	103.4
Effective Green, g (s)	6.4	6.4	65.0		33.3	103.4
Actuated g/C Ratio	0.05	0.05	0.54		0.28	0.86
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	83	75	1782		474	2947
v/s Ratio Prot			c0.16		c0.21	0.11
v/s Ratio Perm	c0.01	0.00				
v/c Ratio	0.23	0.04	0.30		0.77	0.13
Uniform Delay, d1	54.4	53.9	15.1		39.8	1.3
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.4	0.2	0.4		7.3	0.1
Delay (s)	55.8	54.1	15.5		47.1	1.4
Level of Service	E	D	B		D	A
Approach Delay (s)	54.5		15.5			23.7
Approach LOS	D		B			C

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th
9/18/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	10	7	7	348	56	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.98	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1518	1341		2883	2807	
Flt Permitted	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1518	1341		2742	2807	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	12	8	8	409	66	12
RTOR Reduction (vph)	0	8	0	0	9	0
Lane Group Flow (vph)	12	0	0	417	69	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	0.6	0.6		12.7	12.7	
Effective Green, g (s)	0.6	0.6		12.7	12.7	
Actuated g/C Ratio	0.01	0.01		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	18	16		713	730	
v/s Ratio Prot	c0.01				0.02	
v/s Ratio Perm		0.00		c0.15		
v/c Ratio	0.67	0.01		0.58	0.09	
Uniform Delay, d1	24.0	23.8		15.7	13.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	66.1	0.2		1.2	0.1	
Delay (s)	90.1	24.0		17.0	13.7	
Level of Service	F	C		B	B	
Approach Delay (s)	63.6			17.0	13.7	
Approach LOS	E			B	B	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	48.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	25.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	125	2	81	5	2	5	46	215	9	5	53	38
Peak Hour Factor	0.92	0.91	0.91	0.91	0.91	0.92	0.91	0.92	0.91	0.92	0.92	0.92
Hourly flow rate (vph)	136	2	89	5	2	5	51	234	10	5	58	41

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	136	91	5	8	294	63	41
Volume Left (vph)	136	0	5	0	51	5	0
Volume Right (vph)	0	89	0	5	10	0	41
Hadj (s)	0.53	-0.65	0.53	-0.46	0.05	0.08	-0.67
Departure Headway (s)	6.1	4.9	6.4	5.4	5.3	5.5	4.8
Degree Utilization, x	0.23	0.12	0.01	0.01	0.43	0.10	0.06
Capacity (veh/h)	556	686	514	604	658	613	704
Control Delay (s)	9.7	7.4	8.3	7.3	12.3	7.9	6.9
Approach Delay (s)	8.8		7.7		12.3	7.5	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	10.2		
Level of Service	B		
Intersection Capacity Utilization	41.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	152	117	1	65	20	125	302	48	8	194	105
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.94	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.97	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1252	1365	1120	1284	1365	1091	2515	2520		1296	2434	
Flt Permitted	0.71	1.00	1.00	0.53	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	930	1365	1120	719	1365	1091	2515	2520		1296	2434	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	130	185	143	1	79	24	152	368	59	10	237	128
RTOR Reduction (vph)	0	0	114	0	0	19	0	7	0	0	52	0
Lane Group Flow (vph)	130	185	29	1	79	5	152	420	0	10	313	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	19.6	19.6	19.6	19.6	19.6	19.6	11.2	59.5		1.9	50.2	
Effective Green, g (s)	19.6	19.6	19.6	19.6	19.6	19.6	11.2	59.5		1.9	50.2	
Actuated g/C Ratio	0.20	0.20	0.20	0.20	0.20	0.20	0.12	0.62		0.02	0.52	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	188	276	227	145	276	221	291	1550		25	1263	
v/s Ratio Prot		0.14			0.06		c0.06	c0.17		0.01	c0.13	
v/s Ratio Perm	c0.14		0.03	0.00		0.00						
v/c Ratio	0.69	0.67	0.13	0.01	0.29	0.02	0.52	0.27		0.40	0.25	
Uniform Delay, d1	35.7	35.6	31.6	30.8	32.6	30.9	40.2	8.6		46.8	12.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.5	6.3	0.3	0.0	0.6	0.0	1.7	0.4		10.2	0.1	
Delay (s)	46.2	41.8	31.8	30.8	33.2	30.9	41.9	9.0		57.0	12.9	
Level of Service	D	D	C	C	C	C	D	A		E	B	
Approach Delay (s)		39.9			32.7			17.7			14.1	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	24.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	96.7	Sum of lost time (s)	15.7
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	347	1	1	268	26	3	5	1	28	1	56
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.93	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.91	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1241	1621	1669		1483	1353	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.72	1.00		0.75	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1241	1220	1669		1175	1353	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	65	390	1	1	301	29	3	6	1	31	1	63
RTOR Reduction (vph)	0	0	0	0	0	16	0	1	0	0	47	0
Lane Group Flow (vph)	65	390	1	1	301	13	3	6	0	31	17	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	11.0	46.4	46.4	2.7	38.1	38.1	21.9	21.9		21.9	21.9	
Effective Green, g (s)	11.0	46.4	46.4	2.7	38.1	38.1	21.9	21.9		21.9	21.9	
Actuated g/C Ratio	0.13	0.54	0.54	0.03	0.44	0.44	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	920	782	50	755	549	310	425		299	344	
v/s Ratio Prot	c0.04	c0.23		0.00	0.18			0.00			0.01	
v/s Ratio Perm			0.00			0.01	0.00			c0.03		
v/c Ratio	0.31	0.42	0.00	0.02	0.40	0.02	0.01	0.01		0.10	0.05	
Uniform Delay, d1	34.1	11.8	9.1	40.4	16.2	13.5	23.9	24.0		24.5	24.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	1.4	0.0	0.2	0.3	0.0	0.0	0.0		0.2	0.1	
Delay (s)	34.9	13.3	9.1	40.5	16.5	13.5	24.0	24.0		24.7	24.3	
Level of Service	C	B	A	D	B	B	C	C		C	C	
Approach Delay (s)		16.3			16.4			24.0			24.4	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	369	17	19	280	28	11	257	23	15	75	20
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.99	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1048	1540	3041			3053	1073
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.68	1.00			0.86	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1048	1103	3041			2655	1073
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	72	461	21	24	350	35	14	321	29	19	94	25
RTOR Reduction (vph)	0	0	9	0	0	19	0	8	0	0	0	20
Lane Group Flow (vph)	72	461	12	24	350	16	14	342	0	0	113	5
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	7.5	36.4	36.4	2.2	30.1	30.1	14.2	14.2			13.2	13.2
Effective Green, g (s)	7.5	36.4	36.4	2.2	30.1	30.1	14.2	14.2			13.2	13.2
Actuated g/C Ratio	0.11	0.55	0.55	0.03	0.46	0.46	0.22	0.22			0.20	0.20
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	138	672	762	51	555	479	238	656			532	215
v/s Ratio Prot	c0.06	c0.38		0.02	0.29			c0.11				
v/s Ratio Perm			0.01			0.02	0.01				0.04	0.00
v/c Ratio	0.52	0.69	0.02	0.47	0.63	0.03	0.06	0.52			0.21	0.02
Uniform Delay, d1	27.5	10.6	6.6	31.2	13.6	9.8	20.5	22.8			22.0	21.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	3.5	2.9	0.0	6.7	2.3	0.0	0.1	0.8			0.2	0.0
Delay (s)	31.0	13.5	6.6	37.9	15.9	9.9	20.6	23.5			22.2	21.2
Level of Service	C	B	A	D	B	A	C	C			C	C
Approach Delay (s)		15.5			16.7			23.4			22.0	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	65.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	317	58	7	194	110	48	158	3	124	45	20
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.91	1.00	1.00	0.96	1.00	0.97	
Flpb, ped/bikes	0.98	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1315	929		1335	1126	871	1070	957	916	1070	1042	
Flt Permitted	0.46	1.00		0.34	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	640	929		481	1126	871	1070	957	916	1070	1042	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	17	369	67	8	226	128	56	184	3	144	52	23
RTOR Reduction (vph)	0	6	0	0	0	51	0	0	2	0	17	0
Lane Group Flow (vph)	17	430	0	8	226	77	56	184	1	144	58	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	51.2	51.2		50.4	50.4	64.4	24.9	21.1	21.1	14.0	10.2	
Effective Green, g (s)	51.2	51.2		50.4	50.4	64.4	24.9	21.1	21.1	14.0	10.2	
Actuated g/C Ratio	0.48	0.48		0.47	0.47	0.60	0.23	0.20	0.20	0.13	0.10	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	315	444		232	530	564	249	188	180	140	99	
v/s Ratio Prot	0.00	c0.46		0.00	c0.20	0.02	c0.05	c0.19		c0.13	0.06	
v/s Ratio Perm	0.03			0.02		0.07			0.00			
v/c Ratio	0.05	0.97		0.03	0.43	0.14	0.22	0.98	0.00	1.03	0.58	
Uniform Delay, d1	15.3	27.1		22.7	18.7	9.2	33.2	42.7	34.5	46.5	46.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	34.3		0.1	0.6	0.1	0.5	58.8	0.0	83.8	8.5	
Delay (s)	15.3	61.4		22.8	19.3	9.4	33.7	101.5	34.5	130.3	54.9	
Level of Service	B	E		C	B	A	C	F	C	F	D	
Approach Delay (s)		59.7			15.9			85.0			104.5	
Approach LOS		E			B			F			F	

Intersection Summary			
HCM 2000 Control Delay	59.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	107.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	218	327	34	42	63	9	35	39	60	9	66	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00		1.00	0.99			1.00	0.97		0.99	
Flpb, ped/bikes		0.99		0.99	1.00			0.99	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.94	
Flt Protected		0.98		0.95	1.00			0.98	1.00		1.00	
Satd. Flow (prot)		1472		1696	1757			1747	1491		1412	
Flt Permitted		0.84		0.41	1.00			0.83	1.00		0.98	
Satd. Flow (perm)		1263		735	1757			1490	1491		1390	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	242	363	38	47	70	10	39	43	67	10	73	67
RTOR Reduction (vph)	0	2	0	0	4	0	0	0	53	0	35	0
Lane Group Flow (vph)	0	641	0	47	76	0	0	82	14	0	115	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)		42.4		42.4	42.4			17.6	17.6		17.6	
Effective Green, g (s)		42.4		42.4	42.4			17.6	17.6		17.6	
Actuated g/C Ratio		0.50		0.50	0.50			0.21	0.21		0.21	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		636		370	884			311	311		290	
v/s Ratio Prot					0.04							
v/s Ratio Perm		c0.51		0.06				0.06	0.01		c0.08	
v/c Ratio		1.01		0.13	0.09			0.26	0.05		0.40	
Uniform Delay, d1		20.9		11.1	10.8			27.9	26.6		28.7	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		37.6		0.2	0.0			0.5	0.1		0.9	
Delay (s)		58.5		11.2	10.9			28.3	26.6		29.6	
Level of Service		E		B	B			C	C		C	
Approach Delay (s)		58.5			11.0			27.6			29.6	
Approach LOS		E			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	44.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	84.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	93	544	45	20	123	15	48	367	14	21	209	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1668	3373		1700	3347		1260	2499		1260	2391	
Flt Permitted	0.65	1.00		0.17	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1138	3373		313	3347		1260	2499		1260	2391	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	111	648	54	24	146	18	57	437	17	25	249	98
RTOR Reduction (vph)	0	5	0	0	9	0	0	2	0	0	35	0
Lane Group Flow (vph)	111	697	0	24	155	0	57	452	0	25	312	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	32.6	32.6		32.6	32.6		25.9	68.3		5.6	48.0	
Effective Green, g (s)	32.6	32.6		32.6	32.6		25.9	68.3		5.6	48.0	
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.21	0.56		0.05	0.39	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	304	901		83	894		267	1399		57	940	
v/s Ratio Prot		c0.21			0.05		0.05	c0.18		0.02	c0.13	
v/s Ratio Perm	0.10			0.08								
v/c Ratio	0.37	0.77		0.29	0.17		0.21	0.32		0.44	0.33	
Uniform Delay, d1	36.3	41.3		35.5	34.3		39.6	14.4		56.7	25.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	4.2		1.9	0.1		0.4	0.6		5.3	0.2	
Delay (s)	37.0	45.5		37.4	34.4		40.0	15.0		62.0	26.0	
Level of Service	D	D		D	C		D	B		E	C	
Approach Delay (s)		44.3			34.8			17.8			28.4	
Approach LOS		D			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	33.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	122.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	701	11	2	242	1	13	0	1	2	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00			0.99		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3413		1711	3419			1705		1711	1621	
Flt Permitted	0.59	1.00		0.35	1.00			0.78		0.75	1.00	
Satd. Flow (perm)	1060	3413		637	3419			1387		1346	1621	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	762	12	2	263	1	14	0	1	2	1	2
RTOR Reduction (vph)	0	2	0	0	1	0	0	11	0	0	2	0
Lane Group Flow (vph)	2	772	0	2	263	0	0	4	0	2	1	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	15.2	15.2		15.2	15.2			7.8		7.8	7.8	
Effective Green, g (s)	15.2	15.2		15.2	15.2			7.8		7.8	7.8	
Actuated g/C Ratio	0.46	0.46		0.46	0.46			0.24		0.24	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	488	1572		293	1574			327		318	383	
v/s Ratio Prot		c0.23			0.08						0.00	
v/s Ratio Perm	0.00			0.00				c0.00		0.00		
v/c Ratio	0.00	0.49		0.01	0.17			0.01		0.01	0.00	
Uniform Delay, d1	4.8	6.2		4.8	5.2			9.6		9.6	9.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.2		0.0	0.1			0.0		0.0	0.0	
Delay (s)	4.8	6.4		4.8	5.3			9.7		9.6	9.6	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		6.4			5.2			9.7			9.6	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	33.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	74	0	0	302	15	209	316	637	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.99		1.00	0.90				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3399			5096		1711	3078				2694
Flt Permitted		0.92			1.00		0.95	1.00				1.00
Satd. Flow (perm)		3148			5096		1711	3078				2694
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	12	81	0	0	332	16	230	347	700	0	0	27
RTOR Reduction (vph)	0	0	0	0	7	0	0	414	0	0	0	26
Lane Group Flow (vph)	0	93	0	0	341	0	230	633	0	0	0	1
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1483			1776		697	1255				141
v/s Ratio Prot		c0.00			c0.07		0.13	c0.21				0.00
v/s Ratio Perm		0.03										
v/c Ratio		0.06			0.19		0.33	0.50				0.01
Uniform Delay, d1		11.1			17.3		15.4	16.8				34.1
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.1			0.2		1.3	1.4				0.1
Delay (s)		11.2			17.5		16.7	18.2				34.3
Level of Service		B			B		B	B				C
Approach Delay (s)		11.2			17.5			17.9			34.3	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	85	175	211	325	0	0
Ideal Flow (vphpl)	1000	1000	1000	1000	1000	1000
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	*0.85	*0.85	*0.60	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.94	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	755	672	1080	948		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	755	672	1080	948		
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	98	201	243	374	0	0
RTOR Reduction (vph)	29	71	0	0	0	0
Lane Group Flow (vph)	127	72	243	374	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	30.2	30.2	19.8	60.0		
Effective Green, g (s)	30.2	30.2	19.8	60.0		
Actuated g/C Ratio	0.50	0.50	0.33	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	380	338	356	948		
v/s Ratio Prot	0.17		c0.22	c0.39		
v/s Ratio Perm		0.11				
v/c Ratio	0.33	0.21	0.68	0.39		
Uniform Delay, d1	8.9	8.3	17.4	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.5	0.3	5.3	0.3		
Delay (s)	9.4	8.6	22.7	0.3		
Level of Service	A	A	C	A		
Approach Delay (s)	9.0			9.1	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	154	406	150	2	84	29	115	276	10	3	203	97
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.96		1.00	0.96		1.00	1.00		1.00	0.96	
Flpb, ped/bikes	0.96	1.00		0.95	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.96		1.00	0.99		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1163	2107		1158	1178		1215	2407		1215	2218	
Flt Permitted	0.46	1.00		0.40	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	563	2107		484	1178		1215	2407		1215	2218	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	186	489	181	2	101	35	139	333	12	4	245	117
RTOR Reduction (vph)	0	35	0	0	12	0	0	2	0	0	43	0
Lane Group Flow (vph)	186	635	0	2	124	0	139	343	0	4	319	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	43.2	43.2		20.6	20.6		18.0	56.4		4.1	42.5	
Effective Green, g (s)	43.2	43.2		20.6	20.6		18.0	56.4		4.1	42.5	
Actuated g/C Ratio	0.36	0.36		0.17	0.17		0.15	0.47		0.03	0.35	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	289	758		83	202		182	1131		41	785	
v/s Ratio Prot	0.09	c0.30			0.11		c0.11	0.14		0.00	c0.14	
v/s Ratio Perm	0.14			0.00								
v/c Ratio	0.64	0.84		0.02	0.62		0.76	0.30		0.10	0.41	
Uniform Delay, d1	29.6	35.2		41.3	46.0		49.0	19.7		56.2	29.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.28	0.81	
Incremental Delay, d2	4.8	8.1		0.1	5.5		17.2	0.7		1.0	1.5	
Delay (s)	34.5	43.3		41.5	51.5		66.1	20.4		72.9	25.2	
Level of Service	C	D		D	D		E	C		E	C	
Approach Delay (s)		41.4			51.4			33.5			25.7	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps

9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	124	298	185	345
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	135	324	201	375
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			525			
pX, platoon unblocked						
vC, conflicting volume	912	67			135	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	912	67			135	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			86	
cM capacity (veh/h)	235	982			1447	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	67	67	324	201	375
Volume Left	0	0	0	201	0
Volume Right	0	0	324	0	0
cSH	1700	1700	1700	1447	1700
Volume to Capacity	0.04	0.04	0.19	0.14	0.22
Queue Length 95th (ft)	0	0	0	12	0
Control Delay (s)	0.0	0.0	0.0	7.9	0.0
Lane LOS				A	
Approach Delay (s)	0.0			2.8	
Approach LOS					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	107	48	0	204	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	116	52	0	222	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	52				110	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	52				110	52
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				75	94
cM capacity (veh/h)	1552				875	1004

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	58	58	52	287
Volume Left	0	0	0	222
Volume Right	0	0	0	65
cSH	1700	1700	1700	901
Volume to Capacity	0.03	0.03	0.03	0.32
Queue Length 95th (ft)	0	0	0	34
Control Delay (s)	0.0	0.0	0.0	10.8
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.8
Approach LOS				B

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/18/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	69	242	48	54	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	75	263	52	59	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	111				334	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	111				334	52
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				100	100
cM capacity (veh/h)	1477				604	1004

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	163	175	52	59	0
Volume Left	75	0	0	0	0
Volume Right	0	0	0	59	0
cSH	1477	1700	1700	1700	1700
Volume to Capacity	0.05	0.10	0.03	0.03	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	3.7	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.8		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	19	12	11	18	27	25	384	67	29	241	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.96			0.94		1.00	0.98		1.00	0.98	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1539			1502		1540	3010		1540	3022	
Flt Permitted		0.89			0.94		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1395			1432		1540	3010		1540	3022	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	21	13	12	20	29	27	417	73	32	262	37
RTOR Reduction (vph)	0	12	0	0	27	0	0	5	0	0	4	0
Lane Group Flow (vph)	0	36	0	0	34	0	27	485	0	32	295	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		7.6			7.6		4.7	90.4		6.8	92.5	
Effective Green, g (s)		7.6			7.6		4.7	90.4		6.8	92.5	
Actuated g/C Ratio		0.06			0.06		0.04	0.75		0.06	0.77	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		88			90		60	2267		87	2329	
v/s Ratio Prot							c0.02	c0.16		c0.02	0.10	
v/s Ratio Perm		c0.03			0.02							
v/c Ratio		0.41			0.38		0.45	0.21		0.37	0.13	
Uniform Delay, d1		54.0			53.9		56.4	4.4		54.5	3.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.1			2.6		1.9	0.2		1.0	0.1	
Delay (s)		57.1			56.6		58.3	4.6		55.5	3.6	
Level of Service		E			E		E	A		E	A	
Approach Delay (s)		57.1			56.6			7.4			8.6	
Approach LOS		E			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp
9/18/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	474	9	88	0	0	99
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	515	10	96	0	0	108

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	258	258	10	48	48	108
Volume Left (vph)	258	258	0	0	0	0
Volume Right (vph)	0	0	10	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	5.6	5.6	3.2	6.0	6.0	5.7
Degree Utilization, x	0.40	0.40	0.01	0.08	0.08	0.17
Capacity (veh/h)	620	626	1121	558	557	590
Control Delay (s)	11.2	11.2	5.0	8.4	8.4	9.9
Approach Delay (s)	11.1			8.4		9.9
Approach LOS	B			A		A

Intersection Summary			
Delay	10.5		
Level of Service	B		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th
9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	195	0	0	42	28	6	135	7	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	212	0	0	46	30	7	147	8	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	243	76	80	81
Volume Left (vph)	32	0	7	0
Volume Right (vph)	0	30	0	8
Hadj (s)	0.06	-0.21	0.07	-0.03
Departure Headway (s)	4.5	4.4	5.3	5.2
Degree Utilization, x	0.30	0.09	0.12	0.12
Capacity (veh/h)	783	773	641	653
Control Delay (s)	9.4	7.8	7.8	7.7
Approach Delay (s)	9.4	7.8	7.8	
Approach LOS	A	A	A	

Intersection Summary			
Delay	8.6		
Level of Service	A		
Intersection Capacity Utilization	29.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	148	49	3	16	0	50	454	1	0	271	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.97			1.00		1.00	1.00			0.97	
Flpb, ped/bikes		0.99			0.99		1.00	1.00			1.00	
Frt		0.97			1.00		1.00	1.00			0.99	
Flt Protected		1.00			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1314			1591		1540	2266			2168	
Flt Permitted		0.99			0.96		0.95	1.00			1.00	
Satd. Flow (perm)		1301			1540		1540	2266			2168	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	156	52	3	17	0	53	478	1	0	285	28
RTOR Reduction (vph)	0	10	0	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	210	0	0	20	0	53	479	0	0	310	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		24.4			24.4		8.4	85.3			71.8	
Effective Green, g (s)		24.4			24.4		8.4	85.3			71.8	
Actuated g/C Ratio		0.20			0.20		0.07	0.71			0.60	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		264			313		107	1610			1297	
v/s Ratio Prot							c0.03	c0.21			0.14	
v/s Ratio Perm		c0.16			0.01							
v/c Ratio		0.80			0.06		0.50	0.30			0.24	
Uniform Delay, d1		45.4			38.6		53.8	6.4			11.3	
Progression Factor		1.00			1.00		1.06	0.97			1.00	
Incremental Delay, d2		15.3			0.1		3.3	0.4			0.4	
Delay (s)		60.7			38.7		60.4	6.6			11.7	
Level of Service		E			D		E	A			B	
Approach Delay (s)		60.7			38.7			12.0			11.7	
Approach LOS		E			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/18/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	166	0	0	98	223	83	90	384	185	0	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.84	1.00	1.00	0.86	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1017	1540	1621	1190	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1017	1540	1621	1190	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	115	175	0	0	103	235	87	95	404	195	0	168
RTOR Reduction (vph)	0	0	0	0	0	160	0	0	263	0	0	144
Lane Group Flow (vph)	115	175	0	0	103	75	87	95	141	195	0	24
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	10.1	42.3			27.2	27.2	14.8	14.8	14.8	12.1		12.1
Effective Green, g (s)	10.1	42.3			27.2	27.2	14.8	14.8	14.8	12.1		12.1
Actuated g/C Ratio	0.12	0.50			0.32	0.32	0.17	0.17	0.17	0.14		0.14
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	182	1528			982	324	267	281	206	218		171
v/s Ratio Prot	c0.07	0.06			0.03		0.06	0.06		c0.13		0.02
v/s Ratio Perm						c0.07			c0.12			
v/c Ratio	0.63	0.11			0.10	0.23	0.33	0.34	0.69	0.89		0.14
Uniform Delay, d1	35.8	11.5			20.4	21.3	30.8	30.9	33.0	35.9		32.0
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	7.0	0.2			0.2	1.7	0.7	0.7	9.1	33.7		0.4
Delay (s)	42.8	11.6			20.6	23.0	31.5	31.6	42.1	69.6		32.4
Level of Service	D	B			C	C	C	C	D	E		C
Approach Delay (s)		24.0			22.3			38.8			52.4	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	35.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	85.2	Sum of lost time (s)	21.0
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	353	25	2	52	0	38	15	1	172	20	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.99			1.00		1.00	0.99		1.00	0.92	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3374			1798		1711	1785		1711	1652	
Flt Permitted		0.93			0.99		0.73	1.00		0.75	1.00	
Satd. Flow (perm)		3150			1780		1306	1785		1344	1652	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	45	384	27	2	57	0	41	16	1	187	22	27
RTOR Reduction (vph)	0	9	0	0	0	0	0	1	0	0	21	0
Lane Group Flow (vph)	0	447	0	0	59	0	41	16	0	187	28	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		22.2			22.2		9.2	9.2		9.2	9.2	
Effective Green, g (s)		22.2			22.2		9.2	9.2		9.2	9.2	
Actuated g/C Ratio		0.55			0.55		0.23	0.23		0.23	0.23	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1730			978		297	406		306	376	
v/s Ratio Prot								0.01			0.02	
v/s Ratio Perm		c0.14			0.03		0.03			c0.14		
v/c Ratio		0.26			0.06		0.14	0.04		0.61	0.07	
Uniform Delay, d1		4.8			4.2		12.4	12.2		14.0	12.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.1		0.2	0.0		3.6	0.1	
Delay (s)		5.1			4.4		12.7	12.2		17.6	12.3	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		5.1			4.4			12.5			16.5	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	8.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	40.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

2040 Cumulative with Project
Basketball Game – Weekday PM Peak

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	924	825	48	407	937	47	79	1490	477	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.98		1.00	0.98			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00			
Frt	1.00	0.99		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3001		2987	3010			5475	942			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3001		2987	3010			5475	942			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	953	851	49	420	966	48	81	1536	492	0	0	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	206	0	0	0
Lane Group Flow (vph)	953	896	0	420	1014	0	0	1617	286	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	37.2		13.2	33.7			39.2	39.2			
Effective Green, g (s)	18.2	37.2		13.2	33.7			39.2	39.2			
Actuated g/C Ratio	0.17	0.34		0.12	0.31			0.36	0.36			
Clearance Time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1014		358	922			1951	335			
v/s Ratio Prot	c0.21	0.30		0.14	c0.34							
v/s Ratio Perm								0.30	c0.30			
v/c Ratio	1.29	0.88		1.17	1.10			0.83	0.85			
Uniform Delay, d1	45.9	34.4		48.4	38.1			32.3	32.7			
Progression Factor	1.37	1.51		1.42	0.99			0.96	1.17			
Incremental Delay, d2	132.8	4.7		95.4	55.8			3.0	18.2			
Delay (s)	195.8	56.7		164.4	93.6			34.2	56.5			
Level of Service	F	E		F	F			C	E			
Approach Delay (s)		128.2			114.3			39.4			0.0	
Approach LOS		F			F			D			A	

Intersection Summary			
HCM 2000 Control Delay	89.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	98.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	346	1643	36	30	962	24	8	250	107	47	657	592
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.64	1.00	0.87	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	0.77	1.00	1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.96	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1459	4143		1459	2863			1528	813	1123	2354	550
Flt Permitted	0.95	1.00		0.95	1.00			0.96	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1459	4143		1459	2863			1467	813	607	2354	550
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	353	1677	37	31	982	24	8	255	109	48	670	604
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	71	0	25	226
Lane Group Flow (vph)	353	1712	0	31	1005	0	0	263	38	48	856	167
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Effective Green, g (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Actuated g/C Ratio	0.13	0.39		0.08	0.33			0.35	0.35	0.36	0.36	0.36
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	190	1619		118	934			509	282	216	838	196
v/s Ratio Prot	c0.24	0.41		0.02	c0.35						c0.36	
v/s Ratio Perm								0.18	0.05	0.08		0.30
v/c Ratio	1.86	1.06		0.26	1.08			0.52	0.13	0.22	1.02	0.85
Uniform Delay, d1	47.8	33.5		47.5	37.0			28.6	24.6	24.7	35.4	32.7
Progression Factor	0.59	1.13		0.89	0.88			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	394.4	32.6		0.1	36.4			0.9	0.2	0.5	36.6	28.3
Delay (s)	422.6	70.3		42.4	68.9			29.4	24.8	25.3	72.0	61.0
Level of Service	F	E		D	E			C	C	C	E	E
Approach Delay (s)		130.5			68.1			28.1			67.0	
Approach LOS		F			E			C			E	

Intersection Summary			
HCM 2000 Control Delay	91.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	123.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2002	157	0	1562	100	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.91			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	4366			3079	1540	1357
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	4366			3079	1540	1357
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	2085	164	0	1627	104	24
RTOR Reduction (vph)	8	0	0	0	0	3
Lane Group Flow (vph)	2241	0	0	1627	104	21
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	2464			1738	512	451
v/s Ratio Prot	0.51			c0.53	c0.07	
v/s Ratio Perm						0.02
v/c Ratio	0.91			0.94	0.20	0.05
Uniform Delay, d1	21.4			22.1	26.3	24.9
Progression Factor	1.00			0.76	1.00	1.00
Incremental Delay, d2	6.3			1.3	0.9	0.2
Delay (s)	27.8			18.1	27.2	25.1
Level of Service	C			B	C	C
Approach Delay (s)	27.8			18.1	26.8	
Approach LOS	C			B	C	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/27/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	250	1050	150	100	570	810	340	362	1424	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0			2.0	2.0			2.0	2.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	0.87
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		6062			3026	2596			4318	1033
Flt Permitted		0.99			0.52	1.00			0.95	1.00
Satd. Flow (perm)		6062			1584	2596			4318	1033
Peak-hour factor, PHF	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93
Adj. Flow (vph)	272	1129	161	108	613	871	366	393	1531	495
RTOR Reduction (vph)	0	23	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1539	0	0	721	1236	0	0	1974	445
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Perm
Protected Phases		6			4	4		7	7	
Permitted Phases	6			4						7
Actuated Green, G (s)		27.0			25.0	25.0			24.0	24.0
Effective Green, g (s)		29.0			28.0	28.0			27.0	27.0
Actuated g/C Ratio		0.32			0.31	0.31			0.30	0.30
Clearance Time (s)		4.0			5.0	5.0			5.0	5.0
Lane Grp Cap (vph)		1953			492	807			1295	309
v/s Ratio Prot						c0.48			c0.46	
v/s Ratio Perm		0.25			0.46					0.43
v/c Ratio		0.79			1.54dl	1.53			1.52	1.44
Uniform Delay, d1		27.7			31.0	31.0			31.5	31.5
Progression Factor		1.56			0.31	1.00			1.00	1.00
Incremental Delay, d2		2.0			210.5	245.3			239.9	215.6
Delay (s)		45.2			220.1	276.3			271.4	247.1
Level of Service		D			F	F			F	F
Approach Delay (s)		45.2			220.1	276.3			266.9	
Approach LOS		D			F	F			F	

Intersection Summary			
HCM 2000 Control Delay	204.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	137.2%	ICU Level of Service	H
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

4/27/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	105	303	1050	110	565	140	500	260	180	982
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.90		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.95		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)		2494	3622		2497		1228		1401	2690
Flt Permitted		0.95	1.00		1.00		1.00		0.15	0.61
Satd. Flow (perm)		2494	3622		2497		1228		218	1652
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	113	326	1129	118	608	151	538	280	194	1056
RTOR Reduction (vph)	0	0	12	0	15	0	226	0	0	0
Lane Group Flow (vph)	0	406	1268	0	879	0	177	0	379	1151
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	5	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		22.5	22.5		23.0		23.0		42.0	42.0
Effective Green, g (s)		22.5	25.0		24.5		23.0		43.5	43.5
Actuated g/C Ratio		0.25	0.28		0.27		0.26		0.48	0.48
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		623	1006		679		313		322	988
v/s Ratio Prot		0.16	c0.35		c0.35				0.22	c0.21
v/s Ratio Perm							0.14		0.35	0.35
v/c Ratio		0.65	1.26		1.29		0.56		1.18	1.16
Uniform Delay, d1		30.2	32.5		32.8		29.1		33.1	23.2
Progression Factor		1.00	1.00		1.00		1.00		1.05	1.07
Incremental Delay, d2		5.2	125.5		143.1		7.2		82.9	75.4
Delay (s)		35.5	158.0		175.9		36.3		117.7	100.2
Level of Service		D	F		F		D		F	F
Approach Delay (s)			128.5		132.5					104.5
Approach LOS			F		F					F

Intersection Summary			
HCM 2000 Control Delay	121.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	224	209	28	30	77	39	1449	139	70	429	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.92		1.00	0.99		1.00	0.99	
Flt Protected		0.99	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1601	1353		1458		1540	3007		1540	3049	
Flt Permitted		0.91	1.00		0.90		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1471	1353		1321		1540	3007		1540	3049	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	59	236	220	29	32	81	41	1525	146	74	452	26
RTOR Reduction (vph)	0	0	149	0	48	0	0	7	0	0	4	0
Lane Group Flow (vph)	0	295	71	0	94	0	41	1664	0	74	474	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.1	32.1		32.1		8.0	47.5		4.5	44.3	
Effective Green, g (s)		32.1	32.1		32.1		8.0	47.5		4.5	44.3	
Actuated g/C Ratio		0.32	0.32		0.32		0.08	0.48		0.04	0.44	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Grp Cap (vph)		472	434		424		123	1428		69	1350	
v/s Ratio Prot							0.03	c0.55		c0.05	0.16	
v/s Ratio Perm		c0.20	0.05		0.07							
v/c Ratio		0.62	0.16		0.22		0.33	1.17		1.07	0.35	
Uniform Delay, d1		28.8	24.3		24.8		43.5	26.2		47.8	18.4	
Progression Factor		1.00	1.00		1.00		1.23	0.64		1.00	1.00	
Incremental Delay, d2		6.1	0.8		1.2		6.7	81.8		129.7	0.7	
Delay (s)		35.0	25.1		26.0		60.3	98.6		177.4	19.1	
Level of Service		C	C		C		E	F		F	B	
Approach Delay (s)		30.8			26.0			97.7			40.3	
Approach LOS		C			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	71.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	139	20	8	38	48	18	259	24	326	332	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.98	1.00	1.00		1.00	0.96	
Flpb, ped/bikes		0.99			1.00	1.00	0.84	1.00		1.00	1.00	
Frt		0.98			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2978			1605	1353	1292	1595		1540	1530	
Flt Permitted		0.88			0.91	1.00	0.52	1.00		0.95	1.00	
Satd. Flow (perm)		2654			1479	1353	711	1595		1540	1530	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	43	149	22	9	41	52	19	278	26	351	357	51
RTOR Reduction (vph)	0	12	0	0	0	29	0	5	0	0	6	0
Lane Group Flow (vph)	0	202	0	0	50	23	19	299	0	351	402	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		9.7			9.7	25.0	15.8	15.8		15.3	36.1	
Effective Green, g (s)		9.7			9.7	25.0	15.8	15.8		15.3	36.1	
Actuated g/C Ratio		0.17			0.17	0.45	0.28	0.28		0.27	0.65	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		461			257	727	201	451		422	989	
v/s Ratio Prot						0.01		c0.19		c0.23	0.26	
v/s Ratio Perm		c0.08			0.03	0.01	0.03					
v/c Ratio		0.44			0.19	0.03	0.09	0.66		0.83	0.41	
Uniform Delay, d1		20.6			19.7	8.6	14.7	17.7		19.0	4.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			0.4	0.0	0.2	3.6		13.1	0.3	
Delay (s)		21.3			20.1	8.6	14.9	21.3		32.1	5.0	
Level of Service		C			C	A	B	C		C	A	
Approach Delay (s)		21.3			14.2			20.9			17.5	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	55.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

4/27/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	186	473	984	72	420	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.95	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1540	2368	2431	1304	1540	1621
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1540	2368	2431	1304	1540	1621
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	202	514	1070	78	457	299
RTOR Reduction (vph)	0	420	0	12	0	0
Lane Group Flow (vph)	202	94	1070	66	457	299
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	19.7	19.7	44.1	44.1	29.1	78.2
Effective Green, g (s)	19.7	19.7	44.1	44.1	29.1	78.2
Actuated g/C Ratio	0.18	0.18	0.41	0.41	0.27	0.72
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	281	432	993	532	415	1174
v/s Ratio Prot	c0.13		c0.44		c0.30	0.18
v/s Ratio Perm		0.04		0.05		
v/c Ratio	0.72	0.22	1.08	0.12	1.10	0.25
Uniform Delay, d1	41.5	37.5	31.9	19.9	39.4	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	0.3	51.8	0.1	74.4	0.1
Delay (s)	50.0	37.8	83.7	20.0	113.8	5.1
Level of Service	D	D	F	B	F	A
Approach Delay (s)	41.2		79.4			70.8
Approach LOS	D		E			E

Intersection Summary			
HCM 2000 Control Delay	66.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	107.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	24	48	87	213	456	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.96		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		0.99	1.00	1.00	
Frt	0.91		1.00	1.00	0.99	
Flt Protected	0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1547		1688	1531	3107	
Flt Permitted	0.98		0.44	1.00	1.00	
Satd. Flow (perm)	1547		787	1531	3107	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	27	53	97	237	507	51
RTOR Reduction (vph)	48	0	0	0	7	0
Lane Group Flow (vph)	32	0	97	237	551	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	3.8		24.6	24.6	24.6	
Effective Green, g (s)	3.8		24.6	24.6	24.6	
Actuated g/C Ratio	0.10		0.64	0.64	0.64	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	153		504	980	1990	
v/s Ratio Prot	c0.02			0.15	c0.18	
v/s Ratio Perm			0.12			
v/c Ratio	0.21		0.19	0.24	0.28	
Uniform Delay, d1	15.9		2.8	2.9	3.0	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.7		0.2	0.1	0.1	
Delay (s)	16.6		3.0	3.1	3.1	
Level of Service	B		A	A	A	
Approach Delay (s)	16.6			3.0	3.1	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	38.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	211	322	1442	52	74	1022
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00		1.00	1.00
Flpb, ped/bikes	0.93	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1584	1466	3394		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1584	1466	3394		1711	3421
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	234	358	1602	58	82	1136
RTOR Reduction (vph)	0	141	3	0	0	0
Lane Group Flow (vph)	234	217	1657	0	82	1136
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	48.1		7.9	61.1
Effective Green, g (s)	28.7	28.7	48.1		7.9	61.1
Actuated g/C Ratio	0.29	0.29	0.48		0.08	0.61
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	454	420	1632		135	2090
v/s Ratio Prot			c0.49		0.05	c0.33
v/s Ratio Perm	0.15	c0.15				
v/c Ratio	0.52	0.52	1.02		0.61	0.54
Uniform Delay, d1	29.8	29.8	25.9		44.5	11.3
Progression Factor	1.00	1.00	1.63		1.04	1.04
Incremental Delay, d2	1.0	1.1	15.6		7.5	0.3
Delay (s)	30.8	30.9	57.9		54.1	12.1
Level of Service	C	C	E		D	B
Approach Delay (s)	30.9		57.9			14.9
Approach LOS	C		E			B

Intersection Summary			
HCM 2000 Control Delay	38.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	86.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th
4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	40	32	57	260	409	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1540	1351		3047	2974	
Flt Permitted	0.95	1.00		0.74	1.00	
Satd. Flow (perm)	1540	1351		2271	2974	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	38	67	306	481	112
RTOR Reduction (vph)	0	36	0	0	37	0
Lane Group Flow (vph)	47	2	0	373	556	0
Confl. Peds. (#/hr)	1	1	25			25
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	2.1	2.1		15.4	15.4	
Effective Green, g (s)	2.1	2.1		15.4	15.4	
Actuated g/C Ratio	0.04	0.04		0.29	0.29	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	60	53		658	862	
v/s Ratio Prot	c0.03				c0.19	
v/s Ratio Perm		0.00		0.16		
v/c Ratio	0.78	0.03		0.57	0.65	
Uniform Delay, d1	25.3	24.5		16.0	16.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	47.5	0.2		1.1	1.7	
Delay (s)	72.8	24.7		17.1	18.1	
Level of Service	E	C		B	B	
Approach Delay (s)	51.3			17.1	18.1	
Approach LOS	D			B	B	

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	53.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th
4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	67	107	53	87	10	221	44	19	10	164	122
Peak Hour Factor	0.92	0.87	0.87	0.87	0.87	0.92	0.87	0.92	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	54	77	123	61	100	11	254	48	22	11	178	133

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	54	200	61	111	324	189	133
Volume Left (vph)	54	0	61	0	254	11	0
Volume Right (vph)	0	123	0	11	22	0	133
Hadj (s)	0.53	-0.40	0.53	-0.03	0.15	0.06	-0.67
Departure Headway (s)	7.3	6.4	7.4	6.9	6.4	6.5	5.7
Degree Utilization, x	0.11	0.35	0.13	0.21	0.58	0.34	0.21
Capacity (veh/h)	457	527	440	477	533	526	588
Control Delay (s)	10.0	11.6	10.3	10.5	17.9	11.5	9.0
Approach Delay (s)	11.2		10.4		17.9	10.5	
Approach LOS	B		B		C	B	

Intersection Summary			
Delay	12.9		
Level of Service	B		
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	249	131	313	24	263	143	315	1102	19	73	943	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1507	1621	1337	1524	1621	1304	2987	3069		1540	2978	
Flt Permitted	0.46	1.00	1.00	0.66	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	736	1621	1337	1061	1621	1304	2987	3069		1540	2978	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	274	144	344	26	289	157	346	1211	21	80	1036	238
RTOR Reduction (vph)	0	0	225	0	0	103	0	1	0	0	20	0
Lane Group Flow (vph)	274	144	119	26	289	54	346	1231	0	80	1254	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	253	559	461	366	559	449	418	1160		184	1066	
v/s Ratio Prot		0.09			0.18		0.12	c0.40		0.05	c0.42	
v/s Ratio Perm	c0.37		0.09	0.02		0.04						
v/c Ratio	1.08	0.26	0.26	0.07	0.52	0.12	0.83	1.06		0.43	1.18	
Uniform Delay, d1	32.8	23.5	23.5	22.0	26.1	22.4	41.8	31.1		40.9	32.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.59	0.81		1.01	1.00	
Incremental Delay, d2	80.5	1.1	1.3	0.4	3.4	0.5	5.1	33.3		6.3	88.1	
Delay (s)	113.2	24.7	24.9	22.4	29.5	22.9	29.8	58.7		47.5	120.3	
Level of Service	F	C	C	C	C	C	C	E		D	F	
Approach Delay (s)		56.6			26.9			52.3			116.0	
Approach LOS		E			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	70.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	123.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	528	14	42	674	79	49	54	77	88	34	228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.87	1.00	0.98		1.00	0.94	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.94	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.91		1.00	0.87	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1801	1489	1711	1801	1338	1711	1606		1609	1478	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.37	1.00		0.67	1.00	
Satd. Flow (perm)	1711	1801	1489	1711	1801	1338	667	1606		1128	1478	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	574	15	46	733	86	53	59	84	96	37	248
RTOR Reduction (vph)	0	0	7	0	0	45	0	66	0	0	195	0
Lane Group Flow (vph)	152	574	8	46	733	41	53	77	0	96	90	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)			10			10			10			10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	8.0	37.4	37.4	4.6	34.0	34.0	15.6	15.6		15.6	15.6	
Effective Green, g (s)	8.0	37.4	37.4	4.6	34.0	34.0	15.6	15.6		15.6	15.6	
Actuated g/C Ratio	0.11	0.52	0.52	0.06	0.47	0.47	0.21	0.21		0.21	0.21	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	188	927	767	108	843	626	143	345		242	317	
v/s Ratio Prot	c0.09	c0.32		0.03	c0.41			0.05			0.06	
v/s Ratio Perm			0.01			0.03	0.08			c0.09		
v/c Ratio	0.81	0.62	0.01	0.43	0.87	0.07	0.37	0.22		0.40	0.28	
Uniform Delay, d1	31.6	12.5	8.6	32.7	17.3	10.6	24.3	23.5		24.5	23.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	21.9	3.1	0.0	2.7	9.5	0.0	1.6	0.3		1.1	0.5	
Delay (s)	53.5	15.6	8.6	35.4	26.8	10.6	25.9	23.8		25.5	24.3	
Level of Service	D	B	A	D	C	B	C	C		C	C	
Approach Delay (s)		23.3			25.7			24.4			24.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	72.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	142	382	238	67	789	94	138	245	138	162	336	187
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.98	1.00
Satd. Flow (prot)	1540	1540	1378	1540	1540	1321	1540	2912			3030	1357
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.32	1.00			0.64	1.00
Satd. Flow (perm)	1540	1540	1378	1540	1540	1321	523	2912			1976	1357
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	148	398	248	70	822	98	144	255	144	169	350	195
RTOR Reduction (vph)	0	0	105	0	0	27	0	67	0	0	0	140
Lane Group Flow (vph)	148	398	143	70	822	71	144	332	0	0	519	55
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	9.0	65.5	65.5	6.3	61.8	61.8	34.6	34.6			33.6	33.6
Effective Green, g (s)	9.0	65.5	65.5	6.3	61.8	61.8	34.6	34.6			33.6	33.6
Actuated g/C Ratio	0.08	0.55	0.55	0.05	0.52	0.52	0.29	0.29			0.28	0.28
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	116	844	755	81	797	683	151	843			556	381
v/s Ratio Prot	c0.10	c0.26		0.05	c0.53			0.11				
v/s Ratio Perm			0.10			0.05	c0.28				0.26	0.04
v/c Ratio	1.28	0.47	0.19	0.86	1.03	0.10	0.95	0.39			0.93	0.14
Uniform Delay, d1	55.2	16.4	13.6	56.1	28.8	14.7	41.6	34.0			41.8	32.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	175.0	1.9	0.6	56.9	40.2	0.1	59.0	0.3			22.9	0.2
Delay (s)	230.2	18.3	14.1	113.0	69.0	14.8	100.6	34.3			64.7	32.3
Level of Service	F	B	B	F	E	B	F	C			E	C
Approach Delay (s)		56.5			66.7			51.9			55.8	
Approach LOS		E			E			D			E	

Intersection Summary			
HCM 2000 Control Delay	58.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	119.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	100.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	571	76	58	581	475	75	329	48	142	140	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.90	1.00	1.00	0.96	1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1540	1077		1540	1296	992	1232	1102	1058	1232	1165	
Flt Permitted	0.09	1.00		0.09	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	140	1077		140	1296	992	1232	1102	1058	1232	1165	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	77	607	81	62	618	505	80	350	51	151	149	139
RTOR Reduction (vph)	0	4	0	0	0	78	0	0	39	0	31	0
Lane Group Flow (vph)	77	684	0	62	618	427	80	350	12	151	257	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	50.1	50.1		50.1	50.1	60.1	9.0	25.0	25.0	10.0	26.0	
Effective Green, g (s)	50.1	50.1		50.1	50.1	60.1	9.0	25.0	25.0	10.0	26.0	
Actuated g/C Ratio	0.46	0.46		0.46	0.46	0.55	0.08	0.23	0.23	0.09	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	114	495		114	595	592	101	252	242	113	277	
v/s Ratio Prot	0.02	c0.63		0.02	c0.48	0.07	0.06	c0.32		c0.12	0.22	
v/s Ratio Perm	0.28			0.23		0.36			0.01			
v/c Ratio	0.68	1.38		0.54	1.04	0.72	0.79	1.39	0.05	1.34	0.93	
Uniform Delay, d1	25.3	29.4		47.7	29.4	18.2	49.1	42.0	32.7	49.5	40.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	14.7	183.8		5.2	47.3	4.3	33.3	197.6	0.1	199.4	34.9	
Delay (s)	40.0	213.3		52.9	76.7	22.5	82.4	239.6	32.8	248.9	75.5	
Level of Service	D	F		D	E	C	F	F	C	F	E	
Approach Delay (s)		195.8			52.4			191.5			135.1	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM 2000 Control Delay	126.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	109.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	155	49	56	372	17	41	126	109	21	61	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			0.99			0.98	
Flpb, ped/bikes	0.99	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.96		1.00	0.99			0.95			0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1695	3265		1682	1786			1675			1581	
Flt Permitted	0.29	1.00		0.61	1.00			0.89			0.97	
Satd. Flow (perm)	521	3265		1081	1786			1505			1534	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	86	172	54	62	413	19	46	140	121	23	68	261
RTOR Reduction (vph)	0	35	0	0	2	0	0	30	0	0	131	0
Lane Group Flow (vph)	86	191	0	62	430	0	0	277	0	0	221	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	21.5	21.5		21.5	21.5			20.2			20.2	
Effective Green, g (s)	21.5	21.5		21.5	21.5			20.2			20.2	
Actuated g/C Ratio	0.32	0.32		0.32	0.32			0.30			0.30	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	168	1055		349	577			457			465	
v/s Ratio Prot		0.06			c0.24							
v/s Ratio Perm	0.16			0.06				c0.18			0.14	
v/c Ratio	0.51	0.18		0.18	0.75			0.61			0.48	
Uniform Delay, d1	18.2	16.2		16.2	20.1			19.8			18.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	2.6	0.1		0.2	5.2			2.3			0.8	
Delay (s)	20.9	16.3		16.4	25.3			22.0			19.6	
Level of Service	C	B		B	C			C			B	
Approach Delay (s)		17.5			24.1			22.0			19.6	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	66.5	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

18: Third St. & Mariposa St.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	205	177	106	96	507	45	108	1187	67	36	941	303
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.99		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1688	3184		1684	3366		1711	3389		1711	3269	
Flt Permitted	0.34	1.00		0.56	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	602	3184		985	3366		1711	3389		1711	3269	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	218	188	113	102	539	48	115	1263	71	38	1001	322
RTOR Reduction (vph)	0	72	0	0	6	0	0	4	0	0	31	0
Lane Group Flow (vph)	218	229	0	102	581	0	115	1330	0	38	1292	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.7	36.7		36.7	36.7		9.9	37.9		9.9	37.9	
Effective Green, g (s)	36.7	36.7		36.7	36.7		9.9	37.9		9.9	37.9	
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.10	0.38		0.10	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	220	1168		361	1235		169	1284		169	1238	
v/s Ratio Prot		0.07			0.17		0.07	c0.39		0.02	c0.40	
v/s Ratio Perm	c0.36			0.10								
v/c Ratio	0.99	0.20		0.28	0.47		0.68	1.04		0.22	1.04	
Uniform Delay, d1	31.5	21.6		22.4	24.2		43.5	31.1		41.5	31.1	
Progression Factor	1.00	1.00		1.00	1.00		0.94	0.90		1.56	0.58	
Incremental Delay, d2	58.4	0.4		2.0	1.3		18.5	33.8		0.8	26.1	
Delay (s)	89.9	22.0		24.3	25.5		59.4	61.7		65.5	44.2	
Level of Service	F	C		C	C		E	E		E	D	
Approach Delay (s)		50.5			25.3			61.5			44.8	
Approach LOS		D			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	48.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	117.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	496	76	16	824	105	51	0	24	46	0	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.98			0.96		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1711	3353		1711	3363			1666		1711	1531	
Flt Permitted	0.16	1.00		0.35	1.00			0.76		0.70	1.00	
Satd. Flow (perm)	284	3353		628	3363			1313		1268	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	539	83	17	896	114	55	0	26	50	0	187
RTOR Reduction (vph)	0	16	0	0	13	0	0	14	0	0	55	0
Lane Group Flow (vph)	92	606	0	17	997	0	0	67	0	50	132	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	31.6	31.6		31.6	31.6			35.4		35.4	35.4	
Effective Green, g (s)	31.6	31.6		31.6	31.6			35.4		35.4	35.4	
Actuated g/C Ratio	0.41	0.41		0.41	0.41			0.46		0.46	0.46	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	116	1376		257	1380			603		582	703	
v/s Ratio Prot		0.18			0.30						c0.09	
v/s Ratio Perm	c0.32			0.03				0.05		0.04		
v/c Ratio	0.79	0.44		0.07	0.72			0.11		0.09	0.19	
Uniform Delay, d1	19.8	16.3		13.8	19.0			11.8		11.7	12.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	30.0	0.2		0.1	1.9			0.4		0.1	0.1	
Delay (s)	49.8	16.6		13.9	20.9			12.2		11.8	12.4	
Level of Service	D	B		B	C			B		B	B	
Approach Delay (s)		20.8			20.8			12.2			12.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	77.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	129	0	0	1016	111	539	336	541	0	0	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				3.5
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Frt		1.00			0.99		1.00	0.91				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3376			5056		1711	3105				2694
Flt Permitted		0.74			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2515			5056		1711	3105				2694
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	48	132	0	0	1037	113	550	343	552	0	0	618
RTOR Reduction (vph)	0	0	0	0	15	0	0	325	0	0	0	115
Lane Group Flow (vph)	0	180	0	0	1135	0	550	570	0	0	0	503
Confl. Peds. (#/hr)												20
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		48.5			27.5		32.0	32.0				17.5
Effective Green, g (s)		48.5			27.5		32.0	32.0				17.5
Actuated g/C Ratio		0.54			0.31		0.36	0.36				0.19
Clearance Time (s)		4.5			4.5		5.0	5.0				3.5
Lane Grp Cap (vph)		1522			1544		608	1104				523
v/s Ratio Prot		0.02			c0.22		c0.32	0.18				c0.19
v/s Ratio Perm		0.04										
v/c Ratio		0.12			0.73		0.90	0.52				0.96
Uniform Delay, d1		10.2			28.0		27.6	22.9				35.9
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.2			3.1		19.4	1.7				30.9
Delay (s)		10.4			31.1		46.9	24.6				66.8
Level of Service		B			C		D	C				E
Approach Delay (s)		10.4			31.1			33.1			66.8	
Approach LOS		B			C			C			E	

Intersection Summary			
HCM 2000 Control Delay	37.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	176	430	1404	757	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.93	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1581	1424	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1581	1424	3319	1801		
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	181	443	1447	780	0	0
RTOR Reduction (vph)	4	4	0	0	0	0
Lane Group Flow (vph)	323	293	1447	780	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	21.5	21.5	38.5	70.0		
Effective Green, g (s)	21.5	21.5	38.5	70.0		
Actuated g/C Ratio	0.31	0.31	0.55	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	485	437	1825	1801		
v/s Ratio Prot	0.20		c0.44	0.43		
v/s Ratio Perm		c0.21				
v/c Ratio	0.67	0.67	0.79	0.43		
Uniform Delay, d1	21.1	21.2	12.6	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	3.4	4.0	2.5	0.2		
Delay (s)	24.6	25.2	15.0	0.2		
Level of Service	C	C	B	A		
Approach Delay (s)	24.8			9.8	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	227	168	188	9	312	39	209	968	29	110	908	271
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.98		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.99	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.98		1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1529	2496		1448	1569		1540	3056		1540	2899	
Flt Permitted	0.19	1.00		0.53	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	309	2496		809	1569		1540	3056		1540	2899	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	236	175	196	9	325	41	218	1008	30	115	946	282
RTOR Reduction (vph)	0	124	0	0	5	0	0	2	0	0	28	0
Lane Group Flow (vph)	236	247	0	9	361	0	218	1036	0	115	1200	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.5	36.5		24.5	24.5		10.0	37.5		9.7	37.2	
Effective Green, g (s)	36.5	36.5		24.5	24.5		10.0	37.5		9.7	37.2	
Actuated g/C Ratio	0.36	0.36		0.24	0.24		0.10	0.38		0.10	0.37	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	194	911		198	384		154	1146		149	1078	
v/s Ratio Prot	c0.08	0.10			0.23		c0.14	0.34		0.07	c0.41	
v/s Ratio Perm	c0.36			0.01								
v/c Ratio	1.22	0.27		0.05	0.94		1.42	0.90		0.77	1.11	
Uniform Delay, d1	30.0	22.4		28.8	37.0		45.0	29.6		44.1	31.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.92	0.90	
Incremental Delay, d2	135.0	0.2		0.1	31.2		220.7	11.7		20.7	63.6	
Delay (s)	165.0	22.5		28.9	68.2		265.7	41.2		61.5	91.7	
Level of Service	F	C		C	E		F	D		E	F	
Approach Delay (s)		77.9			67.3			80.2			89.2	
Approach LOS		E			E			F			F	

Intersection Summary			
HCM 2000 Control Delay	81.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	105.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: I-280 SB On-Ramp & Pennsylvania

9/24/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	347	724	793	611
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	377	787	862	664
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			525			
pX, platoon unblocked						
vC, conflicting volume	2765	189			377	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2765	189			377	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			27	
cM capacity (veh/h)	4	821			1178	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	189	189	787	862	664
Volume Left	0	0	0	862	0
Volume Right	0	0	787	0	0
cSH	1700	1700	1700	1178	1700
Volume to Capacity	0.11	0.11	0.46	0.73	0.39
Queue Length 95th (ft)	0	0	0	174	0
Control Delay (s)	0.0	0.0	0.0	15.9	0.0
Lane LOS				C	
Approach Delay (s)	0.0			9.0	
Approach LOS					

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	95.4%	ICU Level of Service	F
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/24/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	191	159	0	192	116
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	208	173	0	209	126
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	173				277	173
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	173				277	173
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				70	85
cM capacity (veh/h)	1401				690	841

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	104	104	173	335
Volume Left	0	0	0	209
Volume Right	0	0	0	126
cSH	1700	1700	1700	740
Volume to Capacity	0.06	0.06	0.10	0.45
Queue Length 95th (ft)	0	0	0	59
Control Delay (s)	0.0	0.0	0.0	13.8
Lane LOS				B
Approach Delay (s)	0.0		0.0	13.8
Approach LOS				B

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	35.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp
9/24/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	56	328	159	261	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	357	173	284	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	457				473	173
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	457				473	173
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				100	100
cM capacity (veh/h)	1101				491	841

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	180	238	173	284	0
Volume Left	61	0	0	0	0
Volume Right	0	0	0	284	0
cSH	1101	1700	1700	1700	1700
Volume to Capacity	0.06	0.14	0.10	0.17	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	3.2	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.4		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St
9/24/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	30	46	76	47	287	38	962	23	268	999	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.91		1.00	1.00		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1507			1454		1540	3068		1540	3052	
Flt Permitted		0.70			0.92		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1066			1344		1540	3068		1540	3052	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	33	50	83	51	312	41	1046	25	291	1086	68
RTOR Reduction (vph)	0	25	0	0	85	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	98	0	0	361	0	41	1069	0	291	1150	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		28.5			28.5		5.1	37.4		18.9	51.2	
Effective Green, g (s)		28.5			28.5		5.1	37.4		18.9	51.2	
Actuated g/C Ratio		0.28			0.28		0.05	0.37		0.19	0.51	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		303			383		78	1147		291	1562	
v/s Ratio Prot							0.03	c0.35		c0.19	0.38	
v/s Ratio Perm		0.09			c0.27							
v/c Ratio		0.32			0.94		0.53	0.93		1.00	0.74	
Uniform Delay, d1		28.2			34.9		46.3	30.1		40.5	19.1	
Progression Factor		1.00			1.00		0.98	0.76		1.04	1.17	
Incremental Delay, d2		0.6			31.4		2.5	12.8		41.8	2.0	
Delay (s)		28.8			66.4		48.0	35.6		83.8	24.3	
Level of Service		C			E		D	D		F	C	
Approach Delay (s)		28.8			66.4			36.1			36.3	
Approach LOS		C			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	40.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/24/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	632	58	265	0	0	652
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	687	63	288	0	0	709

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	343	343	63	144	144	709
Volume Left (vph)	343	343	0	0	0	0
Volume Right (vph)	0	0	63	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	7.5	7.5	3.2	7.5	7.5	6.8
Degree Utilization, x	0.72	0.72	0.06	0.30	0.30	1.0
Capacity (veh/h)	469	469	1121	469	469	541
Control Delay (s)	26.2	26.2	5.2	12.5	12.5	181.3
Approach Delay (s)	24.5			12.5		181.3
Approach LOS	C			B		F

Intersection Summary			
Delay	86.1		
Level of Service	F		
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/24/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	90	206	0	0	282	139	30	523	24	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	224	0	0	307	151	33	568	26	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	322	458	317	310
Volume Left (vph)	98	0	33	0
Volume Right (vph)	0	151	0	26
Hadj (s)	0.09	-0.16	0.09	-0.02
Departure Headway (s)	6.5	6.0	6.9	6.8
Degree Utilization, x	0.58	0.77	0.61	0.58
Capacity (veh/h)	531	574	504	510
Control Delay (s)	18.2	26.1	18.7	17.6
Approach Delay (s)	18.2	26.1	18.2	
Approach LOS	C	D	C	

Intersection Summary			
Delay	20.8		
Level of Service	C		
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/24/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	53	67	62	103	13	61	1080	42	0	1195	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.95			0.99		1.00	0.99			0.99	
Flpb, ped/bikes		0.98			0.97		1.00	1.00			1.00	
Frt		0.94			0.99		1.00	0.99			0.99	
Flt Protected		0.99			0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1231			1523		1540	2231			2229	
Flt Permitted		0.87			0.76		0.95	1.00			1.00	
Satd. Flow (perm)		1082			1172		1540	2231			2229	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	37	56	71	65	108	14	64	1137	44	0	1258	51
RTOR Reduction (vph)	0	32	0	0	3	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	132	0	0	184	0	64	1180	0	0	1308	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		19.2			19.2		13.5	70.5			51.9	
Effective Green, g (s)		19.2			19.2		13.5	70.5			51.9	
Actuated g/C Ratio		0.19			0.19		0.14	0.70			0.52	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		207			225		207	1572			1156	
v/s Ratio Prot							0.04	c0.53			c0.59	
v/s Ratio Perm		0.12			c0.16							
v/c Ratio		0.64			0.82		0.31	0.75			1.13	
Uniform Delay, d1		37.2			38.7		39.0	9.2			24.1	
Progression Factor		1.00			1.00		0.68	0.58			1.04	
Incremental Delay, d2		6.6			20.0		0.3	1.1			70.0	
Delay (s)		43.8			58.7		26.7	6.4			95.0	
Level of Service		D			E		C	A			F	
Approach Delay (s)		43.8			58.7			7.5			95.0	
Approach LOS		D			E			A			F	

Intersection Summary			
HCM 2000 Control Delay	52.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/24/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	378	524	0	0	340	478	286	215	429	64	0	547
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.83	1.00	1.00	0.86	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1002	1540	1621	1183	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1002	1540	1621	1183	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	398	552	0	0	358	503	301	226	452	67	0	576
RTOR Reduction (vph)	0	0	0	0	0	258	0	0	176	0	0	371
Lane Group Flow (vph)	398	552	0	0	358	245	301	226	276	67	0	205
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	18.0	41.0			18.0	18.0	22.0	22.0	22.0	12.0		12.0
Effective Green, g (s)	18.0	41.0			18.0	18.0	22.0	22.0	22.0	12.0		12.0
Actuated g/C Ratio	0.20	0.45			0.20	0.20	0.24	0.24	0.24	0.13		0.13
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	304	1387			609	198	372	391	286	203		158
v/s Ratio Prot	c0.26	0.18			0.12		0.20	0.14		0.04		c0.17
v/s Ratio Perm						c0.24			c0.23			
v/c Ratio	1.31	0.40			0.59	1.24	0.81	0.58	0.97	0.33		1.30
Uniform Delay, d1	36.5	16.7			33.1	36.5	32.5	30.4	34.1	35.9		39.5
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	160.8	0.9			4.1	141.8	12.2	2.1	43.4	1.0		173.2
Delay (s)	197.3	17.6			37.3	178.3	44.7	32.5	77.5	36.8		212.7
Level of Service	F	B			D	F	D	C	E	D		F
Approach Delay (s)		92.9			119.6			57.0			194.4	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	108.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	91.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	56	183	13	76	24	218	139	2	18	180	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.91			0.97		1.00	1.00		1.00	0.96	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3083			1739		1711	1797		1711	1726	
Flt Permitted		0.78			0.83		0.59	1.00		0.66	1.00	
Satd. Flow (perm)		2431			1453		1067	1797		1188	1726	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	61	199	14	83	26	237	151	2	20	196	75
RTOR Reduction (vph)	0	173	0	0	10	0	0	0	0	0	11	0
Lane Group Flow (vph)	0	164	0	0	113	0	237	153	0	20	260	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		11.8			11.8		71.1	71.1		71.1	71.1	
Effective Green, g (s)		11.8			11.8		71.1	71.1		71.1	71.1	
Actuated g/C Ratio		0.13			0.13		0.77	0.77		0.77	0.77	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		312			186		825	1390		919	1335	
v/s Ratio Prot								0.08			0.15	
v/s Ratio Perm		0.07			c0.08		c0.22			0.02		
v/c Ratio		0.52			0.61		0.29	0.11		0.02	0.19	
Uniform Delay, d1		37.4			37.8		3.0	2.6		2.4	2.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6			5.5		0.9	0.2		0.0	0.3	
Delay (s)		39.0			43.3		3.9	2.7		2.4	3.1	
Level of Service		D			D		A	A		A	A	
Approach Delay (s)		39.0			43.3			3.4			3.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	91.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

2040 Cumulative with Project with M-TR-11c Basketball Game – Weekday PM Peak

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	924	825	48	405	938	47	79	1490	477	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.98		1.00	0.98			1.00	0.68			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.98	1.00			
Frt	1.00	0.99		1.00	0.99			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	3001		2987	3010			5475	942			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	3001		2987	3010			5475	942			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	953	851	49	418	967	48	81	1536	492	0	0	0
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	206	0	0	0
Lane Group Flow (vph)	953	896	0	418	1015	0	0	1617	286	0	0	0
Confl. Peds. (#/hr)			400			400	400		400			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	18.2	37.2		13.2	33.7			39.2	39.2			
Effective Green, g (s)	18.2	37.2		13.2	33.7			39.2	39.2			
Actuated g/C Ratio	0.17	0.34		0.12	0.31			0.36	0.36			
Clearance Time (s)	6.8	6.8		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	741	1014		358	922			1951	335			
v/s Ratio Prot	c0.21	0.30		0.14	c0.34							
v/s Ratio Perm								0.30	c0.30			
v/c Ratio	1.29	0.88		1.17	1.10			0.83	0.85			
Uniform Delay, d1	45.9	34.4		48.4	38.1			32.3	32.7			
Progression Factor	1.37	1.51		1.42	0.99			0.96	1.17			
Incremental Delay, d2	132.8	4.7		93.2	56.2			3.0	18.2			
Delay (s)	195.8	56.7		162.2	94.0			34.2	56.5			
Level of Service	F	E		F	F			C	E			
Approach Delay (s)		128.2			113.9			39.4			0.0	
Approach LOS		F			F			D			A	

Intersection Summary			
HCM 2000 Control Delay	89.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	98.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	346	1643	36	30	963	24	8	250	107	47	654	592
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.64	1.00	0.87	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	0.77	1.00	1.00
Frt	1.00	1.00		1.00	1.00			1.00	0.85	1.00	0.96	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1459	4143		1459	2863			1528	813	1123	2352	550
Flt Permitted	0.95	1.00		0.95	1.00			0.96	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1459	4143		1459	2863			1472	813	607	2352	550
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	353	1677	37	31	983	24	8	255	109	48	667	604
RTOR Reduction (vph)	0	2	0	0	1	0	0	0	71	0	26	228
Lane Group Flow (vph)	353	1712	0	31	1006	0	0	263	38	48	852	165
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Effective Green, g (s)	14.4	43.0		8.9	35.9			38.2	38.2	39.2	39.2	39.2
Actuated g/C Ratio	0.13	0.39		0.08	0.33			0.35	0.35	0.36	0.36	0.36
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	190	1619		118	934			511	282	216	838	196
v/s Ratio Prot	c0.24	0.41		0.02	c0.35						c0.36	
v/s Ratio Perm								0.18	0.05	0.08		0.30
v/c Ratio	1.86	1.06		0.26	1.08			0.51	0.13	0.22	1.02	0.84
Uniform Delay, d1	47.8	33.5		47.5	37.0			28.5	24.6	24.7	35.4	32.6
Progression Factor	0.59	1.13		0.89	0.88			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	394.4	32.6		0.1	36.8			0.9	0.2	0.5	35.4	26.6
Delay (s)	422.6	70.3		42.4	69.3			29.4	24.8	25.3	70.8	59.2
Level of Service	F	E		D	E			C	C	C	E	E
Approach Delay (s)		130.5			68.5			28.1			65.7	
Approach LOS		F			E			C			E	

Intersection Summary			
HCM 2000 Control Delay	91.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	124.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

9/15/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2002	157	0	1563	100	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.91			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	4366			3079	1540	1357
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	4366			3079	1540	1357
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	2085	164	0	1628	104	24
RTOR Reduction (vph)	8	0	0	0	0	3
Lane Group Flow (vph)	2241	0	0	1628	104	21
Confl. Peds. (#/hr)		37	37		1	3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	62.1			62.1	36.6	36.6
Effective Green, g (s)	62.1			62.1	36.6	36.6
Actuated g/C Ratio	0.56			0.56	0.33	0.33
Clearance Time (s)	4.9			4.9	6.4	6.4
Lane Grp Cap (vph)	2464			1738	512	451
v/s Ratio Prot	0.51			c0.53	c0.07	
v/s Ratio Perm						0.02
v/c Ratio	0.91			0.94	0.20	0.05
Uniform Delay, d1	21.4			22.1	26.3	24.9
Progression Factor	1.00			0.76	1.00	1.00
Incremental Delay, d2	6.3			1.3	0.9	0.2
Delay (s)	27.8			18.1	27.2	25.1
Level of Service	C			B	C	C
Approach Delay (s)	27.8			18.1	26.8	
Approach LOS	C			B	C	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

9/15/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	250	1050	150	100	570	810	340	360	1427	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.0			2.0	2.0			2.0	2.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.96			0.99	0.87
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.98			1.00	0.96			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		6062			3026	2596			4318	1033
Flt Permitted		0.99			0.52	1.00			0.95	1.00
Satd. Flow (perm)		6062			1584	2596			4318	1033
Peak-hour factor, PHF	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93
Adj. Flow (vph)	272	1129	161	108	613	871	366	391	1534	495
RTOR Reduction (vph)	0	23	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1539	0	0	721	1236	0	0	1975	445
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Perm
Protected Phases		6			4	4		7	7	
Permitted Phases	6			4						7
Actuated Green, G (s)		27.0			25.0	25.0			24.0	24.0
Effective Green, g (s)		29.0			28.0	28.0			27.0	27.0
Actuated g/C Ratio		0.32			0.31	0.31			0.30	0.30
Clearance Time (s)		4.0			5.0	5.0			5.0	5.0
Lane Grp Cap (vph)		1953			492	807			1295	309
v/s Ratio Prot						c0.48			c0.46	
v/s Ratio Perm		0.25			0.46					0.43
v/c Ratio		0.79			1.54dl	1.53			1.53	1.44
Uniform Delay, d1		27.7			31.0	31.0			31.5	31.5
Progression Factor		1.56			0.31	1.00			1.00	1.00
Incremental Delay, d2		2.0			210.5	245.3			240.3	215.6
Delay (s)		45.2			220.1	276.3			271.8	247.1
Level of Service		D			F	F			F	F
Approach Delay (s)		45.2			220.1	276.3			267.2	
Approach LOS		D			F	F			F	

Intersection Summary			
HCM 2000 Control Delay	205.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	137.2%	ICU Level of Service	H
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Fifth St. & Bryant St. & I-80 EB On-Ramp

9/15/2015

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	105	303	1050	110	565	140	500	260	180	980
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.99		0.90		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.99		0.95		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)		2494	3622		2497		1228		1401	2690
Flt Permitted		0.95	1.00		1.00		1.00		0.15	0.61
Satd. Flow (perm)		2494	3622		2497		1228		218	1652
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	113	326	1129	118	608	151	538	280	194	1054
RTOR Reduction (vph)	0	0	12	0	15	0	226	0	0	0
Lane Group Flow (vph)	0	406	1268	0	879	0	177	0	379	1149
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	5	0	5	0	0	0	0	5
Parking (#/hr)			10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		22.5	22.5		23.0		23.0		42.0	42.0
Effective Green, g (s)		22.5	25.0		24.5		23.0		43.5	43.5
Actuated g/C Ratio		0.25	0.28		0.27		0.26		0.48	0.48
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		623	1006		679		313		322	988
v/s Ratio Prot		0.16	c0.35		c0.35				0.22	c0.21
v/s Ratio Perm							0.14		0.35	0.35
v/c Ratio		0.65	1.26		1.29		0.56		1.18	1.16
Uniform Delay, d1		30.2	32.5		32.8		29.1		33.1	23.2
Progression Factor		1.00	1.00		1.00		1.00		1.06	1.07
Incremental Delay, d2		5.2	125.5		143.1		7.2		82.9	74.5
Delay (s)		35.5	158.0		175.9		36.3		117.8	99.3
Level of Service		D	F		F		D		F	F
Approach Delay (s)			128.5		132.5					103.9
Approach LOS			F		F					F

Intersection Summary			
HCM 2000 Control Delay	121.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Third St. & Channel St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	224	209	28	30	77	39	1449	139	70	428	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.92		1.00	0.99		1.00	0.99	
Flt Protected		0.99	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1601	1353		1458		1540	3007		1540	3050	
Flt Permitted		0.91	1.00		0.90		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1471	1353		1321		1540	3007		1540	3050	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	59	236	220	29	32	81	41	1525	146	74	451	25
RTOR Reduction (vph)	0	0	149	0	48	0	0	7	0	0	4	0
Lane Group Flow (vph)	0	295	71	0	94	0	41	1664	0	74	472	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		32.1	32.1		32.1		8.0	47.5		4.5	44.3	
Effective Green, g (s)		32.1	32.1		32.1		8.0	47.5		4.5	44.3	
Actuated g/C Ratio		0.32	0.32		0.32		0.08	0.48		0.04	0.44	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Grp Cap (vph)		472	434		424		123	1428		69	1351	
v/s Ratio Prot							0.03	c0.55		c0.05	0.15	
v/s Ratio Perm		c0.20	0.05		0.07							
v/c Ratio		0.62	0.16		0.22		0.33	1.17		1.07	0.35	
Uniform Delay, d1		28.8	24.3		24.8		43.5	26.2		47.8	18.4	
Progression Factor		1.00	1.00		1.00		1.23	0.64		1.00	1.00	
Incremental Delay, d2		6.1	0.8		1.2		6.7	81.8		129.7	0.7	
Delay (s)		35.0	25.1		26.0		60.3	98.6		177.4	19.1	
Level of Service		C	C		C		E	F		F	B	
Approach Delay (s)		30.8			26.0			97.7			40.4	
Approach LOS		C			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	71.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.9
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	139	20	8	37	48	18	259	24	326	332	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.98	1.00	1.00		1.00	0.96	
Flpb, ped/bikes		0.99			1.00	1.00	0.84	1.00		1.00	1.00	
Frt		0.98			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2978			1605	1353	1291	1595		1540	1536	
Flt Permitted		0.88			0.91	1.00	0.52	1.00		0.95	1.00	
Satd. Flow (perm)		2654			1477	1353	713	1595		1540	1536	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	43	149	22	9	40	52	19	278	26	351	357	47
RTOR Reduction (vph)	0	12	0	0	0	29	0	5	0	0	6	0
Lane Group Flow (vph)	0	202	0	0	49	23	19	299	0	351	398	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		9.7			9.7	25.0	15.8	15.8		15.3	36.1	
Effective Green, g (s)		9.7			9.7	25.0	15.8	15.8		15.3	36.1	
Actuated g/C Ratio		0.17			0.17	0.45	0.28	0.28		0.27	0.65	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		461			256	727	201	451		422	993	
v/s Ratio Prot						0.01		c0.19		c0.23	0.26	
v/s Ratio Perm		c0.08			0.03	0.01	0.03					
v/c Ratio		0.44			0.19	0.03	0.09	0.66		0.83	0.40	
Uniform Delay, d1		20.6			19.7	8.6	14.7	17.7		19.0	4.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			0.4	0.0	0.2	3.6		13.1	0.3	
Delay (s)		21.3			20.1	8.6	14.9	21.3		32.1	5.0	
Level of Service		C			C	A	B	C		C	A	
Approach Delay (s)		21.3			14.2			20.9			17.6	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	55.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

9/15/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	186	473	984	72	413	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.95	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1540	2368	2431	1304	1540	1621
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1540	2368	2431	1304	1540	1621
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	202	514	1070	78	449	299
RTOR Reduction (vph)	0	420	0	12	0	0
Lane Group Flow (vph)	202	94	1070	66	449	299
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	19.7	19.7	44.1	44.1	29.1	78.2
Effective Green, g (s)	19.7	19.7	44.1	44.1	29.1	78.2
Actuated g/C Ratio	0.18	0.18	0.41	0.41	0.27	0.72
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	281	432	993	532	415	1174
v/s Ratio Prot	c0.13		c0.44		c0.29	0.18
v/s Ratio Perm		0.04		0.05		
v/c Ratio	0.72	0.22	1.08	0.12	1.08	0.25
Uniform Delay, d1	41.5	37.5	31.9	19.9	39.4	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	0.3	51.8	0.1	67.9	0.1
Delay (s)	50.0	37.8	83.7	20.0	107.3	5.1
Level of Service	D	D	F	B	F	A
Approach Delay (s)	41.2		79.4			66.5
Approach LOS	D		E			E

Intersection Summary			
HCM 2000 Control Delay	65.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	107.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.

9/15/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	24	48	87	213	456	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.96		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		0.99	1.00	1.00	
Frt	0.91		1.00	1.00	0.99	
Flt Protected	0.98		0.95	1.00	1.00	
Satd. Flow (prot)	1547		1688	1531	3107	
Flt Permitted	0.98		0.44	1.00	1.00	
Satd. Flow (perm)	1547		787	1531	3107	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	27	53	97	237	507	51
RTOR Reduction (vph)	48	0	0	0	7	0
Lane Group Flow (vph)	32	0	97	237	551	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	10
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	3.8		24.6	24.6	24.6	
Effective Green, g (s)	3.8		24.6	24.6	24.6	
Actuated g/C Ratio	0.10		0.64	0.64	0.64	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	153		504	980	1990	
v/s Ratio Prot	c0.02			0.15	c0.18	
v/s Ratio Perm			0.12			
v/c Ratio	0.21		0.19	0.24	0.28	
Uniform Delay, d1	15.9		2.8	2.9	3.0	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.7		0.2	0.1	0.1	
Delay (s)	16.6		3.0	3.1	3.1	
Level of Service	B		A	A	A	
Approach Delay (s)	16.6			3.0	3.1	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	38.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.

9/15/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	211	322	1442	52	74	1021
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.96	1.00		1.00	1.00
Flpb, ped/bikes	0.93	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1584	1466	3394		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1584	1466	3394		1711	3421
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	234	358	1602	58	82	1134
RTOR Reduction (vph)	0	141	3	0	0	0
Lane Group Flow (vph)	234	217	1657	0	82	1134
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	28.7	28.7	48.1		7.9	61.1
Effective Green, g (s)	28.7	28.7	48.1		7.9	61.1
Actuated g/C Ratio	0.29	0.29	0.48		0.08	0.61
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	454	420	1632		135	2090
v/s Ratio Prot			c0.49		0.05	c0.33
v/s Ratio Perm	0.15	c0.15				
v/c Ratio	0.52	0.52	1.02		0.61	0.54
Uniform Delay, d1	29.8	29.8	25.9		44.5	11.3
Progression Factor	1.00	1.00	1.63		1.05	1.04
Incremental Delay, d2	1.0	1.1	15.6		7.5	0.3
Delay (s)	30.8	30.9	57.9		54.1	12.1
Level of Service	C	C	E		D	B
Approach Delay (s)	30.9		57.9			14.9
Approach LOS	C		E			B

Intersection Summary			
HCM 2000 Control Delay	38.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	86.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

9/15/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	40	32	57	260	409	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1540	1351		3047	2974	
Flt Permitted	0.95	1.00		0.74	1.00	
Satd. Flow (perm)	1540	1351		2271	2974	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	38	67	306	481	112
RTOR Reduction (vph)	0	36	0	0	37	0
Lane Group Flow (vph)	47	2	0	373	556	0
Confl. Peds. (#/hr)	1	1	25			25
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	2.1	2.1		15.4	15.4	
Effective Green, g (s)	2.1	2.1		15.4	15.4	
Actuated g/C Ratio	0.04	0.04		0.29	0.29	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	60	53		658	862	
v/s Ratio Prot	c0.03				c0.19	
v/s Ratio Perm		0.00		0.16		
v/c Ratio	0.78	0.03		0.57	0.65	
Uniform Delay, d1	25.3	24.5		16.0	16.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	47.5	0.2		1.1	1.7	
Delay (s)	72.8	24.7		17.1	18.1	
Level of Service	E	C		B	B	
Approach Delay (s)	51.3			17.1	18.1	
Approach LOS	D			B	B	

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	53.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	50	67	107	53	87	10	221	44	19	10	164	122
Peak Hour Factor	0.92	0.87	0.87	0.87	0.87	0.92	0.87	0.92	0.87	0.92	0.92	0.92
Hourly flow rate (vph)	54	77	123	61	100	11	254	48	22	11	178	133

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	54	200	61	111	324	189	133
Volume Left (vph)	54	0	61	0	254	11	0
Volume Right (vph)	0	123	0	11	22	0	133
Hadj (s)	0.53	-0.40	0.53	-0.03	0.15	0.06	-0.67
Departure Headway (s)	7.3	6.4	7.4	6.9	6.4	6.5	5.7
Degree Utilization, x	0.11	0.35	0.13	0.21	0.58	0.34	0.21
Capacity (veh/h)	457	527	440	477	533	526	588
Control Delay (s)	10.0	11.6	10.3	10.5	17.9	11.5	9.0
Approach Delay (s)	11.2		10.4		17.9	10.5	
Approach LOS	B		B		C	B	

Intersection Summary			
Delay	12.9		
Level of Service	B		
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.
9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	249	131	316	24	263	143	314	1102	19	73	943	216
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1507	1621	1337	1524	1621	1304	2987	3069		1540	2978	
Flt Permitted	0.46	1.00	1.00	0.66	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	736	1621	1337	1061	1621	1304	2987	3069		1540	2978	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	274	144	347	26	289	157	345	1211	21	80	1036	237
RTOR Reduction (vph)	0	0	227	0	0	103	0	1	0	0	20	0
Lane Group Flow (vph)	274	144	120	26	289	54	345	1231	0	80	1253	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Effective Green, g (s)	34.5	34.5	34.5	34.5	34.5	34.5	14.0	37.8		12.0	35.8	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.14	0.38		0.12	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Grp Cap (vph)	253	559	461	366	559	449	418	1160		184	1066	
v/s Ratio Prot		0.09			0.18		0.12	c0.40		0.05	c0.42	
v/s Ratio Perm	c0.37		0.09	0.02		0.04						
v/c Ratio	1.08	0.26	0.26	0.07	0.52	0.12	0.83	1.06		0.43	1.18	
Uniform Delay, d1	32.8	23.5	23.6	22.0	26.1	22.4	41.8	31.1		40.9	32.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.59	0.81		1.01	1.01	
Incremental Delay, d2	80.5	1.1	1.4	0.4	3.4	0.5	5.1	33.4		6.3	87.7	
Delay (s)	113.2	24.7	24.9	22.4	29.5	22.9	29.7	58.6		47.5	120.0	
Level of Service	F	C	C	C	C	C	C	E		D	F	
Approach Delay (s)		56.5			26.9			52.3			115.7	
Approach LOS		E			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	70.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	123.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.
9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	530	14	42	671	79	49	54	77	88	34	228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.87	1.00	0.98		1.00	0.94	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.94	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.91		1.00	0.87	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1801	1489	1711	1801	1338	1711	1606		1609	1478	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.37	1.00		0.67	1.00	
Satd. Flow (perm)	1711	1801	1489	1711	1801	1338	667	1606		1128	1478	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	576	15	46	729	86	53	59	84	96	37	248
RTOR Reduction (vph)	0	0	7	0	0	45	0	66	0	0	195	0
Lane Group Flow (vph)	152	576	8	46	729	41	53	77	0	96	90	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)			10			10			10			10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	8.0	37.4	37.4	4.6	34.0	34.0	15.6	15.6		15.6	15.6	
Effective Green, g (s)	8.0	37.4	37.4	4.6	34.0	34.0	15.6	15.6		15.6	15.6	
Actuated g/C Ratio	0.11	0.52	0.52	0.06	0.47	0.47	0.21	0.21		0.21	0.21	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	188	927	767	108	843	626	143	345		242	317	
v/s Ratio Prot	c0.09	c0.32		0.03	c0.40			0.05			0.06	
v/s Ratio Perm			0.01			0.03	0.08			c0.09		
v/c Ratio	0.81	0.62	0.01	0.43	0.86	0.07	0.37	0.22		0.40	0.28	
Uniform Delay, d1	31.6	12.6	8.6	32.7	17.2	10.6	24.3	23.5		24.5	23.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	21.9	3.1	0.0	2.7	9.2	0.0	1.6	0.3		1.1	0.5	
Delay (s)	53.5	15.7	8.6	35.4	26.4	10.6	25.9	23.8		25.5	24.3	
Level of Service	D	B	A	D	C	B	C	C		C	C	
Approach Delay (s)		23.3			25.3			24.4			24.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	72.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	385	234	66	789	93	138	242	138	162	329	187
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.98	1.00
Satd. Flow (prot)	1540	1540	1378	1540	1540	1321	1540	2911			3029	1357
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.33	1.00			0.64	1.00
Satd. Flow (perm)	1540	1540	1378	1540	1540	1321	530	2911			1976	1357
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	146	401	244	69	822	97	144	252	144	169	343	195
RTOR Reduction (vph)	0	0	107	0	0	26	0	68	0	0	0	140
Lane Group Flow (vph)	146	401	137	69	822	71	144	328	0	0	512	55
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	9.0	65.6	65.6	6.3	61.9	61.9	34.5	34.5			33.5	33.5
Effective Green, g (s)	9.0	65.6	65.6	6.3	61.9	61.9	34.5	34.5			33.5	33.5
Actuated g/C Ratio	0.08	0.55	0.55	0.05	0.52	0.52	0.29	0.29			0.28	0.28
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	116	846	757	81	798	684	153	841			554	380
v/s Ratio Prot	c0.09	c0.26		0.04	c0.53			0.11				
v/s Ratio Perm			0.10			0.05	c0.27				0.26	0.04
v/c Ratio	1.26	0.47	0.18	0.85	1.03	0.10	0.94	0.39			0.92	0.14
Uniform Delay, d1	55.2	16.4	13.5	56.1	28.8	14.6	41.5	34.0			41.7	32.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	168.5	1.9	0.5	53.8	39.8	0.1	55.2	0.3			21.3	0.2
Delay (s)	223.7	18.3	14.0	109.8	68.6	14.7	96.6	34.3			63.0	32.4
Level of Service	F	B	B	F	E	B	F	C			E	C
Approach Delay (s)		54.9			66.1			50.9			54.5	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	57.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	119.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	99.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	568	76	58	581	475	75	329	48	142	140	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.90	1.00	1.00	0.96	1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1540	1077		1540	1296	992	1232	1102	1058	1232	1165	
Flt Permitted	0.09	1.00		0.09	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	140	1077		140	1296	992	1232	1102	1058	1232	1165	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	77	604	81	62	618	505	80	350	51	151	149	139
RTOR Reduction (vph)	0	4	0	0	0	78	0	0	39	0	31	0
Lane Group Flow (vph)	77	681	0	62	618	427	80	350	12	151	257	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	50.1	50.1		50.1	50.1	60.1	9.0	25.0	25.0	10.0	26.0	
Effective Green, g (s)	50.1	50.1		50.1	50.1	60.1	9.0	25.0	25.0	10.0	26.0	
Actuated g/C Ratio	0.46	0.46		0.46	0.46	0.55	0.08	0.23	0.23	0.09	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	114	495		114	595	592	101	252	242	113	277	
v/s Ratio Prot	0.02	c0.63		0.02	c0.48	0.07	0.06	c0.32		c0.12	0.22	
v/s Ratio Perm	0.28			0.23		0.36			0.01			
v/c Ratio	0.68	1.38		0.54	1.04	0.72	0.79	1.39	0.05	1.34	0.93	
Uniform Delay, d1	25.3	29.4		47.5	29.4	18.2	49.1	42.0	32.7	49.5	40.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	14.7	181.2		5.2	47.3	4.3	33.3	197.6	0.1	199.4	34.9	
Delay (s)	40.0	210.7		52.7	76.7	22.5	82.4	239.6	32.8	248.9	75.5	
Level of Service	D	F		D	E	C	F	F	C	F	E	
Approach Delay (s)		193.4			52.4			191.5			135.1	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM 2000 Control Delay	125.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	109.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	86.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	155	49	56	372	17	41	126	109	21	61	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			0.99			0.98	
Flpb, ped/bikes	0.99	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.96		1.00	0.99			0.95			0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1695	3265		1682	1786			1675			1581	
Flt Permitted	0.29	1.00		0.61	1.00			0.89			0.97	
Satd. Flow (perm)	521	3265		1081	1786			1505			1534	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	86	172	54	62	413	19	46	140	121	23	68	261
RTOR Reduction (vph)	0	35	0	0	2	0	0	30	0	0	131	0
Lane Group Flow (vph)	86	191	0	62	430	0	0	277	0	0	221	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	21.5	21.5		21.5	21.5			20.2			20.2	
Effective Green, g (s)	21.5	21.5		21.5	21.5			20.2			20.2	
Actuated g/C Ratio	0.32	0.32		0.32	0.32			0.30			0.30	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	168	1055		349	577			457			465	
v/s Ratio Prot		0.06			c0.24							
v/s Ratio Perm	0.16			0.06				c0.18			0.14	
v/c Ratio	0.51	0.18		0.18	0.75			0.61			0.48	
Uniform Delay, d1	18.2	16.2		16.2	20.1			19.8			18.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	2.6	0.1		0.2	5.2			2.3			0.8	
Delay (s)	20.9	16.3		16.4	25.3			22.0			19.6	
Level of Service	C	B		B	C			C			B	
Approach Delay (s)		17.5			24.1			22.0			19.6	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	66.5	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	205	177	106	96	507	45	106	1186	67	36	944	303
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		0.98	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	0.99		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1688	3184		1684	3366		1711	3389		1711	3269	
Flt Permitted	0.34	1.00		0.56	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	602	3184		985	3366		1711	3389		1711	3269	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	218	188	113	102	539	48	113	1262	71	38	1004	322
RTOR Reduction (vph)	0	72	0	0	6	0	0	4	0	0	31	0
Lane Group Flow (vph)	218	229	0	102	581	0	113	1329	0	38	1295	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.7	36.7		36.7	36.7		9.9	37.9		9.9	37.9	
Effective Green, g (s)	36.7	36.7		36.7	36.7		9.9	37.9		9.9	37.9	
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.10	0.38		0.10	0.38	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Grp Cap (vph)	220	1168		361	1235		169	1284		169	1238	
v/s Ratio Prot		0.07			0.17		0.07	c0.39		0.02	c0.40	
v/s Ratio Perm	c0.36			0.10								
v/c Ratio	0.99	0.20		0.28	0.47		0.67	1.03		0.22	1.05	
Uniform Delay, d1	31.5	21.6		22.4	24.2		43.5	31.1		41.5	31.1	
Progression Factor	1.00	1.00		1.00	1.00		0.86	0.72		1.56	0.58	
Incremental Delay, d2	58.4	0.4		2.0	1.3		10.2	27.7		0.8	27.0	
Delay (s)	89.9	22.0		24.3	25.5		47.5	50.2		65.7	45.2	
Level of Service	F	C		C	C		D	D		E	D	
Approach Delay (s)		50.5			25.3			49.9			45.8	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	44.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	117.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	496	76	16	822	105	51	0	24	46	0	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.98			0.96		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1711	3353		1711	3363			1666		1711	1531	
Flt Permitted	0.16	1.00		0.35	1.00			0.76		0.70	1.00	
Satd. Flow (perm)	286	3353		628	3363			1314		1268	1531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	539	83	17	893	114	55	0	26	50	0	187
RTOR Reduction (vph)	0	16	0	0	13	0	0	14	0	0	55	0
Lane Group Flow (vph)	92	606	0	17	994	0	0	67	0	50	132	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	31.5	31.5		31.5	31.5			35.4		35.4	35.4	
Effective Green, g (s)	31.5	31.5		31.5	31.5			35.4		35.4	35.4	
Actuated g/C Ratio	0.41	0.41		0.41	0.41			0.46		0.46	0.46	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	117	1373		257	1377			604		583	704	
v/s Ratio Prot		0.18			0.30						c0.09	
v/s Ratio Perm	c0.32			0.03				0.05		0.04		
v/c Ratio	0.79	0.44		0.07	0.72			0.11		0.09	0.19	
Uniform Delay, d1	19.8	16.4		13.8	19.0			11.8		11.7	12.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	28.5	0.2		0.1	1.9			0.4		0.1	0.1	
Delay (s)	48.2	16.6		13.9	20.9			12.2		11.7	12.4	
Level of Service	D	B		B	C			B		B	B	
Approach Delay (s)		20.7			20.8			12.2			12.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	76.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	129	0	0	1016	109	539	325	541	0	0	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				3.5
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Flpb, ped/bikes		1.00			1.00		1.00	1.00				1.00
Frt		1.00			0.99		1.00	0.91				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3376			5057		1711	3101				2694
Flt Permitted		0.74			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2517			5057		1711	3101				2694
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	48	132	0	0	1037	111	550	332	552	0	0	618
RTOR Reduction (vph)	0	0	0	0	15	0	0	334	0	0	0	115
Lane Group Flow (vph)	0	180	0	0	1133	0	550	550	0	0	0	503
Confl. Peds. (#/hr)												20
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		48.5			27.5		32.0	32.0				17.5
Effective Green, g (s)		48.5			27.5		32.0	32.0				17.5
Actuated g/C Ratio		0.54			0.31		0.36	0.36				0.19
Clearance Time (s)		4.5			4.5		5.0	5.0				3.5
Lane Grp Cap (vph)		1523			1545		608	1102				523
v/s Ratio Prot		0.02			c0.22		c0.32	0.18				c0.19
v/s Ratio Perm		0.04										
v/c Ratio		0.12			0.73		0.90	0.50				0.96
Uniform Delay, d1		10.2			28.0		27.6	22.7				35.9
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.2			3.1		19.4	1.6				30.9
Delay (s)		10.4			31.1		46.9	24.3				66.8
Level of Service		B			C		D	C				E
Approach Delay (s)		10.4			31.1			33.0			66.8	
Approach LOS		B			C			C			E	

Intersection Summary			
HCM 2000 Control Delay	37.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

9/15/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	176	430	1404	757	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	0.99	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.93	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1581	1424	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1581	1424	3319	1801		
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	181	443	1447	780	0	0
RTOR Reduction (vph)	4	4	0	0	0	0
Lane Group Flow (vph)	323	293	1447	780	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	21.5	21.5	38.5	70.0		
Effective Green, g (s)	21.5	21.5	38.5	70.0		
Actuated g/C Ratio	0.31	0.31	0.55	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	485	437	1825	1801		
v/s Ratio Prot	0.20		c0.44	0.43		
v/s Ratio Perm		c0.21				
v/c Ratio	0.67	0.67	0.79	0.43		
Uniform Delay, d1	21.1	21.2	12.6	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	3.4	4.0	2.5	0.2		
Delay (s)	24.6	25.2	15.0	0.2		
Level of Service	C	C	B	A		
Approach Delay (s)	24.8			9.8	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	237	171	188	9	312	39	209	967	29	110	908	271
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.98		1.00	1.00		1.00	0.97	
Flpb, ped/bikes	0.99	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.98		1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1529	2499		1448	1569		1540	3056		1540	2899	
Flt Permitted	0.19	1.00		0.53	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	309	2499		807	1569		1540	3056		1540	2899	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	247	178	196	9	325	41	218	1007	30	115	946	282
RTOR Reduction (vph)	0	124	0	0	5	0	0	2	0	0	28	0
Lane Group Flow (vph)	247	250	0	9	361	0	218	1035	0	115	1200	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	36.5	36.5		24.5	24.5		10.0	37.5		9.7	37.2	
Effective Green, g (s)	36.5	36.5		24.5	24.5		10.0	37.5		9.7	37.2	
Actuated g/C Ratio	0.36	0.36		0.24	0.24		0.10	0.38		0.10	0.37	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	194	912		197	384		154	1146		149	1078	
v/s Ratio Prot	c0.09	0.10			0.23		c0.14	0.34		0.07	c0.41	
v/s Ratio Perm	c0.38			0.01								
v/c Ratio	1.27	0.27		0.05	0.94		1.42	0.90		0.77	1.11	
Uniform Delay, d1	30.0	22.4		28.8	37.0		45.0	29.5		44.1	31.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.99	0.96	
Incremental Delay, d2	156.8	0.2		0.1	31.2		220.7	11.6		2.3	52.5	
Delay (s)	186.8	22.6		28.9	68.2		265.7	41.1		46.0	82.6	
Level of Service	F	C		C	E		F	D		D	F	
Approach Delay (s)		87.9			67.3			80.1			79.5	
Approach LOS		F			E			F			E	

Intersection Summary			
HCM 2000 Control Delay	79.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	105.9%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: I-280 On Ramps & Pennsylvania

10/21/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	347	724	793	604
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	377	787	862	657
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			544			
pX, platoon unblocked						
vC, conflicting volume	2758	189			377	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2758	189			377	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			27	
cM capacity (veh/h)	4	821			1178	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	189	189	787	862	657
Volume Left	0	0	0	862	0
Volume Right	0	0	787	0	0
cSH	1700	1700	1700	1178	1700
Volume to Capacity	0.11	0.11	0.46	0.73	0.39
Queue Length 95th (ft)	0	0	0	174	0
Control Delay (s)	0.0	0.0	0.0	15.9	0.0
Lane LOS				C	
Approach Delay (s)	0.0			9.0	
Approach LOS					

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	95.4%	ICU Level of Service	F
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/15/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	192	159	0	204	116
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	209	173	0	222	126
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	173				277	173
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	173				277	173
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				68	85
cM capacity (veh/h)	1401				690	841

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	104	104	173	348
Volume Left	0	0	0	222
Volume Right	0	0	0	126
cSH	1700	1700	1700	738
Volume to Capacity	0.06	0.06	0.10	0.47
Queue Length 95th (ft)	0	0	0	64
Control Delay (s)	0.0	0.0	0.0	14.2
Lane LOS				B
Approach Delay (s)	0.0		0.0	14.2
Approach LOS				B

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp

9/15/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	56	340	159	261	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	370	173	284	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	457				479	173
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	457				479	173
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				100	100
cM capacity (veh/h)	1101				487	841

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	184	246	173	284	0
Volume Left	61	0	0	0	0
Volume Right	0	0	0	284	0
cSH	1101	1700	1700	1700	1700
Volume to Capacity	0.06	0.14	0.10	0.17	0.00
Queue Length 95th (ft)	4	0	0	0	0
Control Delay (s)	3.1	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.3		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	36.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	32	46	76	47	287	38	959	35	271	999	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.91		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1509			1454		1540	3063		1540	3052	
Flt Permitted		0.70			0.91		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1071			1343		1540	3063		1540	3052	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	35	50	83	51	312	41	1042	38	295	1086	68
RTOR Reduction (vph)	0	24	0	0	85	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	101	0	0	361	0	41	1078	0	295	1150	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		28.5			28.5		5.1	37.6		18.7	51.2	
Effective Green, g (s)		28.5			28.5		5.1	37.6		18.7	51.2	
Actuated g/C Ratio		0.28			0.28		0.05	0.38		0.19	0.51	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		305			382		78	1151		287	1562	
v/s Ratio Prot							0.03	c0.35		c0.19	0.38	
v/s Ratio Perm		0.09			c0.27							
v/c Ratio		0.33			0.94		0.53	0.94		1.03	0.74	
Uniform Delay, d1		28.2			35.0		46.3	30.0		40.6	19.1	
Progression Factor		1.00			1.00		0.98	0.77		1.04	1.17	
Incremental Delay, d2		0.6			31.9		2.5	13.3		49.3	2.0	
Delay (s)		28.9			66.9		47.9	36.2		91.5	24.3	
Level of Service		C			E		D	D		F	C	
Approach Delay (s)		28.9			66.9			36.7			38.0	
Approach LOS		C			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	41.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.2
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/15/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	632	58	265	0	0	652
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	687	63	288	0	0	709

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	343	343	63	144	144	709
Volume Left (vph)	343	343	0	0	0	0
Volume Right (vph)	0	0	63	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	7.5	7.5	3.2	7.5	7.5	6.8
Degree Utilization, x	0.72	0.72	0.06	0.30	0.30	1.0
Capacity (veh/h)	469	469	1121	469	469	541
Control Delay (s)	26.2	26.2	5.2	12.5	12.5	181.3
Approach Delay (s)	24.5			12.5		181.3
Approach LOS	C			B		F

Intersection Summary			
Delay	86.1		
Level of Service	F		
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	90	206	0	0	282	139	30	523	24	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	224	0	0	307	151	33	568	26	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	322	458	317	310
Volume Left (vph)	98	0	33	0
Volume Right (vph)	0	151	0	26
Hadj (s)	0.09	-0.16	0.09	-0.02
Departure Headway (s)	6.5	6.0	6.9	6.8
Degree Utilization, x	0.58	0.77	0.61	0.58
Capacity (veh/h)	531	574	504	510
Control Delay (s)	18.2	26.1	18.7	17.6
Approach Delay (s)	18.2	26.1	18.2	
Approach LOS	C	D	C	

Intersection Summary			
Delay	20.8		
Level of Service	C		
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	53	67	62	103	13	61	1089	42	0	1195	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.95			0.99		1.00	0.99			0.99	
Flpb, ped/bikes		0.98			0.97		1.00	1.00			1.00	
Frt		0.94			0.99		1.00	0.99			0.99	
Flt Protected		0.99			0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1231			1523		1540	2232			2229	
Flt Permitted		0.87			0.76		0.95	1.00			1.00	
Satd. Flow (perm)		1082			1172		1540	2232			2229	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	37	56	71	65	108	14	64	1146	44	0	1258	51
RTOR Reduction (vph)	0	32	0	0	3	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	132	0	0	184	0	64	1189	0	0	1308	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		19.2			19.2		13.5	70.5			51.9	
Effective Green, g (s)		19.2			19.2		13.5	70.5			51.9	
Actuated g/C Ratio		0.19			0.19		0.14	0.70			0.52	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		207			225		207	1573			1156	
v/s Ratio Prot							0.04	c0.53			c0.59	
v/s Ratio Perm		0.12			c0.16							
v/c Ratio		0.64			0.82		0.31	0.76			1.13	
Uniform Delay, d1		37.2			38.7		39.0	9.3			24.1	
Progression Factor		1.00			1.00		0.69	0.57			1.04	
Incremental Delay, d2		6.6			20.0		0.2	1.0			70.0	
Delay (s)		43.8			58.7		27.0	6.4			95.0	
Level of Service		D			E		C	A			F	
Approach Delay (s)		43.8			58.7			7.4			95.0	
Approach LOS		D			E			A			F	

Intersection Summary			
HCM 2000 Control Delay	52.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	378	526	0	0	340	478	286	215	439	64	0	547
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.83	1.00	1.00	0.86	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1002	1540	1621	1183	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1002	1540	1621	1183	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	398	554	0	0	358	503	301	226	462	67	0	576
RTOR Reduction (vph)	0	0	0	0	0	258	0	0	176	0	0	371
Lane Group Flow (vph)	398	554	0	0	358	245	301	226	286	67	0	205
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	18.0	41.0			18.0	18.0	22.0	22.0	22.0	12.0		12.0
Effective Green, g (s)	18.0	41.0			18.0	18.0	22.0	22.0	22.0	12.0		12.0
Actuated g/C Ratio	0.20	0.45			0.20	0.20	0.24	0.24	0.24	0.13		0.13
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	304	1387			609	198	372	391	286	203		158
v/s Ratio Prot	c0.26	0.18			0.12		0.20	0.14		0.04		c0.17
v/s Ratio Perm						c0.24			c0.24			
v/c Ratio	1.31	0.40			0.59	1.24	0.81	0.58	1.00	0.33		1.30
Uniform Delay, d1	36.5	16.8			33.1	36.5	32.5	30.4	34.5	35.9		39.5
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	160.8	0.9			4.1	141.8	12.2	2.1	53.3	1.0		173.2
Delay (s)	197.3	17.6			37.3	178.3	44.7	32.5	87.8	36.8		212.7
Level of Service	F	B			D	F	D	C	F	D		F
Approach Delay (s)		92.7			119.6			62.0			194.4	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	109.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	91.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	74	56	183	13	76	24	218	139	2	18	180	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.91			0.97		1.00	1.00		1.00	0.96	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3085			1739		1711	1797		1711	1726	
Flt Permitted		0.78			0.82		0.59	1.00		0.66	1.00	
Satd. Flow (perm)		2423			1441		1067	1797		1188	1726	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	61	199	14	83	26	237	151	2	20	196	75
RTOR Reduction (vph)	0	173	0	0	10	0	0	0	0	0	11	0
Lane Group Flow (vph)	0	167	0	0	113	0	237	153	0	20	260	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		11.8			11.8		71.1	71.1		71.1	71.1	
Effective Green, g (s)		11.8			11.8		71.1	71.1		71.1	71.1	
Actuated g/C Ratio		0.13			0.13		0.77	0.77		0.77	0.77	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		311			185		825	1390		919	1335	
v/s Ratio Prot								0.08			0.15	
v/s Ratio Perm		0.07			c0.08		c0.22			0.02		
v/c Ratio		0.54			0.61		0.29	0.11		0.02	0.19	
Uniform Delay, d1		37.5			37.9		3.0	2.6		2.4	2.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.8			5.6		0.9	0.2		0.0	0.3	
Delay (s)		39.3			43.4		3.9	2.7		2.4	3.1	
Level of Service		D			D		A	A		A	A	
Approach Delay (s)		39.3			43.4			3.4			3.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	91.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

2040 CUMULATIVE WITH PROJECT
BASKETBALL GAME – SATURDAY EVENING

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	662	674	232	651	618	102	74	691	268	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.97		1.00	0.98			1.00	0.90			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.96		1.00	0.98			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	2882		2987	2966			5503	1237			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	2882		2987	2966			5503	1237			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	736	749	258	723	687	113	82	768	298	0	0	0
RTOR Reduction (vph)	0	31	0	0	11	0	0	0	219	0	0	0
Lane Group Flow (vph)	736	976	0	723	789	0	0	850	79	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	21.5	38.7		23.3	40.5			29.1	29.1			
Effective Green, g (s)	21.5	38.7		23.3	40.5			29.1	29.1			
Actuated g/C Ratio	0.20	0.35		0.21	0.37			0.26	0.26			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	875	1013		632	1092			1455	327			
v/s Ratio Prot	0.16	c0.34		c0.24	0.27							
v/s Ratio Perm								0.15	0.06			
v/c Ratio	0.84	0.96		1.14	0.72			0.58	0.24			
Uniform Delay, d1	42.6	35.0		43.4	29.9			35.2	31.8			
Progression Factor	0.80	0.68		0.75	0.51			1.37	5.58			
Incremental Delay, d2	3.3	11.7		77.7	1.6			0.5	0.3			
Delay (s)	37.3	35.4		110.3	17.0			48.7	177.6			
Level of Service	D	D		F	B			D	F			
Approach Delay (s)		36.2			61.3			82.2			0.0	
Approach LOS		D			E			F			A	

Intersection Summary			
HCM 2000 Control Delay	56.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	99.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	348	1439	114	64	572	56	16	178	42	87	817	199
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.97		1.00	0.94			1.00	0.64	1.00	0.99	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00	0.74	1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4253		1296	2415			1599	858	1141	2902	581
Flt Permitted	0.95	1.00		0.95	1.00			0.74	1.00	0.59	1.00	1.00
Satd. Flow (perm)	1540	4253		1296	2415			1189	858	703	2902	581
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	370	1531	121	68	609	60	17	189	45	93	869	212
RTOR Reduction (vph)	0	7	0	0	6	0	0	0	30	0	1	115
Lane Group Flow (vph)	370	1645	0	68	663	0	0	206	15	93	889	76
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	17.4	41.5		11.4	33.9			37.2	37.2	38.2	38.2	38.2
Effective Green, g (s)	17.4	41.5		11.4	33.9			37.2	37.2	38.2	38.2	38.2
Actuated g/C Ratio	0.16	0.38		0.10	0.31			0.34	0.34	0.35	0.35	0.35
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	243	1604		134	744			402	290	244	1007	201
v/s Ratio Prot	c0.24	c0.39		0.05	c0.27						c0.31	
v/s Ratio Perm								0.17	0.02	0.13		0.13
v/c Ratio	1.52	1.03		0.51	0.89			0.51	0.05	0.38	0.88	0.38
Uniform Delay, d1	46.3	34.2		46.6	36.3			29.1	24.5	27.0	33.8	27.0
Progression Factor	0.90	1.11		0.76	0.74			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	251.2	26.8		2.1	9.7			1.1	0.1	1.0	9.2	1.2
Delay (s)	293.0	64.9		37.6	36.7			30.2	24.6	28.0	43.0	28.2
Level of Service	F	E		D	D			C	C	C	D	C
Approach Delay (s)		106.6			36.7			29.2			39.4	
Approach LOS		F			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	70.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	137.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1748	91	0	787	35	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.91			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	4388			3079	1540	1357
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	4388			3079	1540	1357
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1921	100	0	865	38	168
RTOR Reduction (vph)	3	0	0	0	0	8
Lane Group Flow (vph)	2018	0	0	865	38	160
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	80.4			80.4	18.3	18.3
Effective Green, g (s)	80.4			80.4	18.3	18.3
Actuated g/C Ratio	0.73			0.73	0.17	0.17
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3207			2250	256	225
v/s Ratio Prot	c0.46			0.28	0.02	
v/s Ratio Perm						c0.12
v/c Ratio	0.63			0.38	0.15	0.71
Uniform Delay, d1	7.4			5.5	39.2	43.3
Progression Factor	1.00			0.22	1.00	1.00
Incremental Delay, d2	0.9			0.1	0.3	9.8
Delay (s)	8.3			1.3	39.5	53.2
Level of Service	A			A	D	D
Approach Delay (s)	8.3			1.3	50.6	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

4/27/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	246	1136	135	65	529	548	292	504	1371	455
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.95			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.99			1.00	0.95			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		6059			3025	2544			4324	1185
Flt Permitted		0.99			0.59	1.00			0.95	1.00
Satd. Flow (perm)		6059			1800	2544			4324	1185
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	254	1171	139	67	545	565	301	520	1413	469
RTOR Reduction (vph)	0	19	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1545	0	0	612	865	0	0	1980	422
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		21.5			23.0	23.0			28.0	28.0
Effective Green, g (s)		23.5			26.0	26.0			31.0	31.0
Actuated g/C Ratio		0.26			0.29	0.29			0.34	0.34
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1582			520	734			1489	408
v/s Ratio Prot						c0.34			c0.46	0.36
v/s Ratio Perm		0.25			0.34					
v/c Ratio		0.98			1.18	1.18			1.33	1.03
Uniform Delay, d1		33.0			32.0	32.0			29.5	29.5
Progression Factor		1.55			1.00	1.00			1.00	1.00
Incremental Delay, d2		12.3			98.3	94.3			153.1	53.7
Delay (s)		63.4			130.3	126.3			182.6	83.2
Level of Service		E			F	F			F	F
Approach Delay (s)		63.4			130.3	126.3			165.1	
Approach LOS		E			F	F			F	

Intersection Summary			
HCM 2000 Control Delay	125.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	126.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	335	189	510	120	259	41	292	236	77	985
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.98		0.90		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.97		0.95		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)		2186	3343		2346		1161		1327	2558
Flt Permitted		0.95	1.00		1.00		1.00		0.28	0.95
Satd. Flow (perm)		2186	3343		2346		1161		384	2444
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	414	233	630	148	320	51	360	291	95	1216
RTOR Reduction (vph)	0	0	35	0	44	0	179	0	0	0
Lane Group Flow (vph)	0	565	825	0	460	0	48	0	376	1226
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		539	936		547		247		323	1078
v/s Ratio Prot		c0.26	0.25		0.20				0.19	c0.19
v/s Ratio Perm							0.04		c0.31	0.30
v/c Ratio		1.58dl	0.88		0.84		0.20		1.16	1.14
Uniform Delay, d1		28.2	25.8		27.4		24.2		24.3	21.2
Progression Factor		1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2		52.0	11.8		14.4		1.8		102.4	73.4
Delay (s)		80.3	37.6		41.8		26.0		126.7	94.7
Level of Service		F	D		D		C		F	F
Approach Delay (s)			54.5		36.9					102.2
Approach LOS			D		D					F

Intersection Summary			
HCM 2000 Control Delay	71.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	993	197	12	12	16	18	524	84	164	339	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	0.97		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.95		1.00	0.98		1.00	0.99	
Flt Protected		1.00	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1615	1352		1490		1540	2926		1540	3055	
Flt Permitted		0.98	1.00		0.54		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1593	1352		820		1540	2926		1540	3055	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	52	1024	203	12	12	16	19	540	87	169	349	15
RTOR Reduction (vph)	0	0	65	0	7	0	0	11	0	0	2	0
Lane Group Flow (vph)	0	1076	138	0	33	0	19	616	0	169	362	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		70.1	70.1		70.1		2.5	23.5		13.6	34.9	
Effective Green, g (s)		70.1	70.1		70.1		2.5	23.5		13.6	34.9	
Actuated g/C Ratio		0.57	0.57		0.57		0.02	0.19		0.11	0.28	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		907	769		466		31	558		170	866	
v/s Ratio Prot							0.01	c0.21		c0.11	0.12	
v/s Ratio Perm		c0.68	0.10		0.04							
v/c Ratio		1.19	0.18		0.07		0.61	1.10		0.99	0.42	
Uniform Delay, d1		26.5	12.7		11.9		59.8	49.8		54.7	35.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		95.0	0.1		0.1		22.6	70.1		66.9	0.3	
Delay (s)		121.5	12.8		12.0		82.4	119.9		121.6	36.2	
Level of Service		F	B		B		F	F		F	D	
Approach Delay (s)		104.3			12.0			118.8			63.3	
Approach LOS		F			B			F			E	

Intersection Summary			
HCM 2000 Control Delay	97.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	123.1	Sum of lost time (s)	15.9
Intersection Capacity Utilization	106.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	836	14	5	14	26	13	89	4	400	271	34
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	0.96	
Flpb, ped/bikes		1.00			1.00	1.00	0.77	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		1.00			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2592			1430	1191	1062	1436		1377	1364	
Flt Permitted		0.95			0.84	1.00	0.55	1.00		0.95	1.00	
Satd. Flow (perm)		2469			1213	1191	616	1436		1377	1364	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	17	961	16	6	16	30	15	102	5	460	311	39
RTOR Reduction (vph)	0	1	0	0	0	10	0	3	0	0	6	0
Lane Group Flow (vph)	0	993	0	0	22	20	15	104	0	460	344	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		30.3			30.3	49.5	9.0	9.0		19.2	33.2	
Effective Green, g (s)		30.3			30.3	49.5	9.0	9.0		19.2	33.2	
Actuated g/C Ratio		0.41			0.41	0.67	0.12	0.12		0.26	0.45	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		1017			500	883	75	175		359	616	
v/s Ratio Prot						0.01		0.07		c0.33	c0.25	
v/s Ratio Perm		c0.40			0.02	0.01	0.02					
v/c Ratio		0.98			0.04	0.02	0.20	0.60		1.28	0.56	
Uniform Delay, d1		21.2			12.9	4.0	29.0	30.5		27.1	14.8	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		22.4			0.0	0.0	1.3	5.4		146.4	1.1	
Delay (s)		43.6			13.0	4.0	30.3	35.9		173.5	15.9	
Level of Service		D			B	A	C	D		F	B	
Approach Delay (s)		43.6			7.8			35.2			105.4	
Approach LOS		D			A			D			F	

Intersection Summary			
HCM 2000 Control Delay	67.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	73.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	75.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	109	203	249	62	966	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.89	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1540	2366	2431	1232	1540	1621
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1540	2366	2431	1232	1540	1621
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	125	233	286	71	1110	193
RTOR Reduction (vph)	0	202	0	46	0	0
Lane Group Flow (vph)	125	31	286	25	1110	193
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	13.4	13.4	15.8	15.8	57.1	77.9
Effective Green, g (s)	13.4	13.4	15.8	15.8	57.1	77.9
Actuated g/C Ratio	0.13	0.13	0.16	0.16	0.56	0.77
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	203	312	379	192	868	1246
v/s Ratio Prot	c0.08		c0.12		c0.72	0.12
v/s Ratio Perm		0.01		0.02		
v/c Ratio	0.62	0.10	0.75	0.13	1.28	0.15
Uniform Delay, d1	41.5	38.6	40.9	36.8	22.1	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.5	0.1	8.3	0.3	134.3	0.1
Delay (s)	47.0	38.8	49.2	37.2	156.4	3.1
Level of Service	D	D	D	D	F	A
Approach Delay (s)	41.6		46.8			133.7
Approach LOS	D		D			F

Intersection Summary			
HCM 2000 Control Delay	102.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	101.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Terry A Francois Blvd/Terry A Francois Blvd. & South St.
4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	13	31	227	166	147	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.94		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.90		1.00	1.00	1.00	
Flt Protected	0.99		0.95	1.00	1.00	
Satd. Flow (prot)	1515		1670	1531	3150	
Flt Permitted	0.99		0.64	1.00	1.00	
Satd. Flow (perm)	1515		1123	1531	3150	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	15	37	270	198	175	4
RTOR Reduction (vph)	35	0	0	0	1	0
Lane Group Flow (vph)	17	0	270	198	178	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	2.3		27.8	27.8	27.8	
Effective Green, g (s)	2.3		27.8	27.8	27.8	
Actuated g/C Ratio	0.06		0.69	0.69	0.69	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	86		778	1061	2183	
v/s Ratio Prot	c0.01			0.13	0.06	
v/s Ratio Perm			c0.24			
v/c Ratio	0.20		0.35	0.19	0.08	
Uniform Delay, d1	18.0		2.5	2.2	2.0	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.1		0.3	0.1	0.0	
Delay (s)	19.2		2.8	2.3	2.0	
Level of Service	B		A	A	A	
Approach Delay (s)	19.2			2.5	2.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	40.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Third St. & South St.
4/27/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	11	53	542	54	310	474
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.94	0.99		1.00	1.00
Flpb, ped/bikes	0.95	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1628	1437	3339		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1628	1437	3339		1711	3421
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	12	57	583	58	333	510
RTOR Reduction (vph)	0	53	6	0	0	0
Lane Group Flow (vph)	12	4	635	0	333	510
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	4.1	4.1	30.3		15.2	50.6
Effective Green, g (s)	4.1	4.1	30.3		15.2	50.6
Actuated g/C Ratio	0.06	0.06	0.47		0.23	0.78
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	102	90	1558		400	2667
v/s Ratio Prot			c0.19		c0.19	0.15
v/s Ratio Perm	c0.01	0.00				
v/c Ratio	0.12	0.04	0.41		0.83	0.19
Uniform Delay, d1	28.7	28.6	11.4		23.6	1.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.5	0.2	0.8		13.8	0.2
Delay (s)	29.2	28.7	12.2		37.4	2.0
Level of Service	C	C	B		D	A
Approach Delay (s)	28.8		12.2			16.0
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	64.9	Sum of lost time (s)	15.3
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

4/27/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	40	17	16	353	162	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.99	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1540	1353		2879	2840	
Flt Permitted	0.95	1.00		0.94	1.00	
Satd. Flow (perm)	1540	1353		2698	2840	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	20	19	415	191	19
RTOR Reduction (vph)	0	19	0	0	14	0
Lane Group Flow (vph)	47	1	0	434	196	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	2.6	2.6		13.5	13.5	
Effective Green, g (s)	2.6	2.6		13.5	13.5	
Actuated g/C Ratio	0.05	0.05		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	77	67		703	740	
v/s Ratio Prot	c0.03				0.07	
v/s Ratio Perm		0.00		c0.16		
v/c Ratio	0.61	0.01		0.62	0.26	
Uniform Delay, d1	24.1	23.4		16.9	15.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.5	0.1		1.6	0.2	
Delay (s)	37.6	23.5		18.5	15.4	
Level of Service	D	C		B	B	
Approach Delay (s)	33.4			18.5	15.4	
Approach LOS	C			B	B	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	51.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	129	32	32	4	18	10	48	222	15	10	53	38
Peak Hour Factor	0.92	0.79	0.79	0.79	0.79	0.92	0.79	0.92	0.79	0.92	0.92	0.92
Hourly flow rate (vph)	140	41	41	5	23	11	61	241	19	11	58	41

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	140	81	5	34	321	68	41
Volume Left (vph)	140	0	5	0	61	11	0
Volume Right (vph)	0	41	0	11	19	0	41
Hadj (s)	0.53	-0.32	0.53	-0.19	0.04	0.11	-0.67
Departure Headway (s)	6.3	5.4	6.6	5.8	5.4	5.7	5.0
Degree Utilization, x	0.24	0.12	0.01	0.05	0.48	0.11	0.06
Capacity (veh/h)	542	625	503	564	648	592	682
Control Delay (s)	10.1	8.0	8.4	8.0	13.3	8.2	7.1
Approach Delay (s)	9.3		8.0		13.3	7.8	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	10.9		
Level of Service	B		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	172	159	116	8	74	18	79	400	17	14	384	82
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1267	1365	1129	1288	1365	1109	2515	2573		1296	2513	
Flt Permitted	0.70	1.00	1.00	0.64	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	938	1365	1129	873	1365	1109	2515	2573		1296	2513	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	193	179	130	9	83	20	89	449	19	16	431	92
RTOR Reduction (vph)	0	0	91	0	0	14	0	3	0	0	17	0
Lane Group Flow (vph)	193	179	39	9	83	6	89	465	0	16	506	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	19.4	19.4	19.4	19.4	19.4	19.4	6.2	27.0		1.9	22.7	
Effective Green, g (s)	19.4	19.4	19.4	19.4	19.4	19.4	6.2	27.0		1.9	22.7	
Actuated g/C Ratio	0.30	0.30	0.30	0.30	0.30	0.30	0.10	0.42		0.03	0.35	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	284	413	342	264	413	336	243	1085		38	891	
v/s Ratio Prot		0.13			0.06		0.04	c0.18		0.01	c0.20	
v/s Ratio Perm	c0.21		0.03	0.01		0.01						
v/c Ratio	0.68	0.43	0.12	0.03	0.20	0.02	0.37	0.43		0.42	0.57	
Uniform Delay, d1	19.6	17.9	16.1	15.7	16.5	15.6	27.1	13.1		30.5	16.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.3	0.7	0.2	0.1	0.2	0.0	0.9	0.3		7.4	0.8	
Delay (s)	25.9	18.6	16.3	15.8	16.8	15.6	28.0	13.3		37.9	17.5	
Level of Service	C	B	B	B	B	B	C	B		D	B	
Approach Delay (s)		20.8			16.5			15.7			18.1	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	64.0	Sum of lost time (s)	15.7
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	162	387	2	14	186	37	4	11	12	48	11	96
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00		1.00	0.94	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1238	1621	1572		1487	1382	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.69	1.00		0.74	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1238	1169	1572		1162	1382	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	169	403	2	15	194	39	4	11	12	50	11	100
RTOR Reduction (vph)	0	0	1	0	0	27	0	9	0	0	75	0
Lane Group Flow (vph)	169	403	1	15	194	12	4	14	0	50	36	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	21.5	45.6	45.6	2.7	26.8	26.8	21.6	21.6		21.6	21.6	
Effective Green, g (s)	21.5	45.6	45.6	2.7	26.8	26.8	21.6	21.6		21.6	21.6	
Actuated g/C Ratio	0.25	0.54	0.54	0.03	0.32	0.32	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	410	916	778	51	538	390	297	399		295	351	
v/s Ratio Prot	c0.10	c0.24		0.01	0.11			0.01			0.03	
v/s Ratio Perm			0.00			0.01	0.00			c0.04		
v/c Ratio	0.41	0.44	0.00	0.29	0.36	0.03	0.01	0.04		0.17	0.10	
Uniform Delay, d1	26.4	11.9	9.1	40.2	22.4	20.1	23.7	23.8		24.7	24.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	1.5	0.0	3.2	0.4	0.0	0.0	0.0		0.3	0.1	
Delay (s)	27.1	13.4	9.1	43.4	22.8	20.1	23.7	23.8		24.9	24.4	
Level of Service	C	B	A	D	C	C	C	C		C	C	
Approach Delay (s)		17.5			23.7			23.8			24.5	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	84.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	405	60	16	254	19	31	494	118	30	85	50
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.99	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1046	1540	2990			3039	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.67	1.00			0.75	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1046	1085	2990			2301	1072
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	30	455	67	18	285	21	35	555	133	34	96	56
RTOR Reduction (vph)	0	0	29	0	0	11	0	20	0	0	0	38
Lane Group Flow (vph)	30	455	38	18	285	10	35	668	0	0	130	18
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	2.1	37.9	37.9	2.1	36.9	36.9	27.0	27.0			26.0	26.0
Effective Green, g (s)	2.1	37.9	37.9	2.1	36.9	36.9	27.0	27.0			26.0	26.0
Actuated g/C Ratio	0.03	0.47	0.47	0.03	0.46	0.46	0.34	0.34			0.32	0.32
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	31	575	652	40	560	482	366	1009			747	348
v/s Ratio Prot	c0.02	c0.37		0.01	0.23			c0.22				
v/s Ratio Perm			0.03			0.01	0.03				0.06	0.02
v/c Ratio	0.97	0.79	0.06	0.45	0.51	0.02	0.10	0.66			0.17	0.05
Uniform Delay, d1	38.9	17.7	11.4	38.4	15.2	11.7	18.1	22.6			19.3	18.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	146.8	7.3	0.0	7.9	0.7	0.0	0.1	1.6			0.1	0.1
Delay (s)	185.7	25.1	11.4	46.2	15.9	11.7	18.3	24.3			19.4	18.6
Level of Service	F	C	B	D	B	B	B	C			B	B
Approach Delay (s)		32.1			17.3			24.0			19.2	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	24.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	365	65	14	242	78	38	120	13	111	41	73
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.91	1.00	1.00	0.95	1.00	0.95	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1321	930		1335	1126	870	1070	957	911	1070	963	
Flt Permitted	0.41	1.00		0.29	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	567	930		409	1126	870	1070	957	911	1070	963	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	36	429	76	16	285	92	45	141	15	131	48	86
RTOR Reduction (vph)	0	5	0	0	0	34	0	0	13	0	68	0
Lane Group Flow (vph)	36	500	0	16	285	58	45	141	2	131	66	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	54.1	54.1		53.3	53.3	67.3	17.6	17.5	17.5	14.0	13.9	
Effective Green, g (s)	54.1	54.1		53.3	53.3	67.3	17.6	17.5	17.5	14.0	13.9	
Actuated g/C Ratio	0.51	0.51		0.50	0.50	0.63	0.16	0.16	0.16	0.13	0.13	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	302	469		216	560	587	175	156	148	139	124	
v/s Ratio Prot	0.00	c0.54		0.00	c0.25	0.01	0.04	c0.15		c0.12	0.07	
v/s Ratio Perm	0.06			0.04		0.05			0.00			
v/c Ratio	0.12	1.07		0.07	0.51	0.10	0.26	0.90	0.02	0.94	0.53	
Uniform Delay, d1	14.3	26.5		23.6	18.1	7.9	39.0	44.0	37.6	46.2	43.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	60.0		0.1	0.7	0.1	0.8	44.8	0.0	58.7	4.4	
Delay (s)	14.5	86.5		23.7	18.8	8.0	39.8	88.7	37.6	104.8	47.9	
Level of Service	B	F		C	B	A	D	F	D	F	D	
Approach Delay (s)		81.7			16.5			74.0			76.1	
Approach LOS		F			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	61.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	107.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	229	320	34	32	124	60	29	26	42	10	29	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			0.99			0.98	
Flpb, ped/bikes	0.98	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.95			0.94			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1685	3107		1690	1690			1648			1370	
Flt Permitted	0.60	1.00		0.48	1.00			0.88			0.97	
Satd. Flow (perm)	1061	3107		855	1690			1480			1332	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	286	400	42	40	155	75	36	32	52	12	36	80
RTOR Reduction (vph)	0	8	0	0	18	0	0	40	0	0	63	0
Lane Group Flow (vph)	286	434	0	40	212	0	0	80	0	0	65	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	25.8	25.8		25.8	25.8			13.5			13.5	
Effective Green, g (s)	25.8	25.8		25.8	25.8			13.5			13.5	
Actuated g/C Ratio	0.40	0.40		0.40	0.40			0.21			0.21	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	422	1237		340	672			308			277	
v/s Ratio Prot		0.14			0.13							
v/s Ratio Perm	c0.27			0.05				c0.05			0.05	
v/c Ratio	0.68	0.35		0.12	0.32			0.26			0.23	
Uniform Delay, d1	16.1	13.6		12.3	13.4			21.5			21.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	4.3	0.2		0.2	0.3			0.5			0.4	
Delay (s)	20.4	13.8		12.5	13.7			21.9			21.8	
Level of Service	C	B		B	B			C			C	
Approach Delay (s)		16.4			13.5			21.9			21.8	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	64.8	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	79	512	44	40	156	25	42	392	47	27	405	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1669	3371		1697	3327		1260	2474		1260	2449	
Flt Permitted	0.62	1.00		0.28	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1092	3371		501	3327		1260	2474		1260	2449	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	91	589	51	46	179	29	48	451	54	31	466	87
RTOR Reduction (vph)	0	6	0	0	13	0	0	9	0	0	15	0
Lane Group Flow (vph)	91	634	0	46	195	0	48	496	0	31	538	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	30.1	30.1		30.1	30.1		9.3	40.4		8.2	39.3	
Effective Green, g (s)	30.1	30.1		30.1	30.1		9.3	40.4		8.2	39.3	
Actuated g/C Ratio	0.32	0.32		0.32	0.32		0.10	0.43		0.09	0.42	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	348	1077		160	1063		124	1061		109	1021	
v/s Ratio Prot		c0.19			0.06		0.04	c0.20		0.02	c0.22	
v/s Ratio Perm	0.08			0.09								
v/c Ratio	0.26	0.59		0.29	0.18		0.39	0.47		0.28	0.53	
Uniform Delay, d1	23.8	26.9		24.0	23.2		39.8	19.2		40.3	20.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.8		1.0	0.1		2.0	1.5		1.4	0.5	
Delay (s)	24.2	27.7		25.0	23.3		41.8	20.7		41.7	21.0	
Level of Service	C	C		C	C		D	C		D	C	
Approach Delay (s)		27.3			23.6			22.5			22.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	94.2	Sum of lost time (s)	15.5
Intersection Capacity Utilization	104.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	28	658	22	8	211	53	27	0	2	7	5	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.97			0.99		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3405		1711	3318			1705		1711	1561	
Flt Permitted	0.58	1.00		0.37	1.00			0.72		0.74	1.00	
Satd. Flow (perm)	1037	3405		668	3318			1292		1327	1561	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	715	24	9	229	58	29	0	2	8	5	39
RTOR Reduction (vph)	0	4	0	0	32	0	0	24	0	0	30	0
Lane Group Flow (vph)	30	735	0	9	255	0	0	7	0	8	14	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	15.0	15.0		15.0	15.0			7.9		7.9	7.9	
Effective Green, g (s)	15.0	15.0		15.0	15.0			7.9		7.9	7.9	
Actuated g/C Ratio	0.46	0.46		0.46	0.46			0.24		0.24	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	472	1552		304	1512			310		318	374	
v/s Ratio Prot		c0.22			0.08						c0.01	
v/s Ratio Perm	0.03			0.01				0.01		0.01		
v/c Ratio	0.06	0.47		0.03	0.17			0.02		0.03	0.04	
Uniform Delay, d1	5.0	6.2		4.9	5.3			9.6		9.6	9.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.2		0.0	0.1			0.0		0.0	0.0	
Delay (s)	5.1	6.4		5.0	5.3			9.6		9.6	9.6	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		6.4			5.3			9.6			9.6	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	32.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	133	0	0	312	43	219	626	585	0	0	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.98		1.00	0.93				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3385			5038		1711	3173				2694
Flt Permitted		0.83			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2833			5038		1711	3173				2694
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	46	166	0	0	390	54	274	782	731	0	0	172
RTOR Reduction (vph)	0	0	0	0	25	0	0	222	0	0	0	163
Lane Group Flow (vph)	0	212	0	0	419	0	274	1291	0	0	0	9
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1352			1756		697	1294				141
v/s Ratio Prot		c0.01			c0.08		0.16	c0.41				0.00
v/s Ratio Perm		0.06										
v/c Ratio		0.16			0.24		0.39	1.00				0.06
Uniform Delay, d1		11.6			17.6		15.9	22.5				34.2
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.2			0.3		1.7	24.5				0.9
Delay (s)		11.9			17.9		17.5	46.9				35.1
Level of Service		B			B		B	D				D
Approach Delay (s)		11.9			17.9			42.4			35.1	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	35.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

4/27/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	170	128	338	330	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	1.00	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.99	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1690	1428	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1690	1428	3319	1801		
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	207	156	412	402	0	0
RTOR Reduction (vph)	3	53	0	0	0	0
Lane Group Flow (vph)	220	87	412	402	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	37.3	37.3	12.7	60.0		
Effective Green, g (s)	37.3	37.3	12.7	60.0		
Actuated g/C Ratio	0.62	0.62	0.21	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	1050	887	702	1801		
v/s Ratio Prot	0.13		c0.12	c0.22		
v/s Ratio Perm		0.06				
v/c Ratio	0.21	0.10	0.59	0.22		
Uniform Delay, d1	4.9	4.6	21.3	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.1	0.0	1.3	0.1		
Delay (s)	5.0	4.6	22.5	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	4.9			11.4	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

4/27/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	82	41	109	3	38	0	101	340	0	39	336	114
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.93		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.97	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	1.00		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1179	1898		1145	1279		1215	2431		1215	2288	
Flt Permitted	0.44	1.00		0.65	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	544	1898		778	1279		1215	2431		1215	2288	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	92	46	122	3	43	0	113	382	0	44	378	128
RTOR Reduction (vph)	0	85	0	0	0	0	0	0	0	0	26	0
Lane Group Flow (vph)	92	83	0	3	43	0	113	382	0	44	480	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	22.2	22.2		8.0	8.0		10.3	24.7		10.0	24.4	
Effective Green, g (s)	22.2	22.2		8.0	8.0		10.3	24.7		10.0	24.4	
Actuated g/C Ratio	0.30	0.30		0.11	0.11		0.14	0.34		0.14	0.33	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	242	575		85	139		170	820		165	762	
v/s Ratio Prot	c0.05	0.04			0.03		c0.09	0.16		0.04	c0.21	
v/s Ratio Perm	c0.07			0.00								
v/c Ratio	0.38	0.14		0.04	0.31		0.66	0.47		0.27	0.63	
Uniform Delay, d1	19.5	18.6		29.1	30.1		29.8	19.1		28.3	20.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.1		0.2	1.3		9.4	0.4		0.9	1.6	
Delay (s)	20.5	18.7		29.3	31.3		39.2	19.5		29.2	22.2	
Level of Service	C	B		C	C		D	B		C	C	
Approach Delay (s)		19.3			31.2			24.0			22.8	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	73.2	Sum of lost time (s)	21.6
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: Pennsylvania & I-280 SB On-Ramps
9/24/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	234	148	175	201
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	254	161	190	218
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			505			
pX, platoon unblocked						
vC, conflicting volume	853	127			254	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	853	127			254	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			85	
cM capacity (veh/h)	255	899			1308	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	127	127	161	190	218
Volume Left	0	0	0	190	0
Volume Right	0	0	161	0	0
cSH	1700	1700	1700	1308	1700
Volume to Capacity	0.07	0.07	0.09	0.15	0.13
Queue Length 95th (ft)	0	0	0	13	0
Control Delay (s)	0.0	0.0	0.0	8.2	0.0
Lane LOS				A	
Approach Delay (s)	0.0			3.8	
Approach LOS					

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	25.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp
9/24/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	106	69	0	149	84
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	115	75	0	162	91
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	75				133	75
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	75				133	75
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				81	91
cM capacity (veh/h)	1522				848	971

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	58	58	75	253
Volume Left	0	0	0	162
Volume Right	0	0	0	91
cSH	1700	1700	1700	888
Volume to Capacity	0.03	0.03	0.04	0.29
Queue Length 95th (ft)	0	0	0	29
Control Delay (s)	0.0	0.0	0.0	10.7
Lane LOS				B
Approach Delay (s)	0.0		0.0	10.7
Approach LOS				B

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp
9/24/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	67	188	69	284	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	73	204	75	309	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	384				323	75
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	384				323	75
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				100	100
cM capacity (veh/h)	1171				606	971

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	141	136	75	309	0
Volume Left	73	0	0	0	0
Volume Right	0	0	0	309	0
cSH	1171	1700	1700	1700	1700
Volume to Capacity	0.06	0.08	0.04	0.18	0.00
Queue Length 95th (ft)	5	0	0	0	0
Control Delay (s)	4.5	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	2.3		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St
9/24/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	38	18	89	31	170	33	408	21	188	363	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.92		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1547			1470		1540	3056		1540	3019	
Flt Permitted		0.81			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1278			1312		1540	3056		1540	3019	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	41	20	97	34	185	36	443	23	204	395	59
RTOR Reduction (vph)	0	13	0	0	64	0	0	5	0	0	12	0
Lane Group Flow (vph)	0	77	0	0	252	0	36	461	0	204	442	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		19.4			19.4		4.5	27.3		18.3	41.1	
Effective Green, g (s)		19.4			19.4		4.5	27.3		18.3	41.1	
Actuated g/C Ratio		0.24			0.24		0.06	0.34		0.23	0.51	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		309			317		86	1040		351	1547	
v/s Ratio Prot							0.02	c0.15		c0.13	0.15	
v/s Ratio Perm		0.06			c0.19							
v/c Ratio		0.25			0.80		0.42	0.44		0.58	0.29	
Uniform Delay, d1		24.5			28.5		36.6	20.5		27.5	11.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			12.9		1.2	1.4		1.6	0.5	
Delay (s)		25.0			41.5		37.8	21.9		29.1	11.6	
Level of Service		C			D		D	C		C	B	
Approach Delay (s)		25.0			41.5			23.1			17.1	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	289	32	122	0	0	232
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	314	35	133	0	0	252

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	157	157	35	66	66	252
Volume Left (vph)	157	157	0	0	0	0
Volume Right (vph)	0	0	35	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.1	6.1	3.2	5.8	5.8	5.4
Degree Utilization, x	0.26	0.26	0.03	0.11	0.11	0.38
Capacity (veh/h)	565	567	1121	588	587	636
Control Delay (s)	10.0	10.0	5.1	8.3	8.3	11.7
Approach Delay (s)	9.6			8.3		11.7
Approach LOS	A			A		B

Intersection Summary			
Delay	10.1		
Level of Service	B		
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	104	102	0	0	50	100	16	376	18	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	113	111	0	0	54	109	17	409	20	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	224	163	222	224
Volume Left (vph)	113	0	17	0
Volume Right (vph)	0	109	0	20
Hadj (s)	0.13	-0.37	0.07	-0.03
Departure Headway (s)	5.4	5.0	5.6	5.5
Degree Utilization, x	0.33	0.22	0.34	0.34
Capacity (veh/h)	636	676	620	630
Control Delay (s)	11.0	9.4	10.3	10.1
Approach Delay (s)	11.0	9.4	10.2	
Approach LOS	B	A	B	

Intersection Summary			
Delay	10.3		
Level of Service	B		
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
30: Third St. & 25th

9/24/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	67	45	23	78	12	52	418	126	0	384	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.97			0.99		1.00	0.93			0.97	
Flpb, ped/bikes		0.97			0.99		1.00	1.00			1.00	
Frt		0.96			0.99		1.00	0.97			0.98	
Flt Protected		0.98			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1266			1537		1540	2039			2164	
Flt Permitted		0.86			0.92		0.95	1.00			1.00	
Satd. Flow (perm)		1102			1425		1540	2039			2164	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	54	71	47	24	82	13	55	440	133	0	404	47
RTOR Reduction (vph)	0	15	0	0	5	0	0	13	0	0	5	0
Lane Group Flow (vph)	0	157	0	0	114	0	55	560	0	0	446	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		19.1			19.1		13.5	70.6			52.0	
Effective Green, g (s)		19.1			19.1		13.5	70.6			52.0	
Actuated g/C Ratio		0.19			0.19		0.14	0.71			0.52	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		210			272		207	1439			1125	
v/s Ratio Prot							0.04	c0.27			0.21	
v/s Ratio Perm		c0.14			0.08							
v/c Ratio		0.75			0.42		0.27	0.39			0.40	
Uniform Delay, d1		38.2			35.6		38.8	6.0			14.5	
Progression Factor		1.00			1.00		1.00	1.00			1.16	
Incremental Delay, d2		13.4			1.0		0.7	0.8			0.9	
Delay (s)		51.6			36.6		39.5	6.8			17.7	
Level of Service		D			D		D	A			B	
Approach Delay (s)		51.6			36.6			9.6			17.7	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
31: 280 NB Off-ramp/Pennsylvania & Cesar Chavez

9/24/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	127	317	0	0	146	143	93	112	165	43	0	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1033	1540	1621	1203	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1033	1540	1621	1203	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	134	334	0	0	154	151	98	118	174	45	0	166
RTOR Reduction (vph)	0	0	0	0	0	103	0	0	148	0	0	148
Lane Group Flow (vph)	134	334	0	0	154	48	98	118	26	45	0	18
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	11.9	41.2			24.3	24.3	11.4	11.4	11.4	8.1		8.1
Effective Green, g (s)	11.9	41.2			24.3	24.3	11.4	11.4	11.4	8.1		8.1
Actuated g/C Ratio	0.16	0.54			0.32	0.32	0.15	0.15	0.15	0.11		0.11
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	238	1653			975	327	228	240	178	162		127
v/s Ratio Prot	c0.09	c0.11			0.05		0.06	c0.07		c0.03		0.01
v/s Ratio Perm						0.05			0.02			
v/c Ratio	0.56	0.20			0.16	0.15	0.43	0.49	0.15	0.28		0.14
Uniform Delay, d1	30.0	9.2			18.8	18.8	29.7	30.0	28.4	31.6		31.1
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	3.0	0.3			0.3	0.9	1.3	1.6	0.4	0.9		0.5
Delay (s)	33.0	9.5			19.2	19.7	31.0	31.6	28.8	32.5		31.6
Level of Service	C	A			B	B	C	C	C	C		C
Approach Delay (s)		16.2			19.4			30.2			31.8	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	76.7	Sum of lost time (s)	21.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	18	53	5	20	5	26	28	2	10	50	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.91			0.98		1.00	0.99		1.00	0.96	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3076			1749		1711	1784		1711	1722	
Flt Permitted		0.93			0.98		1.00	1.00		1.00	1.00	
Satd. Flow (perm)		2892			1722		1801	1784		1801	1722	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	20	58	5	22	5	28	30	2	11	54	22
RTOR Reduction (vph)	0	19	0	0	2	0	0	2	0	0	20	0
Lane Group Flow (vph)	0	74	0	0	30	0	28	30	0	11	56	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		25.5			25.5		3.1	3.1		3.1	3.1	
Effective Green, g (s)		25.5			25.5		3.1	3.1		3.1	3.1	
Actuated g/C Ratio		0.68			0.68		0.08	0.08		0.08	0.08	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1961			1167		148	147		148	141	
v/s Ratio Prot								0.02			c0.03	
v/s Ratio Perm		c0.03			0.02		0.02			0.01		
v/c Ratio		0.04			0.03		0.19	0.21		0.07	0.40	
Uniform Delay, d1		2.0			2.0		16.1	16.1		15.9	16.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			0.0		0.6	0.7		0.2	1.8	
Delay (s)		2.0			2.0		16.7	16.8		16.1	18.2	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.0			2.0			16.8			17.9	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.08		
Actuated Cycle Length (s)	37.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	21.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

2040 Cumulative with Project with M-TR-11c
Basketball Game – Saturday Evening

HCM Signalized Intersection Capacity Analysis
1: Third St. & King St.
9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	662	674	232	637	622	102	74	691	268	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Lane Util. Factor	*0.97	0.95		0.97	0.95			0.86	1.00			
Frpb, ped/bikes	1.00	0.97		1.00	0.98			1.00	0.90			
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00			
Frt	1.00	0.96		1.00	0.98			1.00	0.85			
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (prot)	4480	2882		2987	2966			5503	1237			
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00			
Satd. Flow (perm)	4480	2882		2987	2966			5503	1237			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	736	749	258	708	691	113	82	768	298	0	0	0
RTOR Reduction (vph)	0	31	0	0	11	0	0	0	219	0	0	0
Lane Group Flow (vph)	736	976	0	708	793	0	0	850	79	0	0	0
Confl. Peds. (#/hr)			100			100	100		100			
Confl. Bikes (#/hr)			10			10			10			
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm			
Protected Phases	5	2		1	6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	21.4	38.7		23.3	40.6			29.1	29.1			
Effective Green, g (s)	21.4	38.7		23.3	40.6			29.1	29.1			
Actuated g/C Ratio	0.19	0.35		0.21	0.37			0.26	0.26			
Clearance Time (s)	6.8	5.3		6.8	5.3			6.8	6.8			
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0			
Lane Grp Cap (vph)	871	1013		632	1094			1455	327			
v/s Ratio Prot	0.16	c0.34		c0.24	0.27							
v/s Ratio Perm								0.15	0.06			
v/c Ratio	0.85	0.96		1.12	0.73			0.58	0.24			
Uniform Delay, d1	42.7	35.0		43.4	29.9			35.2	31.8			
Progression Factor	0.79	0.67		0.75	0.51			1.37	5.58			
Incremental Delay, d2	3.5	11.9		68.4	1.7			0.5	0.3			
Delay (s)	37.4	35.5		101.0	16.9			48.7	177.6			
Level of Service	D	D		F	B			D	F			
Approach Delay (s)		36.3			56.3			82.2			0.0	
Approach LOS		D			E			F			A	

Intersection Summary			
HCM 2000 Control Delay	55.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.9
Intersection Capacity Utilization	98.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Fourth St. & King St.
9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	348	1439	114	64	576	56	16	178	42	87	800	199
Ideal Flow (vphpl)	1900	1900	1900	1600	1600	1600	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Lane Util. Factor	1.00	0.91		1.00	0.95			1.00	1.00	1.00	0.91	0.91
Frpb, ped/bikes	1.00	0.97		1.00	0.94			1.00	0.64	1.00	0.99	0.47
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99	1.00	0.74	1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1540	4253		1296	2416			1599	858	1141	2902	581
Flt Permitted	0.95	1.00		0.95	1.00			0.75	1.00	0.58	1.00	1.00
Satd. Flow (perm)	1540	4253		1296	2416			1202	858	702	2902	581
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	370	1531	121	68	613	60	17	189	45	93	851	212
RTOR Reduction (vph)	0	7	0	0	6	0	0	0	30	0	1	116
Lane Group Flow (vph)	370	1645	0	68	667	0	0	206	15	93	871	75
Confl. Peds. (#/hr)			761			695	1648		678	678		1648
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	0	0	5
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			7	
Permitted Phases							4		4	7		7
Actuated Green, G (s)	17.7	41.9		11.4	34.0			36.8	36.8	37.8	37.8	37.8
Effective Green, g (s)	17.7	41.9		11.4	34.0			36.8	36.8	37.8	37.8	37.8
Actuated g/C Ratio	0.16	0.38		0.10	0.31			0.33	0.33	0.34	0.34	0.34
Clearance Time (s)	7.6	6.0		7.1	7.1			6.8	6.8	5.8	5.8	5.8
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	247	1620		134	746			402	287	241	997	199
v/s Ratio Prot	c0.24	c0.39		0.05	c0.28						c0.30	
v/s Ratio Perm								0.17	0.02	0.13		0.13
v/c Ratio	1.50	1.02		0.51	0.89			0.51	0.05	0.39	0.87	0.38
Uniform Delay, d1	46.1	34.0		46.6	36.3			29.4	24.8	27.3	33.9	27.2
Progression Factor	0.90	1.11		0.76	0.74			1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	240.3	23.8		2.1	9.9			1.1	0.1	1.0	8.6	1.2
Delay (s)	282.0	61.7		37.7	36.8			30.5	24.9	28.3	42.4	28.5
Level of Service	F	E		D	D			C	C	C	D	C
Approach Delay (s)		102.0			36.9			29.5			39.0	
Approach LOS		F			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	68.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	21.5
Intersection Capacity Utilization	137.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Fifth St. & I-280 Ramps/King St.

9/15/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1748	91	0	791	35	153
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9			4.9	6.4	6.4
Lane Util. Factor	0.91			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.99
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	4388			3079	1540	1357
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	4388			3079	1540	1357
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1921	100	0	869	38	168
RTOR Reduction (vph)	3	0	0	0	0	8
Lane Group Flow (vph)	2018	0	0	869	38	160
Confl. Peds. (#/hr)		10	10			3
Confl. Bikes (#/hr)		1				
Turn Type	NA			NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	80.4			80.4	18.3	18.3
Effective Green, g (s)	80.4			80.4	18.3	18.3
Actuated g/C Ratio	0.73			0.73	0.17	0.17
Clearance Time (s)	4.9			4.9	6.4	6.4
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3207			2250	256	225
v/s Ratio Prot	c0.46			0.28	0.02	
v/s Ratio Perm						c0.12
v/c Ratio	0.63			0.39	0.15	0.71
Uniform Delay, d1	7.4			5.5	39.2	43.3
Progression Factor	1.00			0.22	1.00	1.00
Incremental Delay, d2	0.9			0.1	0.3	9.8
Delay (s)	8.3			1.3	39.5	53.2
Level of Service	A			A	D	D
Approach Delay (s)	8.3			1.3	50.6	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Fifth St. & I-80 WB Off-Ramp & Harrison St.

9/15/2015

Movement	WBL	WBT	WBR	NBL	NBT	SBT	SBR	NWL2	NWL	NWR
Lane Configurations										
Volume (vph)	246	1136	135	65	529	548	292	491	1388	455
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5			3.0	3.0			3.0	3.0
Lane Util. Factor		0.81			0.95	0.95			0.94	0.86
Frpb, ped/bikes		0.99			1.00	0.95			1.00	1.00
Flpb, ped/bikes		0.99			1.00	1.00			1.00	1.00
Frt		0.99			1.00	0.95			1.00	0.85
Flt Protected		0.99			0.99	1.00			0.95	1.00
Satd. Flow (prot)		6059			3025	2544			4324	1185
Flt Permitted		0.99			0.59	1.00			0.95	1.00
Satd. Flow (perm)		6059			1800	2544			4324	1185
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	254	1171	139	67	545	565	301	506	1431	469
RTOR Reduction (vph)	0	19	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1545	0	0	612	865	0	0	1984	422
Confl. Peds. (#/hr)	50		100	100			100	50	100	100
Confl. Bikes (#/hr)			10				10			10
Bus Blockages (#/hr)	0	5	0	0	5	5	0	0	0	0
Parking (#/hr)		10				10				
Turn Type	Perm	NA		Perm	NA	NA		Prot	Prot	Prot
Protected Phases		6			4	4		7	7	7
Permitted Phases	6			4						
Actuated Green, G (s)		21.5			23.0	23.0			28.0	28.0
Effective Green, g (s)		23.5			26.0	26.0			31.0	31.0
Actuated g/C Ratio		0.26			0.29	0.29			0.34	0.34
Clearance Time (s)		5.5			6.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0			3.0	3.0			3.0	3.0
Lane Grp Cap (vph)		1582			520	734			1489	408
v/s Ratio Prot						c0.34			c0.46	0.36
v/s Ratio Perm		0.25			0.34					
v/c Ratio		0.98			1.18	1.18			1.33	1.03
Uniform Delay, d1		33.0			32.0	32.0			29.5	29.5
Progression Factor		1.55			1.00	1.00			1.00	1.00
Incremental Delay, d2		12.3			98.3	94.3			154.3	53.7
Delay (s)		63.4			130.3	126.3			183.8	83.2
Level of Service		E			F	F			F	F
Approach Delay (s)		63.4			130.3	126.3			166.1	
Approach LOS		E			F	F			F	

Intersection Summary			
HCM 2000 Control Delay	126.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	126.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

5: Fifth St. & Bryant St. & I-80 EB On-Ramp

Movement	EBL2	EBL	EBT	EBR	NBT	NBR	NBR2	SBL2	SBL	SBT
Lane Configurations										
Volume (vph)	335	189	510	120	259	41	292	236	77	972
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.5	2.0		2.5		4.0		2.5	2.5
Lane Util. Factor		0.81	0.81		0.91		0.91		0.91	0.91
Frpb, ped/bikes		1.00	0.98		0.90		0.98		1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00		1.00	1.00
Frt		1.00	0.97		0.95		0.85		1.00	1.00
Flt Protected		0.95	1.00		1.00		1.00		0.95	1.00
Satd. Flow (prot)		2186	3343		2346		1161		1327	2558
Flt Permitted		0.95	1.00		1.00		1.00		0.28	0.95
Satd. Flow (perm)		2186	3343		2346		1161		384	2444
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	414	233	630	148	320	51	360	291	95	1200
RTOR Reduction (vph)	0	0	35	0	44	0	179	0	0	0
Lane Group Flow (vph)	0	565	825	0	460	0	48	0	376	1210
Confl. Peds. (#/hr)	25			60		200				
Confl. Bikes (#/hr)				10		10	10			
Bus Blockages (#/hr)	0	0	8	0	5	0	0	0	0	5
Parking (#/hr)		10	10							10
Turn Type	Split	Split	NA		NA		Perm	pm+pt	pm+pt	NA
Protected Phases	2	2	2		8			7	7	4
Permitted Phases							8	4	4	
Actuated Green, G (s)		18.5	18.5		16.0		16.0		31.0	31.0
Effective Green, g (s)		18.5	21.0		17.5		16.0		32.5	32.5
Actuated g/C Ratio		0.25	0.28		0.23		0.21		0.43	0.43
Clearance Time (s)		4.5	4.5		4.0		4.0		4.0	4.0
Lane Grp Cap (vph)		539	936		547		247		323	1078
v/s Ratio Prot		c0.26	0.25		0.20				0.19	c0.19
v/s Ratio Perm							0.04		c0.31	0.30
v/c Ratio		1.58dl	0.88		0.84		0.20		1.16	1.12
Uniform Delay, d1		28.2	25.8		27.4		24.2		24.3	21.2
Progression Factor		1.00	1.00		1.00		1.00		1.00	1.00
Incremental Delay, d2		52.0	11.8		14.4		1.8		102.4	67.6
Delay (s)		80.3	37.6		41.8		26.0		126.7	88.8
Level of Service		F	D		D		C		F	F
Approach Delay (s)			54.5		36.9					97.8
Approach LOS			D		D					F

Intersection Summary			
HCM 2000 Control Delay	69.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

6: Third St. & Channel St.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	927	196	12	12	16	18	524	79	155	336	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	0.97		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.95		1.00	0.98		1.00	0.99	
Flt Protected		1.00	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1615	1352		1490		1540	2935		1540	3059	
Flt Permitted		0.98	1.00		0.60		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1591	1352		909		1540	2935		1540	3059	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	52	956	202	12	12	16	19	540	81	160	346	12
RTOR Reduction (vph)	0	0	68	0	7	0	0	10	0	0	2	0
Lane Group Flow (vph)	0	1008	134	0	33	0	19	611	0	160	356	0
Confl. Peds. (#/hr)	15		5	5		15			64			14
Confl. Bikes (#/hr)			2			1			16			14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		70.1	70.1		70.1		2.5	23.5		13.6	34.9	
Effective Green, g (s)		70.1	70.1		70.1		2.5	23.5		13.6	34.9	
Actuated g/C Ratio		0.57	0.57		0.57		0.02	0.19		0.11	0.28	
Clearance Time (s)		4.9	4.9		4.9		5.2	5.5		5.5	5.5	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		906	769		517		31	560		170	867	
v/s Ratio Prot							0.01	c0.21		c0.10	0.12	
v/s Ratio Perm		c0.63	0.10		0.04							
v/c Ratio		1.11	0.17		0.06		0.61	1.09		0.94	0.41	
Uniform Delay, d1		26.5	12.7		11.8		59.8	49.8		54.4	35.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		65.8	0.1		0.1		22.6	65.4		51.4	0.3	
Delay (s)		92.3	12.8		11.9		82.4	115.2		105.7	36.1	
Level of Service		F	B		B		F	F		F	D	
Approach Delay (s)		79.0			11.9			114.2			57.6	
Approach LOS		E			B			F			E	

Intersection Summary			
HCM 2000 Control Delay	82.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	123.1	Sum of lost time (s)	15.9
Intersection Capacity Utilization	101.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Fourth St. & Channel St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	781	14	5	11	26	13	89	4	389	269	31
Ideal Flow (vphpl)	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		0.95			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	0.97	1.00	1.00		1.00	0.96	
Flpb, ped/bikes		1.00			1.00	1.00	0.77	1.00		1.00	1.00	
Frt		1.00			1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		1.00			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		2592			1427	1191	1060	1436		1377	1369	
Flt Permitted		0.95			0.83	1.00	0.55	1.00		0.95	1.00	
Satd. Flow (perm)		2468			1205	1191	618	1436		1377	1369	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	17	898	16	6	13	30	15	102	5	447	309	36
RTOR Reduction (vph)	0	1	0	0	0	10	0	3	0	0	5	0
Lane Group Flow (vph)	0	930	0	0	19	20	15	104	0	447	340	0
Confl. Peds. (#/hr)	28		3	3		28	213		19			213
Confl. Bikes (#/hr)			1						18			10
Parking (#/hr)		2										
Turn Type	Perm	NA		Perm	NA	pm+ov	Perm	NA		Prot	NA	
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2					
Actuated Green, G (s)		30.3			30.3	49.5	9.0	9.0		19.2	33.2	
Effective Green, g (s)		30.3			30.3	49.5	9.0	9.0		19.2	33.2	
Actuated g/C Ratio		0.41			0.41	0.67	0.12	0.12		0.26	0.45	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	2.0	3.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		1017			496	883	75	175		359	618	
v/s Ratio Prot						0.01		0.07		c0.32	c0.25	
v/s Ratio Perm		c0.38			0.02	0.01	0.02					
v/c Ratio		0.91			0.04	0.02	0.20	0.60		1.25	0.55	
Uniform Delay, d1		20.4			12.9	4.0	29.0	30.5		27.1	14.7	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		12.3			0.0	0.0	1.3	5.4		131.6	1.0	
Delay (s)		32.6			12.9	4.0	30.3	35.9		158.8	15.7	
Level of Service		C			B	A	C	D		F	B	
Approach Delay (s)		32.6			7.5			35.2			96.5	
Approach LOS		C			A			D			F	

Intersection Summary			
HCM 2000 Control Delay	58.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	73.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
8: Seventh St. & Mission Bay St.

9/15/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	109	203	249	62	923	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.88	*0.75	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.89	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1540	2366	2431	1232	1540	1621
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1540	2366	2431	1232	1540	1621
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	125	233	286	71	1061	193
RTOR Reduction (vph)	0	202	0	46	0	0
Lane Group Flow (vph)	125	31	286	25	1061	193
Confl. Peds. (#/hr)	60	1		5		
Confl. Bikes (#/hr)		1		30		
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	13.4	13.4	15.8	15.8	57.1	77.9
Effective Green, g (s)	13.4	13.4	15.8	15.8	57.1	77.9
Actuated g/C Ratio	0.13	0.13	0.16	0.16	0.56	0.77
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	203	312	379	192	868	1246
v/s Ratio Prot	c0.08		c0.12		c0.69	0.12
v/s Ratio Perm		0.01		0.02		
v/c Ratio	0.62	0.10	0.75	0.13	1.22	0.15
Uniform Delay, d1	41.5	38.6	40.9	36.8	22.1	3.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.5	0.1	8.3	0.3	110.4	0.1
Delay (s)	47.0	38.8	49.2	37.2	132.5	3.1
Level of Service	D	D	D	D	F	A
Approach Delay (s)	41.6		46.8			112.6
Approach LOS	D		D			F

Intersection Summary			
HCM 2000 Control Delay	87.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	101.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	13	31	224	164	147	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	0.95	
Frpb, ped/bikes	0.94		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		0.98	1.00	1.00	
Frt	0.90		1.00	1.00	1.00	
Flt Protected	0.99		0.95	1.00	1.00	
Satd. Flow (prot)	1513		1671	1531	3150	
Flt Permitted	0.99		0.64	1.00	1.00	
Satd. Flow (perm)	1513		1123	1531	3150	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	15	37	267	195	175	4
RTOR Reduction (vph)	35	0	0	0	1	0
Lane Group Flow (vph)	17	0	267	195	178	0
Confl. Peds. (#/hr)	50	50	50			50
Confl. Bikes (#/hr)		10				30
Parking (#/hr)				10	10	
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	2.2		27.8	27.8	27.8	
Effective Green, g (s)	2.2		27.8	27.8	27.8	
Actuated g/C Ratio	0.06		0.70	0.70	0.70	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	83		780	1064	2189	
v/s Ratio Prot	c0.01			0.13	0.06	
v/s Ratio Perm			c0.24			
v/c Ratio	0.21		0.34	0.18	0.08	
Uniform Delay, d1	18.1		2.4	2.1	2.0	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.2		0.3	0.1	0.0	
Delay (s)	19.3		2.7	2.2	2.0	
Level of Service	B		A	A	A	
Approach Delay (s)	19.3			2.5	2.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	11	53	537	53	307	474
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3	4.9		5.1	4.9
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.94	0.99		1.00	1.00
Flpb, ped/bikes	0.95	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1628	1437	3339		1711	3421
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1628	1437	3339		1711	3421
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	12	57	577	57	330	510
RTOR Reduction (vph)	0	53	6	0	0	0
Lane Group Flow (vph)	12	4	628	0	330	510
Confl. Peds. (#/hr)	71	22		46	46	
Confl. Bikes (#/hr)		10		10		
Turn Type	Perm	Perm	NA		Prot	NA
Protected Phases			2		1	6
Permitted Phases	8	8				
Actuated Green, G (s)	4.1	4.1	30.3		15.2	50.6
Effective Green, g (s)	4.1	4.1	30.3		15.2	50.6
Actuated g/C Ratio	0.06	0.06	0.47		0.23	0.78
Clearance Time (s)	5.3	5.3	4.9		5.1	4.9
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	102	90	1558		400	2667
v/s Ratio Prot			c0.19		c0.19	0.15
v/s Ratio Perm	c0.01	0.00				
v/c Ratio	0.12	0.04	0.40		0.82	0.19
Uniform Delay, d1	28.7	28.6	11.4		23.6	1.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.5	0.2	0.8		13.0	0.2
Delay (s)	29.2	28.7	12.1		36.6	2.0
Level of Service	C	C	B		D	A
Approach Delay (s)	28.8		12.1			15.6
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	64.9	Sum of lost time (s)	15.3
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Terry A Francois Blvd./Terry A Francois Blvd & 16th

9/15/2015

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	40	17	16	348	162	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.99	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1540	1353		2878	2840	
Flt Permitted	0.95	1.00		0.93	1.00	
Satd. Flow (perm)	1540	1353		2697	2840	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	20	19	409	191	19
RTOR Reduction (vph)	0	19	0	0	14	0
Lane Group Flow (vph)	47	1	0	428	196	0
Confl. Peds. (#/hr)	1	1	25			25
Parking (#/hr)				5	5	
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	2.6	2.6		13.4	13.4	
Effective Green, g (s)	2.6	2.6		13.4	13.4	
Actuated g/C Ratio	0.05	0.05		0.26	0.26	
Clearance Time (s)	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	77	68		699	736	
v/s Ratio Prot	c0.03				0.07	
v/s Ratio Perm		0.00		c0.16		
v/c Ratio	0.61	0.01		0.61	0.27	
Uniform Delay, d1	24.1	23.3		16.9	15.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.5	0.1		1.6	0.2	
Delay (s)	37.5	23.4		18.5	15.4	
Level of Service	D	C		B	B	
Approach Delay (s)	33.3			18.5	15.4	
Approach LOS	C			B	B	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	51.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
12: Illinois St & 16th

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	127	32	32	4	18	10	48	220	15	10	53	38
Peak Hour Factor	0.92	0.79	0.79	0.79	0.79	0.92	0.79	0.92	0.79	0.92	0.92	0.92
Hourly flow rate (vph)	138	41	41	5	23	11	61	239	19	11	58	41

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	138	81	5	34	319	68	41
Volume Left (vph)	138	0	5	0	61	11	0
Volume Right (vph)	0	41	0	11	19	0	41
Hadj (s)	0.53	-0.32	0.53	-0.19	0.04	0.11	-0.67
Departure Headway (s)	6.3	5.4	6.5	5.8	5.4	5.7	4.9
Degree Utilization, x	0.24	0.12	0.01	0.05	0.48	0.11	0.06
Capacity (veh/h)	542	626	504	565	648	594	683
Control Delay (s)	10.0	8.0	8.4	7.9	13.2	8.2	7.0
Approach Delay (s)	9.3		8.0		13.2	7.8	
Approach LOS	A		A		B	A	

Intersection Summary			
Delay	10.8		
Level of Service	B		
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
13: Third St. & 16th St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	167	158	121	8	74	18	78	400	17	14	384	82
Ideal Flow (vphpl)	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1267	1365	1129	1288	1365	1109	2515	2573		1296	2513	
Flt Permitted	0.70	1.00	1.00	0.64	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	938	1365	1129	874	1365	1109	2515	2573		1296	2513	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	188	178	136	9	83	20	88	449	19	16	431	92
RTOR Reduction (vph)	0	0	95	0	0	14	0	3	0	0	17	0
Lane Group Flow (vph)	188	178	41	9	83	6	88	465	0	16	506	0
Confl. Peds. (#/hr)	41		14	14		41			39			8
Confl. Bikes (#/hr)			9			10			4			14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	18.9	18.9	18.9	18.9	18.9	18.9	6.2	26.9		1.9	22.6	
Effective Green, g (s)	18.9	18.9	18.9	18.9	18.9	18.9	6.2	26.9		1.9	22.6	
Actuated g/C Ratio	0.30	0.30	0.30	0.30	0.30	0.30	0.10	0.42		0.03	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.0	5.2		5.0	5.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	279	406	336	260	406	330	245	1091		38	895	
v/s Ratio Prot		0.13			0.06		0.03	c0.18		0.01	c0.20	
v/s Ratio Perm	c0.20		0.04	0.01		0.01						
v/c Ratio	0.67	0.44	0.12	0.03	0.20	0.02	0.36	0.43		0.42	0.56	
Uniform Delay, d1	19.5	18.0	16.2	15.8	16.6	15.7	26.7	12.8		30.2	16.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.3	0.8	0.2	0.1	0.3	0.0	0.9	0.3		7.4	0.8	
Delay (s)	25.8	18.7	16.4	15.8	16.9	15.7	27.6	13.1		37.6	17.3	
Level of Service	C	B	B	B	B	B	C	B		D	B	
Approach Delay (s)		20.7			16.6			15.4			17.9	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	63.4	Sum of lost time (s)	15.7
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
14: Construction Driveway/4th St & 16th St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	386	2	14	186	36	4	11	12	48	11	96
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.86	1.00	1.00		1.00	0.94	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.92	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1621	1706	1450	1621	1706	1247	1621	1572		1491	1384	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.69	1.00		0.74	1.00	
Satd. Flow (perm)	1621	1706	1450	1621	1706	1247	1169	1572		1165	1384	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	164	402	2	15	194	38	4	11	12	50	11	100
RTOR Reduction (vph)	0	0	1	0	0	21	0	9	0	0	74	0
Lane Group Flow (vph)	164	402	1	15	194	17	4	14	0	50	37	0
Confl. Peds. (#/hr)	50					50				50		50
Confl. Bikes (#/hr)						10						10
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	10.6	44.0	44.0	2.6	36.0	36.0	21.1	21.1		21.1	21.1	
Effective Green, g (s)	10.6	44.0	44.0	2.6	36.0	36.0	21.1	21.1		21.1	21.1	
Actuated g/C Ratio	0.13	0.53	0.53	0.03	0.44	0.44	0.26	0.26		0.26	0.26	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	207	907	771	50	742	542	298	401		297	353	
v/s Ratio Prot	c0.10	c0.24		0.01	0.11			0.01			0.03	
v/s Ratio Perm			0.00			0.01	0.00			c0.04		
v/c Ratio	0.79	0.44	0.00	0.30	0.26	0.03	0.01	0.04		0.17	0.10	
Uniform Delay, d1	35.0	11.8	9.1	39.2	14.9	13.4	23.0	23.1		24.0	23.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	18.4	1.6	0.0	3.4	0.2	0.0	0.0	0.0		0.3	0.1	
Delay (s)	53.4	13.4	9.1	42.5	15.1	13.4	23.0	23.2		24.2	23.7	
Level of Service	D	B	A	D	B	B	C	C		C	C	
Approach Delay (s)		25.0			16.5			23.2			23.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	82.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
15: 16th St. & Owens St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	403	60	16	254	18	31	456	113	30	85	50
Ideal Flow (vphpl)	1500	1500	1900	1900	1500	1500	1900	1900	1900	1500	1900	1500
Total Lost time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Lane Util. Factor	1.00	*0.95	1.00	1.00	*0.95	1.00	1.00	0.95			0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00			1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00			0.99	1.00
Satd. Flow (prot)	1215	1215	1378	1540	1215	1047	1540	2987			3039	1072
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.67	1.00			0.76	1.00
Satd. Flow (perm)	1215	1215	1378	1540	1215	1047	1085	2987			2333	1072
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	28	453	67	18	285	20	35	512	127	34	96	56
RTOR Reduction (vph)	0	0	29	0	0	11	0	21	0	0	0	39
Lane Group Flow (vph)	28	453	38	18	285	9	35	618	0	0	130	17
Confl. Peds. (#/hr)						17						3
Confl. Bikes (#/hr)						36						
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	2.0	36.7	36.7	2.0	35.7	35.7	24.6	24.6			23.6	23.6
Effective Green, g (s)	2.0	36.7	36.7	2.0	35.7	35.7	24.6	24.6			23.6	23.6
Actuated g/C Ratio	0.03	0.48	0.48	0.03	0.47	0.47	0.32	0.32			0.31	0.31
Clearance Time (s)	5.0	5.0	5.0	4.0	5.0	5.0	4.0	4.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	31	584	662	40	568	489	349	963			721	331
v/s Ratio Prot	c0.02	c0.37		0.01	0.23			c0.21				
v/s Ratio Perm			0.03			0.01	0.03				0.06	0.02
v/c Ratio	0.90	0.78	0.06	0.45	0.50	0.02	0.10	0.64			0.18	0.05
Uniform Delay, d1	37.1	16.4	10.6	36.6	14.1	10.9	18.1	22.1			19.3	18.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2	120.7	6.4	0.0	7.9	0.7	0.0	0.1	1.5			0.1	0.1
Delay (s)	157.8	22.8	10.6	44.5	14.8	10.9	18.2	23.6			19.4	18.6
Level of Service	F	C	B	D	B	B	B	C			B	B
Approach Delay (s)		28.2			16.2			23.3			19.1	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	76.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
16: Mississippi St./Seventh St. & 16th St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	362	65	14	242	78	38	120	13	111	41	73
Ideal Flow (vphpl)	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	*0.80		1.00	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	*0.80	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.91	1.00	1.00	0.95	1.00	0.95	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1321	929		1335	1126	870	1070	957	911	1070	963	
Flt Permitted	0.41	1.00		0.29	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	567	929		414	1126	870	1070	957	911	1070	963	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	36	426	76	16	285	92	45	141	15	131	48	86
RTOR Reduction (vph)	0	5	0	0	0	34	0	0	13	0	68	0
Lane Group Flow (vph)	36	497	0	16	285	58	45	141	2	131	66	0
Confl. Peds. (#/hr)	28		6	6		28			4			11
Confl. Bikes (#/hr)			9			50			7			15
Parking (#/hr)		10	10					10				
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6	7	3	8		7	4	
Permitted Phases	2			6		6			8			
Actuated Green, G (s)	54.1	54.1		53.3	53.3	67.3	17.6	17.5	17.5	14.0	13.9	
Effective Green, g (s)	54.1	54.1		53.3	53.3	67.3	17.6	17.5	17.5	14.0	13.9	
Actuated g/C Ratio	0.51	0.51		0.50	0.50	0.63	0.16	0.16	0.16	0.13	0.13	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	302	469		218	560	587	175	156	148	139	124	
v/s Ratio Prot	0.00	c0.53		0.00	c0.25	0.01	0.04	c0.15		c0.12	0.07	
v/s Ratio Perm	0.06			0.04		0.05			0.00			
v/c Ratio	0.12	1.06		0.07	0.51	0.10	0.26	0.90	0.02	0.94	0.53	
Uniform Delay, d1	14.3	26.5		23.4	18.1	7.9	39.0	44.0	37.6	46.2	43.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	58.0		0.1	0.7	0.1	0.8	44.8	0.0	58.7	4.4	
Delay (s)	14.5	84.5		23.6	18.8	8.0	39.8	88.7	37.6	104.8	47.9	
Level of Service	B	F		C	B	A	D	F	D	F	D	
Approach Delay (s)		79.8			16.5			74.0			76.1	
Approach LOS		E			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	60.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	107.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Illinois St./Illinois St & Mariposa St./Terry A Francois Blvd.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	227	315	34	32	124	60	29	26	42	10	29	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			0.99			0.98	
Flpb, ped/bikes	0.99	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.95			0.94			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1685	3106		1690	1690			1648			1370	
Flt Permitted	0.60	1.00		0.49	1.00			0.88			0.97	
Satd. Flow (perm)	1061	3106		863	1690			1478			1332	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	284	394	42	40	155	75	36	32	52	12	36	80
RTOR Reduction (vph)	0	8	0	0	18	0	0	40	0	0	63	0
Lane Group Flow (vph)	284	428	0	40	212	0	0	80	0	0	65	0
Confl. Peds. (#/hr)	13		16	16		13	16		19	19		16
Parking (#/hr)		10	10								10	10
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	25.6	25.6		25.6	25.6			13.5			13.5	
Effective Green, g (s)	25.6	25.6		25.6	25.6			13.5			13.5	
Actuated g/C Ratio	0.40	0.40		0.40	0.40			0.21			0.21	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	420	1230		341	669			308			278	
v/s Ratio Prot		0.14			0.13							
v/s Ratio Perm	c0.27			0.05				c0.05			0.05	
v/c Ratio	0.68	0.35		0.12	0.32			0.26			0.23	
Uniform Delay, d1	16.1	13.7		12.3	13.5			21.4			21.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	4.3	0.2		0.2	0.3			0.5			0.4	
Delay (s)	20.4	13.8		12.5	13.7			21.8			21.7	
Level of Service	C	B		B	B			C			C	
Approach Delay (s)		16.4			13.6			21.8			21.7	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	64.6	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
18: Third St. & Mariposa St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	79	507	44	40	156	25	42	391	45	27	410	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1400	1400	1400	1400	1400	1400
Total Lost time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1669	3370		1697	3327		1260	2475		1260	2449	
Flt Permitted	0.62	1.00		0.28	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1092	3370		508	3327		1260	2475		1260	2449	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	91	583	51	46	179	29	48	449	52	31	471	87
RTOR Reduction (vph)	0	6	0	0	13	0	0	9	0	0	14	0
Lane Group Flow (vph)	91	628	0	46	195	0	48	492	0	31	544	0
Confl. Peds. (#/hr)	34		24	24		34			16			15
Confl. Bikes (#/hr)			2			6			6			19
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	30.1	30.1		30.1	30.1		9.3	40.4		8.2	39.3	
Effective Green, g (s)	30.1	30.1		30.1	30.1		9.3	40.4		8.2	39.3	
Actuated g/C Ratio	0.32	0.32		0.32	0.32		0.10	0.43		0.09	0.42	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.1	5.1		5.1	5.1	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	348	1076		162	1063		124	1061		109	1021	
v/s Ratio Prot		c0.19			0.06		0.04	c0.20		0.02	c0.22	
v/s Ratio Perm	0.08			0.09								
v/c Ratio	0.26	0.58		0.28	0.18		0.39	0.46		0.28	0.53	
Uniform Delay, d1	23.8	26.8		24.0	23.2		39.8	19.2		40.3	20.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.8		1.0	0.1		2.0	1.5		1.4	0.5	
Delay (s)	24.2	27.6		25.0	23.3		41.8	20.6		41.7	21.1	
Level of Service	C	C		C	C		D	C		D	C	
Approach Delay (s)		27.2			23.6			22.5			22.2	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	94.2	Sum of lost time (s)	15.5
Intersection Capacity Utilization	104.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Minnesota St./4th St. & Mariposa St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	28	653	22	8	211	53	27	0	2	7	5	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.97			0.99		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.96		0.95	1.00	
Satd. Flow (prot)	1711	3404		1711	3318			1705		1711	1561	
Flt Permitted	0.58	1.00		0.37	1.00			0.72		0.74	1.00	
Satd. Flow (perm)	1037	3404		671	3318			1293		1327	1561	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	710	24	9	229	58	29	0	2	8	5	39
RTOR Reduction (vph)	0	4	0	0	32	0	0	24	0	0	30	0
Lane Group Flow (vph)	30	730	0	9	255	0	0	7	0	8	14	0
Parking (#/hr)									5			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	14.9	14.9		14.9	14.9			7.9		7.9	7.9	
Effective Green, g (s)	14.9	14.9		14.9	14.9			7.9		7.9	7.9	
Actuated g/C Ratio	0.45	0.45		0.45	0.45			0.24		0.24	0.24	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	471	1546		304	1507			311		319	375	
v/s Ratio Prot		c0.21			0.08						c0.01	
v/s Ratio Perm	0.03			0.01				0.01		0.01		
v/c Ratio	0.06	0.47		0.03	0.17			0.02		0.03	0.04	
Uniform Delay, d1	5.0	6.2		5.0	5.3			9.5		9.5	9.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.2		0.0	0.1			0.0		0.0	0.0	
Delay (s)	5.1	6.4		5.0	5.3			9.5		9.5	9.6	
Level of Service	A	A		A	A			A		A	A	
Approach Delay (s)		6.4			5.3			9.5			9.6	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	32.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
20: I-280 NB Off-Ramp & Mariposa St.

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	133	0	0	312	43	219	583	580	0	0	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		5.0	5.0				5.0
Lane Util. Factor		0.95			*0.95		1.00	0.95				0.88
Frt		1.00			0.98		1.00	0.93				0.85
Flt Protected		0.99			1.00		0.95	1.00				1.00
Satd. Flow (prot)		3385			5038		1711	3165				2694
Flt Permitted		0.83			1.00		0.95	1.00				1.00
Satd. Flow (perm)		2833			5038		1711	3165				2694
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	46	166	0	0	390	54	274	729	725	0	0	172
RTOR Reduction (vph)	0	0	0	0	25	0	0	237	0	0	0	163
Lane Group Flow (vph)	0	212	0	0	419	0	274	1217	0	0	0	9
Turn Type	Prot	NA			NA		Split	NA				Over
Protected Phases	1	6			2		8	8				1
Permitted Phases												
Actuated Green, G (s)		35.5			26.5		31.0	31.0				4.0
Effective Green, g (s)		35.5			26.5		31.0	31.0				4.0
Actuated g/C Ratio		0.47			0.35		0.41	0.41				0.05
Clearance Time (s)		4.5			4.5		5.0	5.0				5.0
Lane Grp Cap (vph)		1352			1756		697	1290				141
v/s Ratio Prot		c0.01			c0.08		0.16	c0.38				0.00
v/s Ratio Perm		0.06										
v/c Ratio		0.16			0.24		0.39	0.94				0.06
Uniform Delay, d1		11.6			17.6		15.9	21.7				34.2
Progression Factor		1.00			1.00		1.00	1.00				1.00
Incremental Delay, d2		0.2			0.3		1.7	14.8				0.9
Delay (s)		11.9			17.9		17.5	36.4				35.1
Level of Service		B			B		B	D				D
Approach Delay (s)		11.9			17.9			33.4			35.1	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	29.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
21: I-280 SB On-Ramp & Mariposa St.

9/15/2015

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	170	128	338	330	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0		
Lane Util. Factor	0.95	0.95	0.97	1.00		
Frpb, ped/bikes	1.00	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	0.99	0.85	1.00	1.00		
Flt Protected	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1690	1428	3319	1801		
Flt Permitted	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1690	1428	3319	1801		
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	207	156	412	402	0	0
RTOR Reduction (vph)	3	53	0	0	0	0
Lane Group Flow (vph)	220	87	412	402	0	0
Confl. Peds. (#/hr)		5	5			
Confl. Bikes (#/hr)		5				
Turn Type	NA	Perm	Prot	NA		
Protected Phases	4		3	8		
Permitted Phases		4				
Actuated Green, G (s)	37.3	37.3	12.7	60.0		
Effective Green, g (s)	37.3	37.3	12.7	60.0		
Actuated g/C Ratio	0.62	0.62	0.21	1.00		
Clearance Time (s)	5.0	5.0	5.0	5.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	1050	887	702	1801		
v/s Ratio Prot	0.13		c0.12	c0.22		
v/s Ratio Perm		0.06				
v/c Ratio	0.21	0.10	0.59	0.22		
Uniform Delay, d1	4.9	4.6	21.3	0.0		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.1	0.0	1.3	0.1		
Delay (s)	5.0	4.6	22.5	0.1		
Level of Service	A	A	C	A		
Approach Delay (s)	4.9			11.4	0.0	
Approach LOS	A			B	A	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
22: Third St. & Cesar Chavez

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	44	109	13	38	15	101	339	5	39	336	114
Ideal Flow (vphpl)	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Lost time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.93		1.00	0.96		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.97	1.00		0.94	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.89		1.00	0.96		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1180	1898		1141	1182		1215	2422		1215	2286	
Flt Permitted	0.41	1.00		0.64	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	511	1898		773	1182		1215	2422		1215	2286	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	144	49	122	15	43	17	113	381	6	44	378	128
RTOR Reduction (vph)	0	81	0	0	14	0	0	1	0	0	27	0
Lane Group Flow (vph)	144	90	0	15	46	0	113	386	0	44	479	0
Confl. Peds. (#/hr)	100		100	100		100			100			100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)		5	5									
Turn Type	pm+pt	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	26.4	26.4		7.1	7.1		10.5	24.7		10.6	24.8	
Effective Green, g (s)	26.4	26.4		7.1	7.1		10.5	24.7		10.6	24.8	
Actuated g/C Ratio	0.34	0.34		0.09	0.09		0.13	0.32		0.14	0.32	
Clearance Time (s)	5.3	5.3		5.3	5.3		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	293	642		70	107		163	766		165	726	
v/s Ratio Prot	c0.09	0.05			0.04		c0.09	0.16		0.04	c0.21	
v/s Ratio Perm	c0.08			0.02								
v/c Ratio	0.49	0.14		0.21	0.43		0.69	0.50		0.27	0.66	
Uniform Delay, d1	19.7	17.9		32.9	33.5		32.2	21.7		30.2	23.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.1		1.5	2.8		12.0	0.5		0.9	2.3	
Delay (s)	21.0	18.0		34.4	36.3		44.2	22.2		31.1	25.2	
Level of Service	C	B		C	D		D	C		C	C	
Approach Delay (s)		19.4			36.0			27.2			25.7	
Approach LOS		B			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
23: I-280 Ramps & Pennsylvania

10/21/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	234	148	175	201
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	254	161	190	218
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			505			
pX, platoon unblocked						
vC, conflicting volume	853	127			254	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	853	127			254	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			85	
cM capacity (veh/h)	255	899			1308	

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	127	127	161	190	218
Volume Left	0	0	0	190	0
Volume Right	0	0	161	0	0
cSH	1700	1700	1700	1308	1700
Volume to Capacity	0.07	0.07	0.09	0.15	0.13
Queue Length 95th (ft)	0	0	0	13	0
Control Delay (s)	0.0	0.0	0.0	8.2	0.0
Lane LOS				A	
Approach Delay (s)	0.0			3.8	
Approach LOS					

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	25.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
25: 18th St & 280 SB Off-Ramp

9/15/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	107	69	0	223	84
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	116	75	0	242	91
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	75				133	75
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	75				133	75
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				71	91
cM capacity (veh/h)	1522				847	971

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	58	58	75	334
Volume Left	0	0	0	242
Volume Right	0	0	0	91
cSH	1700	1700	1700	878
Volume to Capacity	0.03	0.03	0.04	0.38
Queue Length 95th (ft)	0	0	0	45
Control Delay (s)	0.0	0.0	0.0	11.6
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.6
Approach LOS				B

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
26: 18th St & 280 NB On-Ramp
9/15/2015

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	67	263	69	284	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	73	286	75	309	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	384				364	75
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	384				364	75
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				100	100
cM capacity (veh/h)	1171				571	971

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	168	191	75	309	0
Volume Left	73	0	0	0	0
Volume Right	0	0	0	309	0
cSH	1171	1700	1700	1700	1700
Volume to Capacity	0.06	0.11	0.04	0.18	0.00
Queue Length 95th (ft)	5	0	0	0	0
Control Delay (s)	3.9	0.0	0.0	0.0	0.0
Lane LOS	A				A
Approach Delay (s)	1.8		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
27: Third St. & 20th St
9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	41	18	89	31	170	33	405	69	193	363	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.92		1.00	0.98		1.00	0.98	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1550			1470		1540	3012		1540	3019	
Flt Permitted		0.82			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1284			1312		1540	3012		1540	3019	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	45	20	97	34	185	36	440	75	210	395	59
RTOR Reduction (vph)	0	12	0	0	64	0	0	18	0	0	12	0
Lane Group Flow (vph)	0	82	0	0	252	0	36	497	0	210	442	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		19.2			19.2		4.5	27.4		18.4	41.3	
Effective Green, g (s)		19.2			19.2		4.5	27.4		18.4	41.3	
Actuated g/C Ratio		0.24			0.24		0.06	0.34		0.23	0.51	
Clearance Time (s)		5.2			5.2		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	3.0		2.0	3.0	
Lane Grp Cap (vph)		307			314		86	1029		353	1554	
v/s Ratio Prot							0.02	c0.17		c0.14	0.15	
v/s Ratio Perm		0.06			c0.19							
v/c Ratio		0.27			0.80		0.42	0.48		0.59	0.28	
Uniform Delay, d1		24.8			28.7		36.6	20.8		27.6	11.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5			13.7		1.2	1.6		1.8	0.5	
Delay (s)		25.2			42.5		37.8	22.4		29.4	11.5	
Level of Service		C			D		D	C		C	B	
Approach Delay (s)		25.2			42.5			23.4			17.2	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM 2000 Control Delay	24.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	80.2	Sum of lost time (s)	15.2
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
28: Pennsylvania & 280 SB Off-Ramp

9/15/2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	289	32	122	0	0	232
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	314	35	133	0	0	252

Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total (vph)	157	157	35	66	66	252
Volume Left (vph)	157	157	0	0	0	0
Volume Right (vph)	0	0	35	0	0	0
Hadj (s)	0.53	0.53	-0.67	0.03	0.03	0.03
Departure Headway (s)	6.1	6.1	3.2	5.8	5.8	5.4
Degree Utilization, x	0.26	0.26	0.03	0.11	0.11	0.38
Capacity (veh/h)	565	567	1121	588	587	636
Control Delay (s)	10.0	10.0	5.1	8.3	8.3	11.7
Approach Delay (s)	9.6			8.3		11.7
Approach LOS	A			A		B

Intersection Summary			
Delay	10.1		
Level of Service	B		
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
29: Indiana St/280 NB On-Ramp/ Indiana & 25th

9/15/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	104	102	0	0	50	100	16	376	18	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	113	111	0	0	54	109	17	409	20	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total (vph)	224	163	222	224
Volume Left (vph)	113	0	17	0
Volume Right (vph)	0	109	0	20
Hadj (s)	0.13	-0.37	0.07	-0.03
Departure Headway (s)	5.4	5.0	5.6	5.5
Degree Utilization, x	0.33	0.22	0.34	0.34
Capacity (veh/h)	636	676	620	630
Control Delay (s)	11.0	9.4	10.3	10.1
Approach Delay (s)	11.0	9.4	10.2	
Approach LOS	B	A	B	

Intersection Summary			
Delay	10.3		
Level of Service	B		
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	67	45	23	78	12	52	463	126	0	384	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.2			5.2		5.1	5.1			5.1	
Lane Util. Factor		1.00			1.00		1.00	*0.70			*0.70	
Frpb, ped/bikes		0.97			0.99		1.00	0.94			0.97	
Flpb, ped/bikes		0.97			0.99		1.00	1.00			1.00	
Frt		0.96			0.99		1.00	0.97			0.98	
Flt Protected		0.98			0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1266			1537		1540	2056			2164	
Flt Permitted		0.86			0.92		0.95	1.00			1.00	
Satd. Flow (perm)		1102			1425		1540	2056			2164	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	54	71	47	24	82	13	55	487	133	0	404	47
RTOR Reduction (vph)	0	15	0	0	5	0	0	11	0	0	5	0
Lane Group Flow (vph)	0	157	0	0	114	0	55	609	0	0	446	0
Confl. Peds. (#/hr)	100		100	100		100			100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)	5	5	5									
Turn Type	Perm	NA		Perm	NA		Prot	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8								
Actuated Green, G (s)		19.1			19.1		13.5	70.6			52.0	
Effective Green, g (s)		19.1			19.1		13.5	70.6			52.0	
Actuated g/C Ratio		0.19			0.19		0.14	0.71			0.52	
Clearance Time (s)		5.2			5.2		5.1	5.1			5.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		210			272		207	1451			1125	
v/s Ratio Prot							0.04	c0.30			0.21	
v/s Ratio Perm		c0.14			0.08							
v/c Ratio		0.75			0.42		0.27	0.42			0.40	
Uniform Delay, d1		38.2			35.6		38.8	6.1			14.5	
Progression Factor		1.00			1.00		1.00	1.00			1.16	
Incremental Delay, d2		13.4			1.0		0.7	0.9			0.9	
Delay (s)		51.6			36.6		39.5	7.0			17.7	
Level of Service		D			D		D	A			B	
Approach Delay (s)		51.6			36.6			9.7			17.7	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	19.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.4
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	127	319	0	0	146	143	93	112	211	43	0	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.86	1.00	1.00	0.87	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85	1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1540	3079			3079	1032	1540	1621	1202	1540		1205
Flt Permitted	0.95	1.00			1.00	1.00	0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1540	3079			3079	1032	1540	1621	1202	1540		1205
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	134	336	0	0	154	151	98	118	222	45	0	166
RTOR Reduction (vph)	0	0	0	0	0	103	0	0	188	0	0	149
Lane Group Flow (vph)	134	336	0	0	154	48	98	118	34	45	0	17
Confl. Peds. (#/hr)			100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)						5						5
Turn Type	Prot	NA			NA	Perm	Split	NA	Perm	Prot		Prot
Protected Phases	5	2			6		8	8		7		7
Permitted Phases						6			8	7		7
Actuated Green, G (s)	11.9	41.3			24.4	24.4	11.8	11.8	11.8	8.1		8.1
Effective Green, g (s)	11.9	41.3			24.4	24.4	11.8	11.8	11.8	8.1		8.1
Actuated g/C Ratio	0.15	0.53			0.32	0.32	0.15	0.15	0.15	0.10		0.10
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0	6.0	6.0	5.0		5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	237	1647			973	326	235	247	183	161		126
v/s Ratio Prot	c0.09	c0.11			0.05		0.06	c0.07		c0.03		0.01
v/s Ratio Perm						0.05			0.03			
v/c Ratio	0.57	0.20			0.16	0.15	0.42	0.48	0.19	0.28		0.14
Uniform Delay, d1	30.3	9.4			19.0	18.9	29.6	29.9	28.5	31.9		31.4
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	3.1	0.3			0.3	0.9	1.2	1.5	0.5	1.0		0.5
Delay (s)	33.3	9.6			19.4	19.9	30.8	31.3	29.0	32.8		31.9
Level of Service	C	A			B	B	C	C	C	C		C
Approach Delay (s)		16.4			19.6			30.0			32.1	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	77.2	Sum of lost time (s)	21.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	18	53	5	20	5	26	28	2	10	50	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		0.95			1.00		1.00	1.00		1.00	1.00	
Frt		0.91			0.98		1.00	0.99		1.00	0.96	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3082			1749		1711	1784		1711	1722	
Flt Permitted		0.93			0.98		1.00	1.00		1.00	1.00	
Satd. Flow (perm)		2885			1722		1801	1784		1801	1722	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	20	58	5	22	5	28	30	2	11	54	22
RTOR Reduction (vph)	0	19	0	0	2	0	0	2	0	0	20	0
Lane Group Flow (vph)	0	77	0	0	30	0	28	30	0	11	56	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		25.5			25.5		3.1	3.1		3.1	3.1	
Effective Green, g (s)		25.5			25.5		3.1	3.1		3.1	3.1	
Actuated g/C Ratio		0.68			0.68		0.08	0.08		0.08	0.08	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1956			1167		148	147		148	141	
v/s Ratio Prot								0.02			c0.03	
v/s Ratio Perm		c0.03			0.02		0.02			0.01		
v/c Ratio		0.04			0.03		0.19	0.21		0.07	0.40	
Uniform Delay, d1		2.0			2.0		16.1	16.1		15.9	16.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0			0.0		0.6	0.7		0.2	1.8	
Delay (s)		2.0			2.0		16.7	16.8		16.1	18.2	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.0			2.0			16.8			17.9	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.08		
Actuated Cycle Length (s)	37.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	21.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

2040 Cumulative with Project with M-TR-11c
Basketball Game – Saturday Evening
Mitigated Results Pennsylvania/I-280 SB off-ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	632	58	265	0	0	652
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0			5.0
Lane Util. Factor	0.97	1.00	0.95			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3319	1531	3421			1801
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3319	1531	3421			1801
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	687	63	288	0	0	709
RTOR Reduction (vph)	0	41	0	0	0	0
Lane Group Flow (vph)	687	22	288	0	0	709
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	21.0	21.0	29.0			29.0
Effective Green, g (s)	21.0	21.0	29.0			29.0
Actuated g/C Ratio	0.35	0.35	0.48			0.48
Clearance Time (s)	5.0	5.0	5.0			5.0
Lane Grp Cap (vph)	1161	535	1653			870
v/s Ratio Prot	c0.21		0.08			c0.39
v/s Ratio Perm		0.01				
v/c Ratio	0.59	0.04	0.17			0.81
Uniform Delay, d1	16.0	12.9	8.7			13.2
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	2.2	0.1	0.2			8.3
Delay (s)	18.2	13.0	9.0			21.5
Level of Service	B	B	A			C
Approach Delay (s)	17.8		9.0			21.5
Approach LOS	B		A			C

Intersection Summary			
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX WS2

Supplemental Wind Study

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TABLES

CONSULTING ENGINEERS & SCIENTISTS

Table 1a: Wind Hazard Results

References	Existing			Mitigation 1				Mitigation 2			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
1	41	13	e	42	16	3	e	41	9	-4	e
2	28	0		29	0	0		29	0	0	
3	22	0		18	0	0		18	0	0	
4	14	0		19	0	0		20	0	0	
5	36	0		28	0	0		29	0	0	
6	36	0		44	38	38	e	43	35	35	e
7	39	6	e	34	0	-6		34	0	-6	
8	35	0		25	0	0		26	0	0	
9	29	0		26	0	0		26	0	0	
10	24	0		23	0	0		24	0	0	
11	15	0		29	0	0		30	0	0	
12	24	0		23	0	0		24	0	0	
13	33	0		27	0	0		28	0	0	
14	30	0		30	0	0		31	0	0	
15	32	0		30	0	0		30	0	0	
16	27	0		20	0	0		20	0	0	
17	21	0		16	0	0		16	0	0	
18	18	0		32	0	0		33	0	0	
19	20	0		31	0	0		32	0	0	
20	24	0		23	0	0		22	0	0	
21	30	0		25	0	0		22	0	0	

Table 1a: Wind Hazard Results

References	Existing			Mitigation 1				Mitigation 2			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
22	26	0		23	0	0		23	0	0	
23	21	0		28	0	0		29	0	0	
24	23	0		17	0	0		18	0	0	
25	26	0		16	0	0		16	0	0	
26	34	0		19	0	0		19	0	0	
27	32	0		26	0	0		27	0	0	
28	28	0		31	0	0		32	0	0	
29	25	0		21	0	0		22	0	0	
30	23	0		21	0	0		21	0	0	
31	24	0		22	0	0		23	0	0	
32	24	0		35	0	0		35	0	0	
33	27	0		26	0	0		25	0	0	
34	Data not available			25	0	-		25	0	-	
35				33	0	-		33	0	-	
36				26	0	-		26	0	-	
37				15	0	-		15	0	-	
38				16	0	-		17	0	-	
39				21	0	-		22	0	-	
40				31	0	-		32	0	-	
41				33	0	-		34	0	-	
42				21	0	-		21	0	-	

Table 1a: Wind Hazard Results

References	Existing			Mitigation 1				Mitigation 2			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
43	Data not available			39	5	-	e	39	5	-	e
44				34	0	-		34	0	-	
45				25	0	-		26	0	-	
46				25	0	-		26	0	-	
47				23	0	-		24	0	-	
48				22	0	-		22	0	-	
49	31	0		22	0	0		22	0	0	
50	35	0		40	7	7	e	40	7	7	e
51	34	0		23	0	0		23	0	0	
52	31	0		25	0	0		25	0	0	
53	23	0		28	0	0		28	0	0	
54	38	3	e	25	0	-3		25	0	-3	
55	29	0		23	0	0		23	0	0	
56	22	0		20	0	0		20	0	0	
57	30	0		27	0	0		27	0	0	
58	19	0		24	0	0		24	0	0	
59	21	0		22	0	0		23	0	0	
60	Data not available			Data not available				Data not available			
61											
62				31	0	-		32	0	-	
63				29	0	-		30	0	-	

Table 1a: Wind Hazard Results

References	Existing			Mitigation 1				Mitigation 2			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
64	Data not available			36	1	-		36	1	-	
65				45	24	-	e	45	24	-	e
66				38	3	-	e	38	3	-	e
67				28	0	-		27	0	-	
68				24	0	-		23	0	-	
69				11	0	-		10	0	-	
70				11	0	-		10	0	-	
71				21	0	-		22	0	-	
72				24	0	-		25	0	-	
73				43	16	-	e	43	16	-	e
74				20	0	-		20	0	-	
75				19	0	-		18	0	-	
76				28	0	-		28	0	-	
77				24	0	-		23	0	-	
78				17	0	-		17	0	-	
79				22	0	-		22	0	-	
80				10	0	-		9	0	-	
81				24	0	-		22	0	-	
82	31	0		27	0	0		26	0	0	
83	31	0		30	0	0		29	0	0	
84	34	0		21	0	0		20	0	0	

Table 1a: Wind Hazard Results

References	Existing			Mitigation 1				Mitigation 2			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
85	31	0		26	0	0		25	0	0	
86	32	0		20	0	0		20	0	0	
87	31	0		18	0	0		17	0	0	
88	32	0		11	0	0		11	0	0	
89	31	0		11	0	0		11	0	0	
90	29	0		23	0	0		22	0	0	
91	34	0		25	0	0		23	0	0	
92	32	0		20	0	0		20	0	0	
93	31	0		28	0	0		27	0	0	
94	29	0		19	0	0		19	0	0	
95	35	0		24	0	0		23	0	0	
96	29	0		30	0	0		30	0	0	
97	34	0		21	0	0		21	0	0	
98	39	6	e	31	0	-6		31	0	-6	
99	40	8	e	43	23	15	e	40	9	1	e
100	22	0		22	0	0		22	0	0	
101	32	0		28	0	0		29	0	0	
102	35	0		32	0	0		33	0	0	
103	37	1	e	35	0	-1		36	0	-1	
104	33	0		33	0	0		32	0	0	
105	45	70	e	42	40	-30	e	42	40	-30	e

Table 1a: Wind Hazard Results

References	Existing			Mitigation 1				Mitigation 2			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
106	39	5	e	41	9	4	e	40	8	3	e
107	Data not available			Data not available				Data not available			
108											
109	29	0		Data not available				Data not available			
110	28	0									
111	32	0									
112	35	0									
113	31	0									
114	28	0									
115	29	0									
116	34	0									
117	30	0									
118	29	0									
119	26	0									
120	28	0									
121	26	0									
122	31	0									
123	30	0									
124	27	0									
125	33	0									
126	33	0									

Table 1a: Wind Hazard Results

References	Existing			Mitigation 1				Mitigation 2			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
127	34	0									
128	32	0									
129	33	0									
130	31	0									
131	33	0									
132	33	0									
133	33	0									
134	34	0									
135	33	0		Data not available				Data not available			
136	32	0									
137	28	0									
138	29	0									
139	32	0									
140	32	0									
141	31	0									
142	33	0									
Average Wind Speeds, Total Hours & Exceeds	**30**	**112**	**8/103**	**26**	**182**	**-**	**10/104**	**26**	**157**	**-**	**10/104**
Averages & Totals – Sidewalks & Plaza*	**29**	**112**	**8/69**	**26**	**133**	**21**	**6/69**	**26**	**108**	**-4**	**6/69**

*Sidewalks & Plaza: Locations 1 – 33, 49 – 59, 82 – 106

Table 1b: Wind Hazard Results

References	Mitigation 3				Mitigation 4				Mitigation 5			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
1	40	7	-6	e	39	6	-7	e	41	9	-4	e
2	29	0	0		29	0	0		28	0	0	
3	18	0	0		18	0	0		18	0	0	
4	19	0	0		18	0	0		19	0	0	
5	28	0	0		28	0	0		28	0	0	
6	44	39	39	e	43	30	30	e	43	34	34	e
7	34	0	-6		34	0	-6		34	0	-6	
8	26	0	0		25	0	0		25	0	0	
9	27	0	0		27	0	0		29	0	0	
10	23	0	0		22	0	0		24	0	0	
11	29	0	0		28	0	0		29	0	0	
12	24	0	0		23	0	0		23	0	0	
13	27	0	0		27	0	0		27	0	0	
14	31	0	0		30	0	0		31	0	0	
15	30	0	0		30	0	0		29	0	0	
16	20	0	0		20	0	0		20	0	0	
17	16	0	0		15	0	0		16	0	0	
18	31	0	0		30	0	0		32	0	0	
19	29	0	0		28	0	0		30	0	0	
20	24	0	0		22	0	0		26	0	0	
21	27	0	0		27	0	0		25	0	0	

Table 1b: Wind Hazard Results

References	Mitigation 3				Mitigation 4				Mitigation 5			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
22	23	0	0		23	0	0		25	0	0	
23	27	0	0		26	0	0		28	0	0	
24	18	0	0		18	0	0		18	0	0	
25	16	0	0		15	0	0		16	0	0	
26	19	0	0		18	0	0		18	0	0	
27	25	0	0		26	0	0		26	0	0	
28	31	0	0		31	0	0		31	0	0	
29	21	0	0		21	0	0		21	0	0	
30	22	0	0		21	0	0		22	0	0	
31	22	0	0		22	0	0		22	0	0	
32	35	0	0		34	0	0		35	0	0	
33	26	0	0		26	0	0		27	0	0	
34	26	0	-		26	0	-		26	0	-	
35	33	0	-		33	0	-		34	0	-	
36	26	0	-		26	0	-		26	0	-	
37	15	0	-		15	0	-		15	0	-	
38	16	0	-		16	0	-		16	0	-	
39	21	0	-		21	0	-		21	0	-	
40	32	0	-		32	0	-		32	0	-	
41	34	0	-		34	0	-		34	0	-	
42	21	0	-		21	0	-		21	0	-	

Table 1b: Wind Hazard Results

References	Mitigation 3				Mitigation 4				Mitigation 5			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
43	39	5	-	e	39	5	-	e	39	5	-	e
44	34	0	-		33	0	-		34	0	-	
45	26	0	-		25	0	-		25	0	-	
46	25	0	-		25	0	-		25	0	-	
47	23	0	-		23	0	-		23	0	-	
48	21	0	-		21	0	-		22	0	-	
49	23	0	0		22	0	0		22	0	0	
50	40	7	7	e	40	7	7	e	40	7	7	e
51	23	0	0		23	0	0		23	0	0	
52	25	0	0		25	0	0		25	0	0	
53	28	0	0		28	0	0		29	0	0	
54	25	0	-3		24	0	-3		25	0	-3	
55	23	0	0		23	0	0		23	0	0	
56	20	0	0		19	0	0		20	0	0	
57	27	0	0		26	0	0		27	0	0	
58	23	0	0		23	0	0		24	0	0	
59	23	0	0		23	0	0		23	0	0	
60	Data not available				Data not available				Data not available			
61												
62	32	0	-		31	0	-		32	0	-	
63	30	0	-		29	0	-		30	0	-	

Table 1b: Wind Hazard Results

References	Mitigation 3				Mitigation 4				Mitigation 5			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
64	36	1	-		35	0	-		36	1	-	
65	45	24	-	e	45	24	-	e	45	24	-	e
66	38	3	-	e	38	3	-	e	38	3	-	e
67	28	0	-		28	0	-		28	0	-	
68	23	0	-		23	0	-		23	0	-	
69	11	0	-		11	0	-		11	0	-	
70	9	0	-		10	0	-		10	0	-	
71	21	0	-		21	0	-		21	0	-	
72	24	0	-		24	0	-		24	0	-	
73	43	16	-	e	43	16	-	e	43	16	-	e
74	19	0	-		19	0	-		20	0	-	
75	19	0	-		18	0	-		19	0	-	
76	27	0	-		26	0	-		27	0	-	
77	24	0	-		24	0	-		24	0	-	
78	17	0	-		17	0	-		17	0	-	
79	22	0	-		22	0	-		22	0	-	
80	10	0	-		9	0	-		9	0	-	
81	23	0	-		23	0	-		23	0	-	
82	27	0	0		26	0	0		26	0	0	
83	30	0	0		29	0	0		29	0	0	
84	21	0	0		20	0	0		21	0	0	

Table 1b: Wind Hazard Results

References	Mitigation 3				Mitigation 4				Mitigation 5			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
85	25	0	0		25	0	0		24	0	0	
86	20	0	0		20	0	0		20	0	0	
87	17	0	0		18	0	0		18	0	0	
88	11	0	0		11	0	0		11	0	0	
89	11	0	0		11	0	0		12	0	0	
90	23	0	0		23	0	0		24	0	0	
91	24	0	0		24	0	0		25	0	0	
92	20	0	0		20	0	0		20	0	0	
93	28	0	0		27	0	0		27	0	0	
94	19	0	0		20	0	0		19	0	0	
95	25	0	0		24	0	0		24	0	0	
96	31	0	0		30	0	0		30	0	0	
97	23	0	0		21	0	0		22	0	0	
98	30	0	-6		37	8	2	e	37	9	3	e
99	43	24	16	e	40	9	1	e	41	17	9	e
100	22	0	0		21	0	0		22	0	0	
101	28	0	0		28	0	0		28	0	0	
102	32	0	0		31	0	0		32	0	0	
103	34	0	-1		34	0	-1		35	0	-1	
104	32	0	0		32	0	0		32	0	0	
105	42	40	-30	e	42	40	-30	e	42	40	-30	e

Table 1b: Wind Hazard Results

References	Mitigation 3				Mitigation 4				Mitigation 5			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
106	40	7	2	e	40	8	3	e	40	8	3	e
107	Data not available				Data not available				Data not available			
108												
109	Data not available				Data not available				Data not available			
110												
111												
112												
113												
114												
115												
116												
117												
118												
119												
120												
121												
122												
123												
124												
125												
126												

Table 1b: Wind Hazard Results

References	Mitigation 3				Mitigation 4				Mitigation 5			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
127	Data not available				Data not available				Data not available			
128												
129												
130												
131												
132												
133												
134												
135												
136												
137												
138												
139												
140												
141												
142												
Average Wind Speeds, Total Hours & Exceeds	**26**	**173**	**-**	**10 / 104**	**26**	**156**	**-**	**11 / 104**	**26**	**173**	**-**	**11 / 104**
Averages & Totals – Sidewalks & Plaza*	**26**	**124**	**12**	**6 / 69**	**26**	**108**	**-4**	**7 / 69**	**26**	**124**	**12**	**7 / 69**

*Sidewalks & Plaza: Locations 1 – 33, 49 – 59, 82 – 106

CONSULTING ENGINEERS & SCIENTISTS

Table 1c: Wind Hazard Results

References	Mitigation 6				Mitigation 7			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
1	40	7	-6	e	41	10	-3	e
2	28	0	0		28	0	0	
3	18	0	0		18	0	0	
4	19	0	0		19	0	0	
5	29	0	0		28	0	0	
6	43	32	32	e	43	32	32	e
7	34	0	-6		34	0	-6	
8	25	0	0		25	0	0	
9	26	0	0		28	0	0	
10	24	0	0		24	0	0	
11	29	0	0		29	0	0	
12	23	0	0		23	0	0	
13	28	0	0		28	0	0	
14	31	0	0		30	0	0	
15	30	0	0		29	0	0	
16	20	0	0		20	0	0	
17	16	0	0		16	0	0	
18	32	0	0		32	0	0	
19	31	0	0		30	0	0	
20	23	0	0		25	0	0	
21	22	0	0		27	0	0	

Table 1c: Wind Hazard Results

References	Mitigation 6				Mitigation 7			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
22	23	0	0		23	0	0	
23	28	0	0		28	0	0	
24	18	0	0		18	0	0	
25	16	0	0		16	0	0	
26	19	0	0		18	0	0	
27	26	0	0		26	0	0	
28	31	0	0		31	0	0	
29	22	0	0		21	0	0	
30	21	0	0		22	0	0	
31	22	0	0		22	0	0	
32	34	0	0		33	0	0	
33	26	0	0		26	0	0	
34	25	0	-		25	0	-	
35	33	0	-		33	0	-	
36	26	0	-		26	0	-	
37	15	0	-		15	0	-	
38	16	0	-		16	0	-	
39	21	0	-		21	0	-	
40	31	0	-		31	0	-	
41	33	0	-		33	0	-	
42	21	0	-		21	0	-	

Table 1c: Wind Hazard Results

References	Mitigation 6				Mitigation 7			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
43	39	5	-	e	39	5	-	e
44	34	0	-		33	0	-	
45	25	0	-		25	0	-	
46	25	0	-		24	0	-	
47	23	0	-		23	0	-	
48	21	0	-		21	0	-	
49	22	0	0		21	0	0	
50	40	7	7	e	40	7	7	e
51	23	0	0		23	0	0	
52	25	0	0		24	0	0	
53	28	0	0		28	0	0	
54	24	0	-3		24	0	-3	
55	23	0	0		23	0	0	
56	19	0	0		19	0	0	
57	26	0	0		26	0	0	
58	23	0	0		23	0	0	
59	23	0	0		22	0	0	
60	Data not available				Data not available			
61								
62	31	0	-		31	0	-	
63	29	0	-		29	0	-	

Table 1c: Wind Hazard Results

References	Mitigation 6				Mitigation 7			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
64	35	0	-		35	0	-	
65	45	24	-	e	45	24	-	e
66	38	3	-	e	38	3	-	e
67	27	0	-		27	0	-	
68	23	0	-		23	0	-	
69	11	0	-		11	0	-	
70	10	0	-		10	0	-	
71	21	0	-		21	0	-	
72	24	0	-		24	0	-	
73	43	16	-	e	43	16	-	e
74	19	0	-		19	0	-	
75	18	0	-		18	0	-	
76	27	0	-		27	0	-	
77	23	0	-		24	0	-	
78	17	0	-		16	0	-	
79	22	0	-		22	0	-	
80	9	0	-		9	0	-	
81	22	0	-		22	0	-	
82	26	0	0		26	0	0	
83	29	0	0		29	0	0	
84	20	0	0		20	0	0	

Table 1c: Wind Hazard Results

References	Mitigation 6				Mitigation 7			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
85	25	0	0		25	0	0	
86	19	0	0		19	0	0	
87	17	0	0		17	0	0	
88	11	0	0		11	0	0	
89	12	0	0		11	0	0	
90	22	0	0		22	0	0	
91	23	0	0		23	0	0	
92	19	0	0		19	0	0	
93	28	0	0		27	0	0	
94	18	0	0		18	0	0	
95	24	0	0		24	0	0	
96	30	0	0		30	0	0	
97	22	0	0		22	0	0	
98	31	0	-6		31	0	-6	
99	41	16	8	e	41	11	3	e
100	22	0	0		21	0	0	
101	29	0	0		28	0	0	
102	32	0	0		32	0	0	
103	34	0	-1		34	0	-1	
104	32	0	0		33	0	0	
105	42	40	-30	e	42	40	-30	e

Table 1c: Wind Hazard Results

References	Mitigation 6				Mitigation 7			
Location Number	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds	Wind Speed Exceeded 1 hour/year (mph)	Hours per Year Wind Speed Exceeds Hazard Criteria	Hours Change Relative to Existing	Exceeds
106	40	8	3	e	40	7	2	e
107	Data not available				Data not available			
108								
109	Data not available				Data not available			
110								
111								
112								
113								
114								
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117								
118								
119								
120								
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125								
126								

Table 1c: Wind Hazard Results

<table>
<tr><th>References</th><th colspan="4">Mitigation 6</th><th colspan="4">Mitigation 7</th></tr>
<tr><th>Location Number</th><th>Wind Speed Exceeded 1 hour/year (mph)</th><th>Hours per Year Wind Speed Exceeds Hazard Criteria</th><th>Hours Change Relative to Existing</th><th>Exceeds</th><th>Wind Speed Exceeded 1 hour/year (mph)</th><th>Hours per Year Wind Speed Exceeds Hazard Criteria</th><th>Hours Change Relative to Existing</th><th>Exceeds</th></tr>
<tr><td>127</td><td colspan="4" rowspan="16">Data not available</td><td colspan="4" rowspan="16">Data not available</td></tr>
<tr><td>128</td></tr>
<tr><td>129</td></tr>
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<tr><td>139</td></tr>
<tr><td>140</td></tr>
<tr><td>141</td></tr>
<tr><td>142</td></tr>
<tr><td>**Average Wind Speeds, Total Hours & Exceeds**</td><td>**26**</td><td>**158**</td><td>**-**</td><td>**10/104**</td><td>**26**</td><td>**155**</td><td>**-**</td><td>**10/104**</td></tr>
<tr><td>**Averages & Totals – Sidewalks & Plaza***</td><td>**26**</td><td>**110**</td><td>**-2**</td><td>**6/69**</td><td>**26**</td><td>**107**</td><td>**-5**</td><td>**6/69**</td></tr>
</table>

*Sidewalks & Plaza: Locations 1 – 33, 49 – 59, 82 – 106

CONSULTING ENGINEERS & SCIENTISTS

Table 2: Description of Configurations

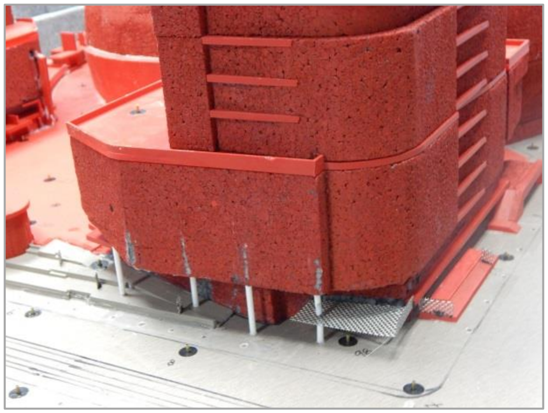
Configuration	Vertical Fins on West Façade of Southwest Office Building	Grade-Level Screens around Southwest Office Building	Canopy at Southwest Corner of Southwest Office Building	Photo
Mitigation 1	Four fins, 17' high	Five screens, 6' high	Porous canopy with porous vertical standoff	
Mitigation 2	-	Five screens, 6' high	Porous canopy with porous vertical standoff	

Table 2: Description of Configurations

Configuration	Vertical Fins on West Façade of Southwest Office Building	Grade-Level Screens around Southwest Office Building	Canopy at Southwest Corner of Southwest Office Building	Photo
Mitigation 3	-	-	Porous canopy with porous vertical standoff	
Mitigation 4	-	-	Solid canopy with porous vertical standoff	

Table 2: Description of Configurations

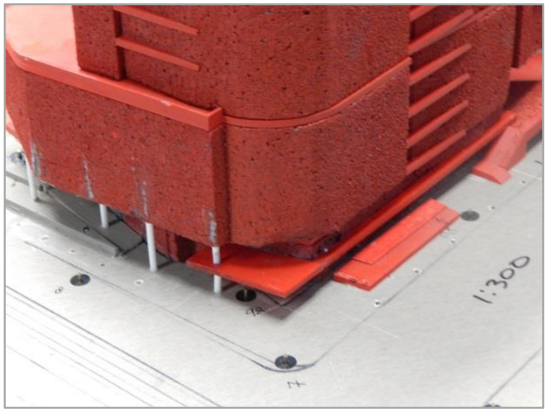
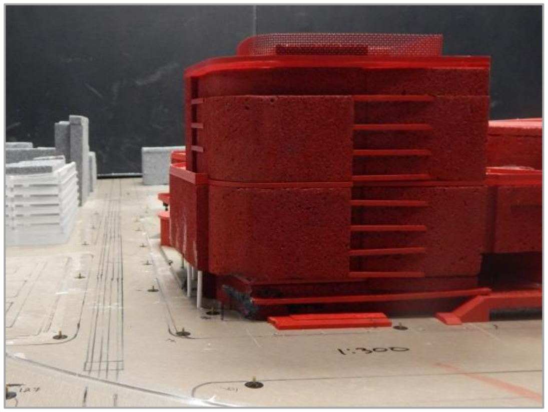
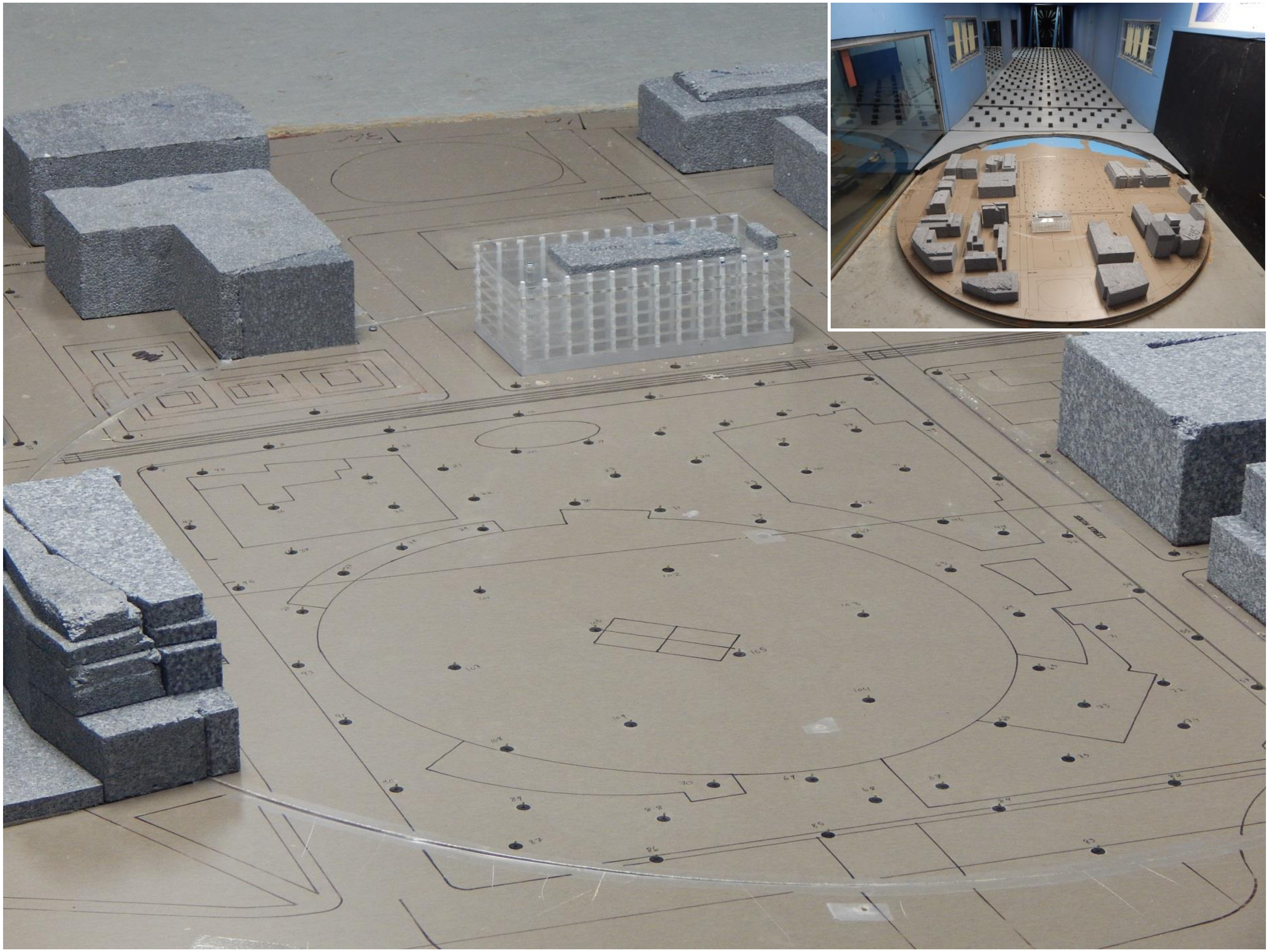
Configuration	Vertical Fins on West Façade of Southwest Office Building	Grade-Level Screens around Southwest Office Building	Canopy at Southwest Corner of Southwest Office Building	Photo
Mitigation 5	-	-	Solid canopy	
Mitigation 6	-	-	Porous canopy	

Table 2: Description of Configurations

Configuration	Vertical Fins on West Façade of Southwest Office Building	Grade-Level Screens around Southwest Office Building	Canopy at Southwest Corner of Southwest Office Building	Photo
Mitigation 7	-	-	-	

FIGURES



Wind Tunnel Study Model
Existing

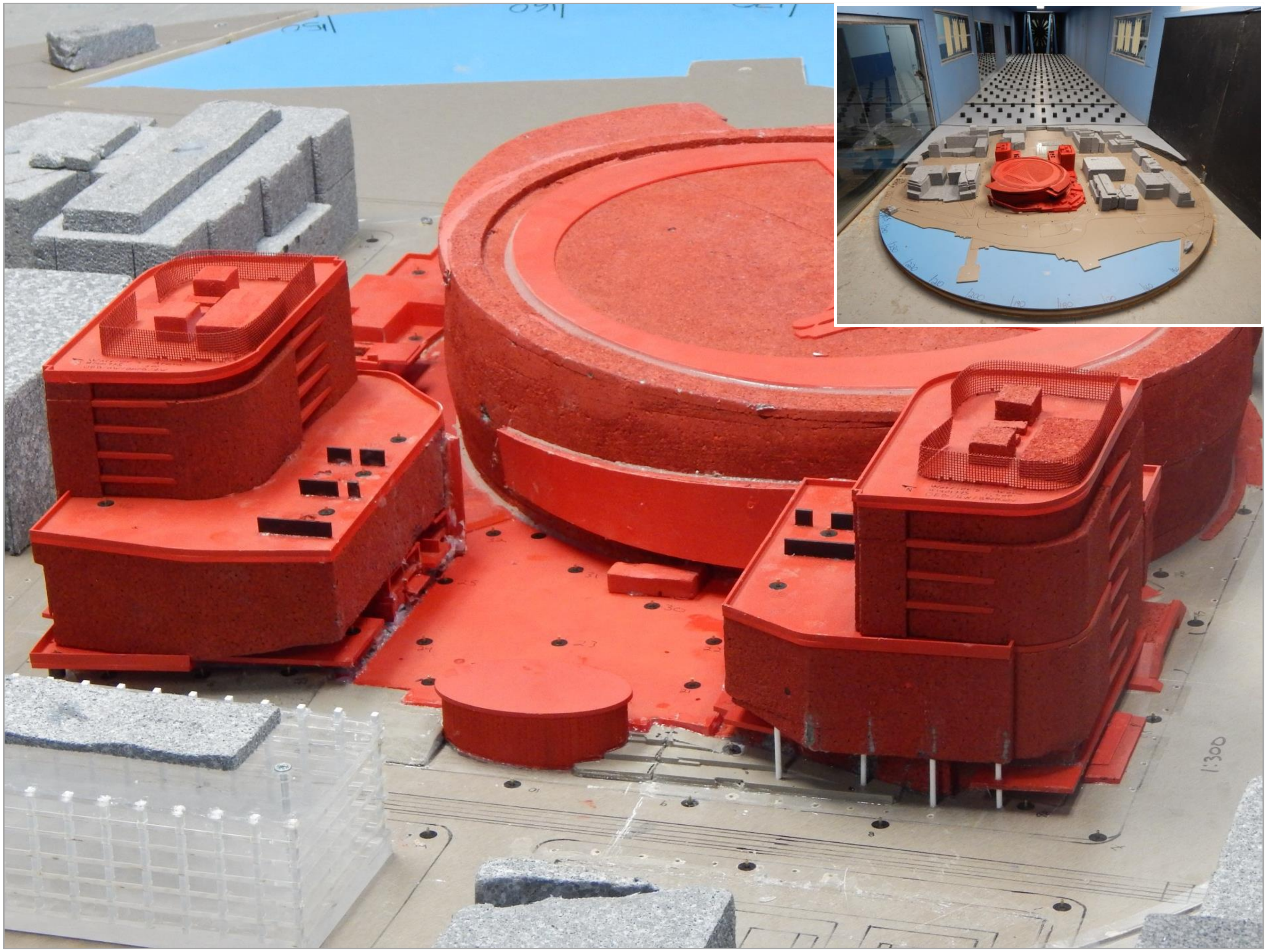
Warrior's Arena – San Francisco, CA

Project #1401775

Figure No. 1a

Date: April 23 , 2015

RWDI



Wind Tunnel Study Model

Existing + Project *(with solid canopy, or "Mitigation 5" in Table 2)*

Warrior's Arena – San Francisco, CA

Project #1401775

Figure No. 1b

Date: May 12 , 2015

RWDI

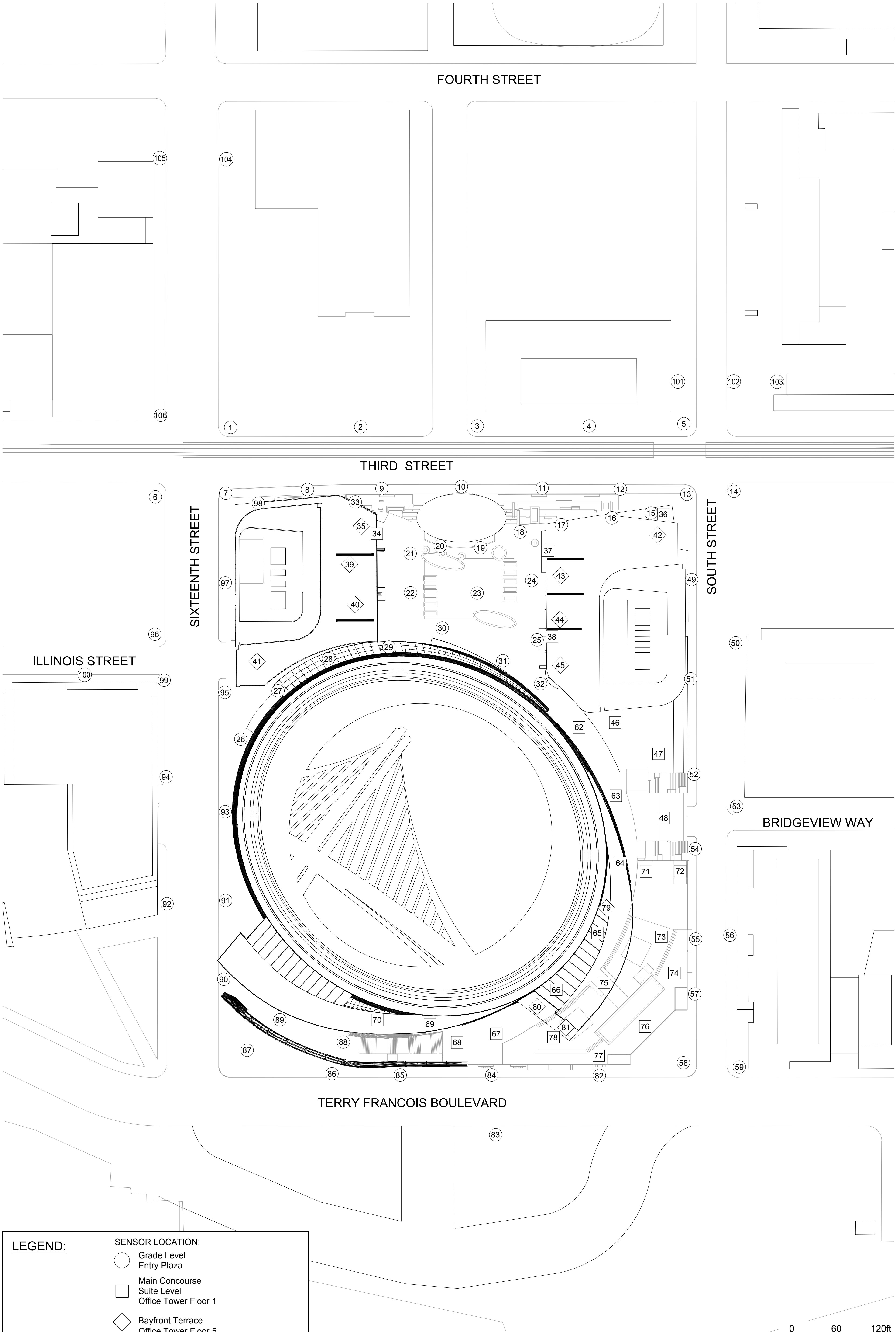
Pedestrian Wind Hazard Conditions - Existing
Annual (January to December, 6:00am to 8:00pm)

Warrior's Arena - San Francisco, CA

True North

Project #1401775

Drawn by: ARM	Figure: 2a
Approx. Scale:	1"=120'
Date Revised:	April 22, 2015



Sensor Locations - Existing + Proposed

Warrior's Arena - San Francisco, CA

Project #1401775

True North

Drawn by: ARM	Figure: 2b
Approx. Scale:	1"=120'
Date Revised:	May 12, 2015

RWDI

APPENDIX COM2

Written Comments (including all Attachments) on Draft SEIR, Uncoded

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STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 4
P.O. BOX 23660
OAKLAND, CA 94623-0660
PHONE (510) 286-5528
FAX (510) 286-5559
TTY 711
www.dot.ca.gov

Serious Drought.
Help save water!

July 20, 2015

SF280144
SF-280-R 6.6
SCH# 2014112045

Mr. Brett Bollinger
Planning Department
City and County of San Francisco
1650 Mission Street, Suite 400
San Francisco, CA 94103

Event Center & Mixed-Use Development at Mission Bay Blocks 29-32 – Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the project referenced above. The proposed project, located on an approximate 11-acre site, would construct a multi-purpose event center and a variety of mixed uses including office, retail, open space, and parking within the Mission Bay South Redevelopment Plan Area of San Francisco. The project site is approximately one half mile from the Interstate 280 (I-280) ramps at Mariposa Street, 18th Street, and Pennsylvania Avenue. Our comments seek to promote the State's smart mobility goals that support a vibrant economy and build active communities rather than sprawl. We have reviewed the Draft Subsequent Environmental Impact Report (SEIR) and have the following comments to offer.

Forecasting
Please clarify why there is only minor difference in volumes at Study Intersections 9, 10, 11, 12, and 13 between Cumulative Project-No Event and Cumulative Project-With Basketball Game Conditions, as shown in Figures 13a and 15a (SEIR, Appendix TR, pgs. TR-156, TR-152). Additionally, Study Intersection 12 shows greater southbound and eastbound volumes in Figure 13a than 15a. The volumes of inbound vehicle trips during the weekday 4-6 and 6-8 peak hour periods are estimated 379 & 2,489 respectively and 2,797 outbound vehicle trips during the 9-11 PM peak period (pg. TR-37). This would appear to show significant Cumulative volumes. Please clarify or revise the report. The report should identify traffic turning movements per study intersection under Basketball Game Only, Convention Only Conditions separately.

Parking

- Given the Project is located on AT&T Parking Lots B & E, please clarify if Mitigation Measure M-TR-11c, which provides additional off-site parking from the Project Plus

Overlapping Giants Evening Game Scenario, should be revised from 1,000 to 1,600 spaces to account for AT&T Park's displaced 600 parking spaces. Table 1-1, which presents the Summary of Proposed Project Facilities, shows the arena will have seating capacity of maximum 18,500 patrons. Approximately 950 vehicle parking spaces are proposed from the combined Blocks 29-32 and the existing off-site 450 South Street Parking Garage (SEIR, Vol. 1, pg. 1-7). Mitigation Measure M-TR-11c states the City shall identify one or more off-site parking lots to provide approximately 250 additional parking spaces for all events and up to approximately 750 additional parking spaces for use during dual events of 12,500 or more event center attendees, for a total of 1,000 additional offsite parking spaces (pg. 1-23). The AT&T Park Post-Game Event Traffic Plan, courtesy of the Mission Bay Transportation Management Agency, is available at the following webpage and identifies AT&T Parking Lots B & E:
http://sanfrancisco.giants.mlb.com/sf/downloads/y2015/postgame_map.pdf.

- Please elaborate how the AT&T Park Post-Game Event Traffic Plan is incorporated within the Project's Transportation and Circulation analysis regarding parking impacts on the surrounding neighborhood and roadways. According to the Post-Game Event Traffic Plan and noted in the report, some streets near AT&T Park and its parking lots are closed beginning in the 7th inning to approximately one hour post-event. Given the Project's additional number of vehicles seeking parking, potential safety issues for all road users should be identified and fully mitigated. Project-related queuing impacts on nearby State facilities should be analyzed. The AT&T Park Post-Game Event Traffic Plan is available at the webpage above.

- Please quantify how many additional Parking Control Officers (PCOs) will be utilized when there are overlapping events. Mitigation Measure M-TR-11a, under Conditions With a SF Giants Evening Game at AT&T Park, states the Project's Transportation Management Plan shall be expanded to include additional PCOs that shall be deployed at some specific intersections (pg. 1-22). Mitigation Measure M-TR-2a, under Conditions Without a SF Giants Game at AT&T Park, states "four additional PCOs shall be deployed to intersection where the proposed project would result in significant impacts, as conditions warrant during events (pg. 1-15).

Interstate 280 Mitigation
Please explain the possible interventions on the I-280 Mariposa Street on-ramp, listed under Contraflow Lane Mitigation in Table 2-1 (pg. 2-17).

Transportation Management Plan
We commend the City's Transportation Management Plan (TMP) to encourage sustainable mode shares and reduce single vehicle occupancy trips. The Project's participation in the Waterfront Transportation Assessment reflects comprehensive early planning efforts and on-going coordination between agencies to assess the mobility needs of travelers and provide

additional services within the Mission Bay Area. We agree the TMP should include documentation for monitoring vehicle trip reduction, including annual reports to demonstrate the ongoing reduction of vehicle trips while continuing to survey the travel patterns of residents and employees within the project area. We recommend the TMP elaborate future coordination between nearby proposed large-scale development projects and their associated Transportation Management Agencies and various Transportation Demand Management measures to ensure the TMP is thoughtfully planned.

Transportation Impact Fees

Please identify any transportation impact fees to be used for project mitigation. Consider including information from the City's local and any relevant regional impact fee program and identify if those programs include improvements to alternative modes. Caltrans encourages the City to ensure sufficient allocation of contributions toward regional transit improvements in order to better mitigate and plan for the impact of future cumulative growth on the regional transportation system. We support projects and measures to reduce vehicle miles traveled and to increase sustainable mode shares.

Mitigation Responsibility

As the lead agency, the City and County of San Francisco is responsible for identifying and ensuring the coordinated implementation of all project mitigations. The project's fair share contribution, financing, scheduling, implementation responsibilities associated with planned improvements on Caltrans ROW should be listed, in addition to identifying viable funding sources per General Plan Guidelines.

Should you have any questions regarding this letter or require additional information, please contact Sherie George at (510) 286-5535 or by email at: sherie.george@dot.ca.gov.

Sincerely,

PATRICIA MAURICE
District Branch Chief
Local Development - Intergovernmental Review

c: State Clearinghouse

State of California—Transportation Agency EDMUND G. BROWN Jr., Governor

DEPARTMENT OF CALIFORNIA HIGHWAY PATROL

San Francisco Area
455 Eighth Street
San Francisco, CA 94103
415-557-1094
(800) 735-2929 (TT/TDD)
(800) 735-2922 (Voice)

LATE
7-20-15
E

RECEIVED
AUG 05 2015
STATE C_EARING HOUSE

August 3, 2015

File No.: 335.14995.12893

State Clearinghouse
1400 Tenth Street, Room 121
Sacramento, CA 95814

Thank you for the opportunity to review the "Notice of Completion" environmental document from the State Clearinghouse regarding the Golden State Warriors multi-purpose event center project, State Clearinghouse #2014112045. The California Highway Patrol is the primary agency that provides traffic law enforcement, safety and traffic management on Interstate 80, Interstate 280 and US 101 within the city limits of San Francisco, California. The San Francisco Area is responsible for these functions and will be affected by the implications of this project. To that end, we offer the following comment:

Our concerns relate to the final design of the proposed 18,064 seat multi-purpose event center with regard to the potential increase in traffic congestion, changes in traffic congestion patterns and the additional enforcement demands on freeways and transition ramps at and near the proposed event center. A year-round event center of this magnitude could potentially affect emergency response times for Area personnel during peak commute times which may have a negative impact on departmental services. Furthermore, in addition to a potential increase in overall traffic congestion, Area resources may also be negatively affected with a potential increase in the number protective service details associated with this event center. Our recommendation would be to further analyze traffic patterns and schedule events appropriately with other event centers and/or city organizers in order to reduce traffic congestion to the greatest extent possible.

If you have any questions, or wish to discuss this matter further, please contact Lieutenant R. Rios at (415) 557-1094.

Sincerely,

C. SHERRY, Captain
Commander
San Francisco Area

cc: Valley Division
Special Projects Section

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

July 21, 2015

Brett Bollinger
City and County of San Francisco
Office of Community Investment & Infrastructure
1650 Mission Street, Ste. 400
San Francisco, CA 94103

Subject: Event Center and Mixed-Use Development at Mission Bay Blocks 29-32
SCH#: 2014112045

Dear Brett Bollinger:

The State Clearinghouse submitted the above named Supplemental EIR to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on July 20, 2015, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

Document Details Report
State Clearinghouse Data Base

SCH# 2014112045
Project Title Event Center and Mixed-Use Development at Mission Bay Blocks 29-32
Lead Agency San Francisco, City and County of

Type **SIR** Supplemental EIR

Description GSW Arena LLC (GSW), an affiliate of Golden State Warriors, LLC, which owns and operates the Golden State Warriors National Basketball Association (NBA) team, proposes to construct a multi-purpose event center and a variety of mixed uses, including office, retail, open space and structured parking on an ~11 acre site (Blocks 29-32) within the Mission Bay South Redevelopment Plan Area of San Francisco. The proposed event center would host the Golden State Warriors basketball team during the NBA season, as well as provide a year round venue for a variety of other uses, including concerts, family shows, other sporting events cultural events, conferences and conventions. GSW has entered into an agreement to purchase the site. The project requires approval of amendments to the Mission Bay Plan Design for Development, among other approvals.

Lead Agency Contact

Name Brett Bollinger
Agency City and County of San Francisco
Phone (415) 575-9024 ***Fax***
email
Address Office of Community Investment & Infrastructure
1650 Mission Street, Ste. 400
City San Francisco ***State*** CA ***Zip*** 94103

Project Location

County San Francisco
City San Francisco
Region
Lat / Long 37° 46' 04" N / 122° 23' 16" W
Cross Streets 16th Street & 3rd Street
Parcel No. Block 8722, Lots 001 and 008
Township ***Range*** ***Section*** ***Base***

Proximity to:

Highways Hwy 101, I-280, I-80
Airports
Railways Caltrain
Waterways San Francisco Bay, Mission Creek
Schools SFUSD
Land Use MB-RA; Mission Bay South Redevelopment Plan - Commercial/Industrial/Retail Designation

Project Issues Archaeologic-Historic; Biological Resources; Drainage/Absorption; Flood Plain/Flooding; Forest Land/Fire Hazard; Geologic/Seismic; Minerals; Population/Housing Balance; Public Services; Recreation/Parks; Schools/Universities; Sewer Capacity; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazardous; Vegetation; Water Quality; Water Supply; Wetland/Riparian; Growth Inducing; Landuse; Cumulative Effects; Other Issues

Reviewing Agencies Resources Agency; Department of Fish and Wildlife, Region 3; Cal Fire; Department of Parks and Recreation; San Francisco Bay Conservation and Development Commission; Department of Water Resources; Office of Emergency Services, California; Resources, Recycling and Recovery; California Highway Patrol; Caltrans, District 4; Air Resources Board; Regional Water Quality Control Board, Region 2; Native American Heritage Commission; Public Utilities Commission; State Lands Commission

Note: Blanks in data fields result from insufficient information provided by lead agency.

Document Details Report
State Clearinghouse Data Base

Date Received 06/04/2015 *Start of Review* 06/04/2015 *End of Review* 07/20/2015

Note: Blanks in data fields result from insufficient information provided by lead agency.

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit

Edmund G. Brown Jr.
Governor

Ken Alex
Director

August 6, 2015

Brett Bollinger
City and County of San Francisco
Office of Community Investment & Infrastructure
1650 Mission Street, Ste. 400
San Francisco, CA 94103

Subject: Event Center and Mixed-Use Development at Mission Bay Blocks 29-32
SCH#: 2014112045

Dear Brett Bollinger:

The enclosed comment (s) on your Supplemental EIR was (were) received by the State Clearinghouse after the end of the state review period, which closed on July 20, 2015. We are forwarding these comments to you because they provide information or raise issues that should be addressed in your final environmental document.

The California Environmental Quality Act does not require Lead Agencies to respond to late comments. However, we encourage you to incorporate these additional comments into your final environmental document and to consider them prior to taking final action on the proposed project.

Please contact the State Clearinghouse at (916) 445-0613 if you have any questions concerning the environmental review process. If you have a question regarding the above-named project, please refer to the ten-digit State Clearinghouse number (2014112045) when contacting this office.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

University of California
San Francisco

UCSF

Campus Planning

Lori Yamauchi
Associate Vice Chancellor

654 Minnesota Street
2nd Floor, Box 0286
San Francisco, CA 94143-0286

Tel: (415) 476-2911
Fax: (415) 476-9478

July 27, 2015

Tiffany Bohee, Executive Director
Office of Community Investment & Infrastructure
One South Van Ness Avenue, 5th Floor
San Francisco, CA 94103

RE: **Comments on Warriors' San Francisco Event Center Draft Subsequent Environmental Impact Report "DEIR"**
OCII Case No. ER 2014-919-97

Dear Ms. Bohee:

Thank you for the opportunity to review and comment on the Draft Subsequent Environmental Impact Report ("DEIR") for the proposed Golden State Warriors' ("GSW") Event Center and Mixed-Use Development project (the "Event Center" or the "Project") located at Mission Bay Blocks 29-32. UCSF appreciates the City's and the GSW's commitment to creating an Event Center project that is successful for the Mission Bay neighborhood, as well as all of San Francisco. We also appreciate the City's and GSW's commitment to identify and mitigate negative impacts that could result from the Project. After a careful review of the DEIR, UCSF continues to be concerned about the Project's potential impacts on UCSF's Mission Bay campus and Medical Center, the greater Mission Bay area and its environs.

UCSF acknowledges and appreciates the efforts made by the City and GSW to date to address concerns that UCSF has expressed about the impacts of the proposed Event Center on UCSF patients, patient visitors, patient care givers, and emergency vehicles. In the spirit of cooperation that has marked those conversations between UCSF, the City and GSW, UCSF offers the following comments on the DEIR, with the understanding that the City will continue to work with UCSF, GSW, and neighbors to develop more detailed plans to address and mitigate the negative impacts of the Project. We understand that these more detailed plans will be included in the Final EIR and incorporated into the Event Center's conditions of project approval, which will result in a project that will fit well in the neighborhood, be supported by UCSF, and be an asset for the City.

A. Transportation Impacts

Driven by its commitment to patient care and public safety, UCSF's primary goal is to ensure that patients, patient visitors and patient care workers, as well as emergency vehicles, have 24/7 unimpeded access to its Mission Bay hospitals. This goal may be impeded by traffic congestion and parking impacts of the proposed Event Center, especially when there are dual and/or overlapping large events at the Event Center and AT&T Park. The DEIR indicates that there would be an average of nine dual and/or overlapping large events at the Event Center per year, comprised of two basketball games and seven concerts with an average attendance of 12,500 or more (DEIR p. 5.2-171). As such, large dual and/or overlapping events at AT&T Park and the Events Center should be managed judiciously. In addition, the impacts of such events—particularly on traffic flow—should be monitored and the City should have the ability to employ additional mitigation measures to ensure traffic can be maintained at acceptable levels and access to the Mission Bay hospitals is assured. Should the City's efforts to maintain acceptable traffic levels fail and access to the hospitals be impeded, UCSF supports a trigger mechanism giving the City the ability to manage the scheduling of dual and/or overlapping large events until such time that traffic can operate during such events at acceptable levels. Further, UCSF encourages City efforts to ensure funding is secured to manage these impacts and to ensure a robust monitoring program.

Page 5.2-32, Table 5.2-8, and page 5.2-237, Table 5.2-68 of the DEIR assumes that four UCSF lots and garages, totaling 2,590 parking spaces, will be available to event attendees. UCSF has informed the City that it should not include any of UCSF's parking spaces in the baseline parking supply in the DEIR because UCSF's current use and projected demand demonstrate that UCSF needs its parking spaces for its staff, patients and visitors. UCSF's future parking demand is expected to increase over existing demand. We appreciate that the parking supply/demand analysis in the DEIR does include tables showing the parking surplus/shortfall when UCSF's garages are not included in the parking supply.

We support the City's efforts to optimize public transit service to and from the Event Center. Toward that end, we offer the following comments:

Page 5.2-51, funding of incremental event-only Mission Bay shuttles is left to the discretion of GSW. Please consider making it a requirement that GSW fund additional shuttles if the Mission Bay TMA requests such service.

Page 5.2-52, Table 5.2-14, we suggest Mission Bay TMA shuttle hours be expanded to cover post-game as well as pre-game (6-8 pm) hours.

Page 5.2-53, it is unclear whether GSW or the City will pay for the four additional light rail vehicles. The Final EIR should specify.

Page 5.2-56, we would appreciate the City/GSW consulting UCSF when the number and location of PCOs are refined after Year 1.

Page 5.2-57 through 58, the text indicates that the listed transportation management strategies would apply to concerts with more than 12,500 attendees, but Table 5.2-16 (footnote b) says more than 14,000 attendees. UCSF believes that the lower number should be used.

Page 5.2-64 through 68, it is unclear who will decide which TDM measures will be implemented. We recommend that this not be solely at the discretion of GSW. Please describe which City agency will have the authority to order specific additional TDM measures.

Page 5.2-67 through 68, UCSF appreciates the performance standards set forth in the TMP. Please describe how the City would enforce these measures. In addition, we would appreciate receiving copies of the monitoring reports upon their submittal to OCII.

Page 5.2-68, third bullet, in addition to event traffic not blocking access to the UCSF emergency room entrance, please consider deploying PCOs to ensure vehicle queuing does not block access to the UCSF hospital and hospital garage for medical staff, patients and visitors.

Page 5.2-80, the TSP should apply to all large events (+12,500).

Page 5.2-130, we request that marquee events, such as National Hockey League regular season games, not be allowed to be regularly scheduled as overlapping events given the significant traffic impacts posed by such overlapping events and the unknown transportation mode profile of those attending such events.

Page 5.2-146 through 147 and 5.2-185, given the relatively high auto mode share by South Bay and North Bay event attendees, can funding be secured for additional South Bay and North Bay transit service needs? Mitigation Measures M- TR-5a and b require GSW to "work with the Ballpark/Mission Bay Transportation Coordinating Committee to coordinate" with Caltrain, Golden Gate Transit and WETA to provide additional service; how can this mitigation measure be strengthened?

Page 5.2-167 and page 5.2-181, Table 5.2-50, the fact that the I-280 northbound off-ramp at Mariposa is projected at LOS F during the evening peak hour during overlapping events is significant. This off ramp is an important access path to the UCSF hospitals and to neighboring land uses, and cannot be in a failing condition on a regular basis. We request a mitigation measure requiring the City to investigate the reconfiguration of the I-280 Mariposa Street northbound off-ramp lanes to better segregate Event Center traffic from UCSF and other non-Event Center traffic.

Page 5.2.169, Improvement Measure 1-TR-10b, we request that the traffic engineering study for Mariposa Street be completed prior to, not after, certification of the Final EIR and that it be implemented and included as a condition of project approval, if determined feasible.

Page 5.2-180, Mitigation Measure M-TR-11c, UCSF encourages efforts to avoid scheduling non-Warriors events at the Event Center of 12,500 or more attendees that start within 60 minutes of the start of events at AT&T Park, as stated in this mitigation measure. We suggest that the mitigation measure be modified to limit large overlapping non-GSW events to what was analyzed in the DEIR -- no more than seven large Arena concerts per year. In 2014, the City imposed a numeric limit on large concerts at the Masonic Auditorium, providing a precedent for this type of condition.

Page 5.2-249, we request that the City commit to the additional parking lots south of the Event Center in order to minimize traffic and parking impacts of overlapping events. The total projected shortfall of about 2,000 spaces in the cumulative condition during overlapping events is substantial.

Comments on May 2015 TMP

Section 10.2.8, UCSF surveys need not be limited to only emergency access, but also could include surveys of general patient and staff access to the UCSF campus and Medical Center.

Section 10.4.4, we request that this performance standard be expanded to require that event traffic not block patient, staff and visitor access to the UCSF hospitals, not just emergency room access.

B. Impacts on UCSF Helipad Operations Have Not Been Adequately Addressed

After a review of the DEIR, UCSF remains concerned about the projected impact on UCSF's medical helipad, and about the DEIR's analysis of this matter. UCSF's helipad provides access to critical emergency care for children and pregnant women in distress. UCSF undertook an extensive community process and received helipad and access route approval by various regulatory agencies, including the Federal Aviation Administration, the California Department of Transportation's Aeronautics Division, and the San Francisco Board of Supervisors. Any activities proposed by GSW that would render UCSF's flight paths unusable or that would compromise the safety of air medical access are unacceptable to UCSF.

UCSF understands and appreciates that the City and GSW continue to work on addressing the impacts. Nonetheless, the DEIR identifies the following:

- There would be 5 construction cranes at the Event Center construction site (see DEIR Figure 5.2-28), which would extend over all streets surrounding the project site, Third Street, 16th Street, Terry Francois Boulevard, and South Street.

- One crane would penetrate the airspace of UCSF's primary flight path --the flight path over 16th Street that is most frequently used, which arrives from and departs to the east. The DEIR concluded that this constitutes a potentially significant impact.

- Other cranes could penetrate the airspace of one or more of UCSF's secondary flight paths.

We understand that GSW may have a revised plan that relocates the construction cranes so that no penetration of the UCSF flight path airspace would occur, and we appreciate GSW's efforts on this matter. However, there is no commitment to avoid penetration of the flight path airspace at this time. We would appreciate GSW working toward a commitment to avoid penetration of the UCSF flight path, which we want included in the Final EIR. Also, we have the following concerns about the DEIR analysis:

- Page 5.2-265, the mitigation measure calls for the development of a Crane Safety Plan. The DEIR provides that the safety plan would identify appropriate measures "to reduce, and where possible, avoid, potential conflicts", by, among other things, seeking to "minimize penetrations" or "the duration of penetrations" into helicopter flight airspace. As currently written, the mitigation measure would allow for construction cranes to penetrate the flight path's airspace, which potentially compromises the ability of the helipad to operate 24/7. Accordingly, UCSF does not concur that Mitigation Measure M-TR-9a reduces this impact to less than significant levels. Rather, UCSF requests that the mitigation measure be revised with the objective to ensure safe, 24/7 operation of the UCSF medical helipad by requiring GSW to locate their constructions cranes so that no penetrations of airspace occur during the construction of the Project.

- Page 5.2-263, the discussion of impacts on the alternative flight path over South Street is unclear. The text states that the working radii of the two construction cranes over South Street are not located under any part of UCSF's alternative arrival/departure flight path. However, the text also identifies the minimum amount of vertical clearance anticipated between the cranes and the approach and transitional surfaces of the flight path. It is extremely important that the analysis of impacts be clear.

- Page 5.2-270 through 272, while the DEIR does require GSW to develop an exterior lighting plan, it does not discuss the impact of laser pointers and drones which could present a real danger to helicopter pilots and passengers. Both UCSF's helipad consultant and pilots whom we have consulted agree that this is a real safety issue.

Although incidents are rare, it seems that in an event/crowd atmosphere, especially if there were an outdoor activity at the Third Street Plaza, the likelihood would be increased that an incident could occur. UCSF requests that mitigation measures be identified to reduce or eliminate this potential. Mitigation Measure M–TR–9d does not go far enough. It promises to develop an exterior lighting plan that incorporates measures to ensure specialized exterior lighting systems "would not have an undue impact on helipad operations." Any impact to a helicopter pilot transporting a critically-ill patient should be considered an undue and unacceptable impact, and further mitigation should be imposed.

C. Noise Impacts Have Not Been Adequately Addressed

When UCSF planned and developed a large student housing complex along Third Street in 2002, it relied on the zoning districts in the South Plan, which called for commercial/industrial uses on adjacent blocks such as Blocks 29-32. Those uses would be primarily daytime uses, not uses that would disgorge up to 18,000 people after 10:00 p.m. on more than 100 days per year.

Page 5.3-26, Improvement Measure I-N0–3. UCSF requests that this measure be modified to expand the distance for notification of owners and occupants to include all occupants of the UCSF Medical Center at Mission Bay and the student housing on Third Street.

Pages 5.3–37 through 5.3-38, the DEIR indicates that the excessive noise would occur at the northbound Muni line platform adjacent to the UCSF student housing building on up to 105 evenings following basketball games, concerts and other major event. To address this impact, the DEIR indicates that the project sponsor will urge patrons to respect the quiet of the neighborhood as they leave the area and provide to all interested neighbors a contact agency and phone number that would be prepared to respond to complaints. We respectfully request that GSW and the City devise more effective mitigation measures to address this significant impact.

The land uses most affected are the UCSF Mission Bay Housing units on Block 20 that front onto Third Street and onto Gene Friend Way. These buildings have no air conditioning and rely on a passive ducting system for ventilation when windows are closed for noise control. At the time these structures were built, it was anticipated that adjacent development would consist of biotechnology or office uses. It was not anticipated that an arena and event center with over 200 events per year would be proposed directly across the street, of which up to 150 large events would generate crowd noise that, according to the DEIR, would be significant and unavoidable due to "the increase in noise levels from crowds gathering at the Muni T-line platform during quieter nighttime periods". The significant and unavoidable impact of crowd noise on the UCSF Mission Bay Housing complex would most acutely affect those units in Hearst Tower which contain bedrooms that face Third Street or Gene Friend Way (83 units), those units in the

South Building which contain bedrooms that face Gene Friend Way (63 units), and those units in the North Building which contain bedrooms that face Third Street (18 units). For these reasons, UCSF requests that the following mitigation measure be included in the Final EIR:

> To minimize the effect of crowd noise on nearby sensitive receptors at the UCSF Mission Bay Housing complex, the project sponsor will evaluate and implement feasible noise control measures to limit the significant increase in noise affecting the existing UCSF Mission Bay Housing complex on Block 20. The noise control measures will be submitted to the City for review and approval, and following City approval, will be implemented to reduce the significant and unavoidable noise impacts affecting UCSF Mission Bay Housing on Block 20.

Page 5.3–41, the DEIR provides that construction-related vehicles and equipment will be required to use designated truck routes to travel to and from the project site, as determined in consultation with the SFMTA. UCSF requests that truck routes be designated in consultation and coordination with UCSF and other nearby developers.

Tables 5.3-2 and 5.3-4, the distance from the "project site" to the UCSF Medical Center at Mission Bay is listed as 560 feet, without any explanation of measuring points. Elsewhere in the DEIR it is listed as 300 feet. This distance needs to be confirmed because at page 5.3-14, summarizing Article 1, Section 47.2 of the San Francisco Police Code, the DEIR states that "except as permitted by the Entertainment Commission, [amplified] sound shall not be issued within 450 feet of hospitals." As GSW proposes noise sources and noise generating events in the outdoor plaza areas as well as within the Event Center, the Final EIR should be specific and consistent about the locations from which distances were measured and what those distances are.

D. <u>Inadequate Mitigation Measures</u>

"An EIR shall describe feasible mitigation measures which could minimize significant adverse impacts…" CEQA Guidelines section 15126.4(a)(1). "Mitigation measures must be fully enforceable through permit conditions, agreements, or other legally-binding instruments." CEQA Guidelines sections 15126.4(a)(2).

Many of the Mitigation Measures contained in the DEIR, as summarized in Table 1–2, are conditioned upon language such as "if feasible."

In addition, some Mitigation Measures lack implementation or enforcement mechanisms or performance standards include TR – 2 ("if feasible", "if available", "working in good faith", "make good faith efforts"), TR – 4, TR – 5, TR –9a, TR –11 ("make good faith efforts", "if feasible", "shall exercise commercially reasonable efforts"), NO-4, and WS –1.

We suggest that the significance determination for each of these impacts be reassessed assuming a worst-case scenario in which the proposed mitigation measures are not feasible. Also, the Final EIR should identify whom at OCII or other City agencies will be responsible for determining "feasibility," "availability," "good faith," and "commercially reasonable efforts." We respectfully submit that GSW should not be allowed to make these determinations.

The adoption of an effective mechanism to fully fund the City's operating costs to manage impacts as described above for the life of the Event Center would help to eliminate funding as a criteria for determining the feasibility of the measures that are the responsibility of the City.

E. <u>Utilities and Service Systems</u>

Page 5.7–2, the DEIR indicates that the Mission Bay FSEIR determined that the projected increases in wastewater generation and storm water flows could be accommodated by the planned infrastructure at Mission Bay, and that the Mission Bay Plan's effects on wastewater and stormwater collection and treatment facilities would be less than significant. The DEIR now states that wastewater capacity will be inadequate when Project flows are added to existing and planned flows. But the DEIR presents no evidence other than a letter to SFPUC from its consultant, Hydroconsultant Engineers, as to current demands on the wastewater and stormwater collection and treatment facilities at Mission Bay and concerning what happened to make the 1998 prediction untrue. The DEIR discussion suggests that UCSF development at Mission Bay is the reason why peak flows would exceed the capacity of the dry weather pump stations, but this contention is contradicted by the analysis recently conducted by UCSF's consultants, as described below. In response to the UCSF's review of the supporting studies listed in the DEIR on page 5.7-7 (SF-DPW / SF-PUC memos "Mariposa Pump Station (MPS) Dry Weather Flow Hydraulic Analysis" dated February 3, 2015, and "Hydraulic Assessment of Mission Bay Sanitary Pump Station" dated February 25, 2015), UCSF undertook sanitary sewer flow monitoring to address questions in those analyses of the actual sewage flow contributions UCSF has to the respective pump stations. This information was provided to the City, however the relevant information from this study does not seem to be incorporated into the DEIR.

Page 5.7-7, the DEIR indicates that the SFPUC is performing interim improvements at the Mariposa Pump Station to accommodate planned and approved peak wastewater flow rates from UCSF that would exceed the Mariposa Pump Station's dry weather capacity. Also, at page 5.7-12, a similar statement is made that the peak flows from UCSF are contributing to peak dry weather flows from the Mariposa subbasin that now exceed the Mariposa Pump Stations dry weather capacity and therefore interim improvements are being made. The interim improvements described in the DEIR include connecting the existing 10-inch dry weather force to the 20-inch wet weather force main as well as upsizing the influent sewer to the pump station.

The February 2015 SF DPW memo did describe the same force main improvements, but the increases in dry weather flows were not attributed to UCSF. UCSF's consultants, Freyer & Laureta, Inc., prepared a May 15, 2015, memorandum presenting results of flow monitoring from Blocks 24a/b, 25a, and Phase I of the UCSF Medical Center. The memorandum concluded that the cumulative measured average and peak sanitary sewer flow rates from these UCSF facilities was generally less than both the Mission Bay Master Plan and 2014 LRDP estimated sanitary sewer flow rates.

Page 5.7-13 through 17, the discussion related to Impact C-UT-2 indicates that the projected peak flow rates from the UCSF planned development of Block 25b, Block 33/34, Block 40, and Phase 2 of the MCMB is 1.2 mgd. However, the 1.2 mgd projected peak flow rate includes both Phase 1 and Phase 2 of the Hospital construction. The correct projected peak wastewater flow rate from Block 25b, Block 33/34, Block 40, and Phase 2 of the Hospital should be 0.95 mgd based on the LRDP.

Page 5. 7–16, the statement that UCSF flows to the Mission Bay Pump Station would be 6.63 mgd with full LRDP development is not accurate. See 2014 LRDP Draft EIR at page 7-99 (indicating that the estimated peak flow increase to the Mission Bay Block P15 pump station from UCSF's proposed growth under the 2014 LRDP would be 0.23 mgd, resulting in a need for P15 pump station capacity of 6.63 mgd.).

Page 5.7-13 through 5.7-17, it is not clear why Impact C–UT–2 does not require mitigation involving a fair share contribution by the project sponsor; rather it states that no mitigation is currently available.

Page 5.7–19, the DEIR indicates again that existing and planned UCSF development at Mission Bay would result in a major contribution to cumulative wastewater flows in the subbasin. (See responses above)

F. <u>Other Issues</u>

1. <u>Project Description</u>

Page 3-36 through 37, UCSF appreciates the City and GSW's commitment to the improvements listed. UCSF requests the DEIR include documentation to confirm these improvements are fully funded.

Page 3-49, as discussed in greater detail in Section B, above, contractor compliance with all codes, rules and regulations is not enough to ensure that tower cranes do not interfere with helicopter flight path.

Again, thank you for the opportunity to comment on the DEIR. We acknowledge the City's and GSW's efforts to address our concerns about the potential impacts of the proposed project. UCSF is supportive of a successful Event Center project, and looks forward to changes to the Project's EIR mitigation measures that will bring about meaningful improvements in projected conditions in the area.

Should you have any questions about these comments, please contact me at (415) 476-8312.

Sincerely,

Lori Yamauchi
Associate Vice Chancellor

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

July 20, 2015

Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: Event Center & Mixed-Use Development at Mission Bay Blocks 29-32 DSEIR

Dear Mr. Bollinger:

Bay Area Air Quality Management District (Air District) staff has reviewed the City and County of San Francisco's (City) Draft Subsequent Environmental Impact Report (DSEIR) prepared for the Event Center & Mixed-Use Development at Mission Bay Blocks 29-32 (Project). The Project applicant proposes to construct a multi-purpose 750,000 square foot event center and 605,000 square feet of office, 125,000 square feet of retail, 475,000 square feet of parking and loading use, and approximately three acres of open space. The Project site is approximately 11 acres. The site is within the Mission Bay South Redevelopment Plan Area of San Francisco. The event center would have a capacity of 18,064 seats and host the Golden State Warriors, and provide a year-round venue for a variety of other uses, including concerts, family shows, other sporting events, cultural events, conferences and conventions.

Air District staff greatly appreciates the opportunity to work with the City to address the potentially significant air quality impacts estimated for this Project. Project design features and the mitigation measures identified in the DSEIR will substantially lessen the local and regional air quality impacts from construction and operation of the Project.

However, even with these Project design features and on-site mitigation measures, air quality impacts from the Project still exceed the City's thresholds of significance. Therefore, Mitigation Measure M-AQ-2b Emissions Offsets (M-AQ-2b) commits the Project applicant to providing funds to achieve additional emission reductions to reduce air emissions below the thresholds of significance. To this end, M-AQ-2b states that the Project applicant would provide funding of $321,646 to the Air District to fund emissions reduction projects in the region in order to

offset the remaining criteria pollutant emissions generated by both the construction and operation activities from the Project.

However, as Air District staff previously has discussed with the City, the Project Applicant would need to contribute $620,922 to fully offset the remaining criteria pollutant emissions from this Project through the Air District's grant programs. The Air District recommends that the DSEIR MM-AQ-2b be updated to reflect this funding amount.

Air District staff is available to assist the City to address these comments. If you have any questions, please contact Alison Kirk, Senior Planner, at (415) 749-5169 or akirk@baaqmd.gov.

Sincerely,

Jean Roggenkamp
Deputy Air Pollution Control Officer

cc: BAAQMD Vice Chair Eric Mar
BAAQMD Director John Avalos
BAAQMD Director Edwin M. Lee

BART
SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT
300 Lakeside Drive, P.O. Box 12688
Oakland, CA 94604-2688
(510) 464-6000

July 27, 2015

Tiffany Bohee, OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Attn: Brett Bollinger

Re: BART District Comments on the Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 (OCII Case No. ER 2014-919-97)

Dear Director Bohee,

The San Francisco Bay Area Rapid Transit District (BART) has reviewed the Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center and Mixed-Use Development at Mission Bay Blocks 29-32. BART appreciates the coordination with the City and County of San Francisco on this important project, and supports many of the transit-first actions proposed to encourage multi-modal access to the site.

For context, BART's Transbay service began in 1974, and the original planning horizon has been surpassed by more than a decade. Given strong job expansion in San Francisco, BART has experienced unprecedented ridership growth (~25% over the last four years), which creates a number of peak period capacity challenges. BART is in the process of replacing the existing rail car fleet, modernizing the train control system, and expanding train storage, which will allow BART to carry more San Francisco-bound patrons. However, as the Bay Area concentrates more growth around the region's rail systems, BART anticipates substantial ridership increases — beyond what the current system can safely and comfortably accommodate. The Metropolitan Transportation Commission's (MTC's) Plan Bay Area (2013) and Core Capacity Challenge Grant does partially fund several of BART's most important capacity projects serving San Francisco, but BART looks forward to partnering with the City to address cumulative impacts and funding solutions.

We understand that the development proposal is for a mixed-use project that features an 18,500-seat multi-purpose event center, along with open space, parking and retail uses in the Mission Bay South Redevelopment Area. BART submitted Scoping Comments in a letter dated January 23, 2013 based on the Notice of Preparation (NOP) issued by the City of San Francisco for the project (at the former location). We are submitting the following comments based on our review of the DSEIR to the City and County of San Francisco for your consideration in proceeding with the document.

1. System capacity improvements (i.e., rail car fleet expansion, stations, train control modernization, and additional shop & yard facilities) are needed to alleviate peak period constraints from projected ridership, but are unfunded. The BART Fleet Management Plan (FMP) (2010) service levels shared with the City in our January 23, 2013 Scoping Comments on the NOP are based on projected demand. The BART FMP indicates that BART will need to increase base service frequency from 15- to 12-minute headways, and have approximately 1,100 vehicles by 2025 in order to adequately serve the demand generated in San Francisco. BART's current funding, however, leaves us more than 300 rail cars short of this total. The DEIR should take this information into account in analyzing projected transit capacity and crowding.

2. BART should be represented on the Ballpark/Mission Bay Transportation Coordinating Committee. BART looks forward to working with the City to identify appropriate short-term and long-term mitigation strategies and operational actions to address identified transportation shortcomings.

3. The proposed Transportation Management Plan's (TMP) objective is to mitigate surface traffic impacts by shifting trips from personal vehicles to other modes. Given the significant traffic impact of the project under all scenarios analyzed and the subsequent need for a successful implementation of the TMP, the impacts of the target mode shift to transit on BART capacity should be anticipated, quantified and closely monitored.

4. The DSEIR analysis does not sufficiently detail its methodology and assumptions to enable the reader to interpret the analysis and the extent of impact for both BART operations and station capacity. For all scenarios, assumptions should be documented, including numbers of trains, train capacity, transfer (station) locations and directions of travel, average travel times to each station (to better understand passenger arrival times at the stations and their impact on station and operation capacity), etc.

5. Timing of Central Subway Service: Currently, the arena is scheduled to open prior to commencement of Central Subway service. If that sequence holds, Warriors fans taking BART will rely almost solely upon the Embarcadero Station - with nearly 38,000 daily boardings, the most heavily patronized station in the BART system. BART currently experiences heavy congestion at both Embarcadero and Montgomery Stations (and is working with the City to develop capacity improvements to these stations). Embarcadero Station also has the narrowest platform width of the Market Street stations. To ensure that BART can safely deliver patrons to events (in addition to accommodating peak commute loads), the City should work with BART to mitigate the short-term impact to ridership at these stations. BART seeks mitigation measures in the both short and long term to divert trip generation at Montgomery and Embarcadero stations.

6. The project sponsor should work with regional transit providers to encourage inbound event patrons to consider AC Transit Transbay service during the Inbound PM Peak. In general, all transit information should be seamlessly integrated with proposed dissemination of parking information so patrons understand all travel options simultaneously, including transit.

7. BART is concerned about Transbay operating capacity in the eastern direction during the late evenings after events, especially after simultaneous events throughout the city on Friday and Saturday nights. Analysis for this scenario (OUTBOUND from project site) was not included in the DSEIR. Given the timing of the ends of basketball games and large events, and the time required to travel to BART stations, event patrons may be using the last trains of the evening when stations and trains are already crowded. For this scenario, the DSEIR needs a broader definition of "simultaneous events" that are known to significantly increase BART ridership. This includes other events occurring and ending simultaneously throughout the city and along the Market Street Corridor (i.e. concert venues), as well as the "ambient" increase in ridership on weekend late evenings. At a minimum, the project should call for monitoring transit capacity during this condition (late evening OUTBOUND to East Bay on Fridays and Saturdays).

8. Station Capacity: BART's NOP comment letter stated that the City needs to work with BART to analyze the impacts of the proposed Project on peak period travel for station capacity as well as line haul capacity to ensure that BART can safely deliver patrons to and from events. However, there was no station level ridership forecast, or analysis, to determine the impacts to individual stations.

9. 16th Street Station: BART is particularly aware of station loading capacity constraints at the 16th St. station. It is unclear from the analysis how many patrons would need to transfer to Muni service at this station, or what impacts that could have at the station plazas. This station does not have faregates on the concourse level nearest the entrance on the north-east corner of Mission St. and 16th St. To accommodate passengers that will be dropped off at this entrance from either MUNI #22 buses or supplementary shuttles, a new fare area may need to be added, including faregates, station booth and support infrastructure such as CCTV. Staffing needs include a station agent, police and possibly staff to meter passengers at the concourse and platform level.

Thank you for the opportunity to comment on this Draft SEIR. Please call me if you have any questions.

Sincerely,

Val Joseph Menotti

Val Joseph Menotti
Chief Planning & Development Officer
BART Planning, Development & Construction
San Francisco Bay Area Rapid Transit
300 Lakeside Drive, 21st Floor
Oakland, CA 94612
510.287.4794

Caltrain

July 27, 2015

Ms. Tiffany Bohee
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Ms. Bohee:

Subject: Comments on the Draft Subsequent Environmental Impact Report for the Event Center & Mixed Use Development at Mission Bay

On behalf of the Peninsula Joint Powers Board (JPB) Caltrain is submitting the following comments on the Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center & Mixed-Use Development at Mission Bay Blocks 29-32 (the Project). Caltrain provides commuter rail service between San Francisco, San Jose and Gilroy, operating a mix of express, local and limited service. Today, Caltrain operates 92 trains per weekday, 36 trains on Saturday and 32 trains on Sunday. Caltrain also operates supplemental service for a variety of special events including extra trains after San Francisco Giants games.

The Project site is located 0.8 miles south of the Caltrain terminal at Fourth/King and 0.9 miles northeast of Caltrain's station at 22nd Street and the analysis in the DSEIR indicates that travel demand generated by the project on event days will result in a substantial addition of riders to the Caltrain system. Specifically Caltrain notes that Impacts TR-5 and TR-14 identify Caltrain service as being significantly capacity-impacted to and from the South Bay during the weekday evening, weekday late evening, and Saturday evening peak hours during both the "Basketball Game Scenario" (Impact TR-5) and the "Basketball Game with Overlapping SF Giants Game at AT&T Park Scenario" (Impact TR-14) evaluated in the DSEIR.

In response to the above impacts the DSEIR identifies mitigation measure M-TR-5a "Additional Caltrain Service," noting that implementation of this measure would reduce or minimize the severity of the capacity utilization exceedances for Caltrain and would not result in secondary transportation impacts. The DSEIR also notes, however, that the provision of additional Caltrain service is uncertain and full funding for the service has not yet been identified. Implementation of the mitigation measure thus remains uncertain and impacts TR-5 and TR-14 are found to be Significant and Unavoidable with mitigation.

PENINSULA CORRIDOR JOINT POWERS BOARD
1250 San Carlos Ave. – P.O. Box 3006
San Carlos, CA 94070-1306 650.508.6269

Caltrain agrees with the DSEIR's analysis of capacity impacts to our service, the conclusion that additional service has the potential to mitigate a portion of these impacts, and the statement that additional Caltrain service has not yet been defined, funded or agreed to. Caltrain understands the importance of the regional transportation services we provide and we look forward to working collaboratively with the City and County of San Francisco and the project sponsors to address the transportation challenges and opportunities presented by this unique project. As the project advances through the environmental process we encourage the City and the project sponsors to engage with us directly to more formally define, analyze and identify funding for any contemplated increase in Caltrain service.

Sincerely,

Stacy L. Cocke
on behalf of

Marian Lee
Executive Officer, Caltrain Modernization Program

Ec: Chuck Harvey, Deputy CEO, Operations, Engineering & Construction
Rita Haskin, Executive Officer, Marketing
Hilda Lafebre, Manager, Environmental Planning

From: Petty, Sebastian
To: Warriors, PLN (CPC)
Subject: Caltrain contact information
Date: Wednesday, July 15, 2015 6:21:17 PM

Hi Brett,

It was nice talking to you this afternoon! Per our conversation, could you provide information on the following?

- Who at Caltrain (or Samtrans) was the notice of availability sent to?
- Did the EIR analyze capacity impacts to Caltrain inbound service during the PM (pre-event) condition?

Thanks!

Sebastian Petty, AICP, Senior Planner
CalMod Program Office
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San Mateo, CA 94403
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www.caltrain.com/calmod

inspiring people to protect
Bay Area birds since 1917

July 17, 2015

Ms. Tiffany Bohee, OCII Executive Director
c/o Mr. Brett Bollinger, SF Planning Department
1650 Mission St, Suite 400
San Francisco, CA 94103

Mr. David Kelly, Project Sponsor GSW Arena LLC
warriors @sfgov.org

re: Draft SEIR for case number: OCII: ER 2014-919-97; Planning Dept: 2014.1441E

Dear Sirs and Ladies:

I am writing on behalf of the Golden Gate Audubon Society in response to the Draft SEIR for the Event Center and Mixed-use Development project at Mission Bay Blocks 29-32. We were pleased to see that this SEIR included planned mitigations for possible impact to resident and migratory birds. Two specific areas are addressed: Mitigation Measure M-BI-4a: Pre-construction surveys for nesting birds; and Mitigation Measure M-BI-4b: Bird-Safe Building Practices (refer to details in table 1-2, biological resources, initial study section E13; vol 1 pages 1-58, 1-59). Also the project description in section 3 (page 3-28) mentions Bird-Safe Design: *"The project sponsor proposes to incorporate bird-safe design measures that would reduce the potential effects of the proposed buildings, signage and lighting on birds."* The bird-safe building codes are important regulations that San Francisco has adopted – making our city a national leader in environmental stewardship. **We hope that you will do your utmost to meet and even exceed the bird-safe building design codes.**

There are some open questions regarding the planned open space near the project (Bayfront Park, and Agua Vista Park). It is not clear if the scope of this SEIR includes those spaces. These are additional areas of possible impact to bird populations on the shoreline. For example, the old piers off the Bayfront Park area served as the last remaining sites in San Francisco where Caspian Terns had nested collectvely. Replacement nesting platforms were proposed to be built by the Port of SF as required mitigation for America's Cup (and hasn't been done as promised yet). The shoreline beach area is also used by birds on migration, so further development of this area could have deleterious impact on wildlife use. Part of the beauty and attraction of these areas is the waterfront, so to the extent that you can incorporate natural waterline and structures that sustain the presence of charismatic wildlife (such as birds), you are serving both the people and the health of the San Francisco Bay. We encourage you to consider native plantings and features that support native wildlife. To the extent that these natural resources are negatively impacted, it will be necessary to mitigate for those impacts.

Thank you for your consideration of comments on this project. We encourage project leaders to be familiar with the biological report which both Golden Gate Audubon had submitted a few years back pertaining to this general area. It is called, *A Summary Report of Avian Surveys Conducted in 2008 at Dilapidated Piers and Other Structures along the Port of San Francisco's Southern Waterfront Properties* which was provided to the Port of San Francisco.

GOLDEN GATE AUDUBON SOCIETY
2530 San Pablo Avenue, Suite G, Berkeley, CA 94702
phone 510.843.2222 *web* www.goldengateaudubon.org *email* ggas@goldengateaudubon.org

As the project proceeds, GGAS would like to be kept informed about the results of the surveys, and proposed construction plans to reduce instances of collisions with birds. We can be reached at (510) 843-2222.

Very sincerely yours,

Cindy Margulis
Executive Director
Golden Gate Audubon

Bayview Community Truckers Association
1485 Bayshore Boulevard - #139
San Francisco, CA 94124

July 24, 2015

Ms. Tiffany Bohee Sent via e-mail: warriors@sfgov.org
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Market Street – Suite 400
San Francisco, CA 94103

Re: Comments On Golden State Warriors Arena Draft SEIR

Dear Ms. Bohee:

The undersigned small business owner/operators of trucks locally based in Bayview-Hunters Point want to thank you and OCII for giving us the opportunity to comment on the Draft SEIR for the proposed Golden State Warriors Arena at Mission Bay. Our group of highly qualified hazardous-certified truckers are made up of local minority truck owners who reside in and/or hire our drivers and other employees from the local community. We park our vehicles at the Port of San Francisco railyard off Third Street, which also hires exclusively from the local community. Our member truckers transport contaminated and hazardous waste to the railyard from remediation projects all over San Francisco and the Bay Area. The local truck-to-rail system offers the following benefits to projects like the Warriors Arena project:

- Railyard is just a few blocks from arena site compared to 250 miles one-way for long-haul truck trip to Southern California landfills;
- Excavation phase impacts can be reduced months by using truck-to-rail option;
- Reduced fuel consumption by hundreds of thousands of gallons and reduced toxic air emissions (CO_2) by millions of pounds per project;
- Reduced liability of hazardous waste at high speeds down public highways;
- Economic development dollars stay in our neighborhood.

With that in mind, here are our comments on the Draft SEIR:

1. We found no mention in the EIR documents about the geology or toxic containimation at the proposed site. Our group of truckers hauled more than 100,000 tons of toxic soils from the Shorenstein office buildings site (formerly Union Oil tank farm owned by Chevron-Texaco) immediately adjacent to the south side of the proposed arena site. Our understanding is that the arena site has similar contamination, which should be discussed in the EIR.

2. The project plans show the arena building being sunken down into the site, which means the soils currently there will need to be excavated and removed. Since the arena site is at least as big as the adjacent Shorenstein site, and since the fill material is likely similar, in excess of 100,000 tons of soils will likely need to be removed. The traffic, air and other impacts from this soil removal activity during the construction period should be discussed in the EIR. We believe using the same very successful approach as used on the Shorenstein project, mass excavation and 1-mile haul down Illinois Street to the railyard – would result in the least environmental impacts of all options.

3. We would like to see the direct excavation of all Class 1 toxic soils and use of our local truck-to-rail as the preferred remediation option because:

   (a) any *on-site treatment* of toxic soils means double or triple-handling of the waste and airborne toxics spread into nearby neighborhoods and the Bay;

   (b) *long-haul trucking* has the ability to remove from the site only 500 tons daily maximum, and due to a shortage of hazardous trucks in the State, possibly far less. This means the excavation phase of the site preparation could take months more than the local rail option; would generate many times the amount of CO_2 and other toxic air emissions as the rail option; and would have far greater risk of impacts on the driving public due to millions of high speed truck miles with toxic waste from the project.

   (c) *local truck-to-rail* option can remove 3,000 tons daily and reduce the period of construction (and impacts from construction) by months; offers a 1-mile one-way truck haul versus a 250-mile one-way truck haul to Southern California; offers significantly reduced fuel use and toxic emissions; offers the ability to use 100% local-based minority and women-owned truckers.

Other projects that our team of local truckers have successfully hauled hazardous and contaminated soils to the railyard at the Port, in addition to the adjacent Shorenstein project, include: UCSF Medial Center at Mission Bay; Kaiser Medical Center @ Mission Bay; Transbay Terminal; Pac Bell Park; The Gap Headquarters; SFMTA Third Street Light Rail; Hunters Point Naval Shipyard; Equity Potrero –16th Street; Embarcadero Waterfront Improvement; Avalon Bay Communities; SFMTA Central Subway; and hundreds more that have chosen the local truck-to-rail option as the best option.

We would like that our community truckers be able to take part in this exciting and historic project using our successful truck-to-rail approach. And again, we appreciate the opportunity to comment on the EIR.

Sincerely,

LEE G & COMPANY
Lee Gray, President

L.C.E TRANSPORT
Regena Jones, President

MCD TRUCKING
Olivia Dews-Smith, Principal

BIG "M" TRUCKING
Maurice Wysinger, President

NORTHERN TRUCKING
Asteria Hunter, President

HARMON TRUCKING
William Harmon, Owner

JOE WILLIAMS TRUCKING
Joe Williams, Owner

DONESSDE TRUCKING
Don Durkee, Owner

From: Sharpe, Catherine [mailto:casharpe@Fibrogen.com]
Sent: Monday, July 06, 2015 10:54 AM
To: Myall, Hilde (CII)
Cc: Corinnewoods@cs.com
Subject: RE: Mission Bay CAC Agenda - July 9th Meeting
Importance: High

Hilde, good morning. We are reading through the Warrior's DEIR and encountering major heartburn with the noise and vibration analysis and mitigation. First, we see continuing reference to the MB Good Neighbor Policy and the SFEIR for MB completed in 1998. None of us in the MB life science community have seen those documents much less participated in the development of same. Life science and specifically sophistication of instrumentation and evolution of preclinical work has changed dramatically since 1998.

Could you please forward a copies of at least the Good Neighbor Policy as soon as is possible.

Best regards

Catherine

Catherine Sharpe
Director, Community Affairs & Real Estate
FibroGen, Inc.
409 Illinois Street
San Francisco, CA 94158 USA
Phone: (415) 978-1870
Cell: (650) 278-5010
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Law Offices of
ROBERT F. KANE
870 Market Street, Suite 1128
San Francisco, California 94102
Telephone (415) 982-1510
Facsimile (415) 982-5821
Email RKane1089@aol.com

June 18, 2015

San Francisco Chronicle

Dear Sir or Madam:

Professor Richard Zitrin is absolutely correct in his June 18th op ed that the Warriors need to stay in Oakland. What he did not address is what one of my law professors said you always need to examine: "cui bono", to whose benefit. Moving the Warriors to San Francisco is all about getting more money for the out-of-state owner of the Warriors. Think luxury boxes and increased ticket prices. Just like Larry Ellison after extracting concessions for the America's Cup abandoned San Francisco and chose to go to San Diego for the next Cup, do you think the Warrior's owners are acting in the best interest of the Bay Area. The ads they have placed in the Chronicle using sports figures like Joe Montana to promote their scheme is pure hypocrisy. Where was Joe when the 49ers moved, looking to invest in real estate in Santa Clara. Remember how San Francisco felt when the Yorks moved the 49ners. Let's put a stop to such behavior. Maybe we should be talking about with public ownership of sports teams such as in Green Bay and demand the owners provide that as a condition of locating in a city. Over the 40 years between championships, the arena in Oakland has been sold out regardless of the Warrior's record. There is no reason to move the Warriors from Oakland. The Coliseum site has much better access, particularly to public transportation than the proposed Mission Bay site adjacent to a new hospital. One only needs to go to ATT Park and recognize the traffic problems when the Giants are playing. Hopefully, you do not need to see a doctor when the Warrior's are playing. Its about time that we see professional sports teams as a benefit to the entire Bay Area and that we plan for multiple venues so all cities can share the benefit and burdens. This is the true "sharing" economy.

ROBERT F. KANE

Law Offices of
THOMAS N. LIPPE, APC

201 Mission Street
12th Floor
San Francisco, California 94105

Telephone: 415-777-5604
Facsimile: 415-777-5606
Email: Lippelaw@sonic.net

June 29, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: **Request for extension of comment period.** Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms. Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance, an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project").

I write to request a 45-day extension, to September 3, 2015, of the public comment period on the Draft Subsequent Environmental Impact Report ("DSEIR"), currently set to expire on July 20, 2015. This extension is necessary for the public, including my client, to meaningfully comment on the DSEIR.

The Project is a large, multifaceted sports, entertainment, and office complex situated in a densely populated metropolitan area. The Project vicinity is expected to experience large increases in traffic even without this Project. (See San Francisco Transportation Plan, 2040.) Also, the Project setting has a long history of industrial and chemical pollution, yet retains a wide diversity of environmental resources and amenities that are threatened by further development.

As a result, this DSEIR has a long and complex environmental review history under CEQA, including the 1990 FEIR for the Mission Bay Plan, the 1998 FSEIR for the Mission Bay North Redevelopment Plan and the Mission Bay South Redevelopment Plan, and nine addenda to the 1998 Mission Bay FSEIR (completed between 2000 and 2013) for specific developments within Mission Bay that required additional environmental review beyond the 1998 FSEIR. (See DSEIR, p. 2-4 - 2-

5.)

Consequently, 45-days is simply not enough time to meaningfully review and comment on the DSEIR. Indeed, in recognition of the depth and complexity of the environmental review needed for the Project, the City recently obtained a one year extension (from January 1, 2016, to January 1, 2017),[1] from the state legislature of the deadline by which the City must certify the Project's Final SEIR in order to qualify for the "super fast track" litigation schedule provided in AB 900 (codified at Public Resources Code section 21178 et seq.).

The City has been engaged in the environmental review of development in Mission Bay for over 25 years. The City has also been engaged in the environmental review of the Warriors Arena Project for over a year, since April 29, 2014,[2] or at least since preparing the June 24, 2015, Administrative Draft of the DSEIR. Further, with the comment period ending on July 20, 2015, the City will have almost a year and a half to respond to public comments and issue the Final SEIR, and process any appeal of the FSEIR certification to the Board of Supervisors and still take advantage of AB 900's "super fast track" litigation schedule.[3]

These facts reveal an EIR preparation schedule that confers a vast advantage on the City over members of the public who do not share the City's strong desire to locate the Warriors arena in Mission Bay. In the interests of fairness and meaningful public participation in the EIR process, the City should extend the comment period on the DSEIR for at least 45 additional days, to September 3, 2015. Indeed, public participation in the EIR process is fundamental state policy:

> An EIR is an "environmental 'alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return." [citations omitted] The EIR is also intended "to demonstrate to an apprehensive citizenry that the agency has, in fact, analyzed and considered the ecological implications of its action." [citations omitted] Because the EIR must be certified or rejected by public officials, it is a document of accountability. If CEQA is scrupulously followed, the public will know the basis on which its responsible officials either approve or reject environmentally significant

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[1]See Public Resources Code section 21189.1.

[2]See April 29, 2014, CCII Agenda, Item # *.

[3]The deadline for filing the EIR appeal is 30-days after OCII certifies it. The clerk is required to schedule the hearing on the appeal no earlier than 21-days and no later than 45-days after the 30-day appeal period expires. (San Francisco Administrative Code § 31.16.)

> action, and the public, being duly informed, can respond accordingly to action with which it disagrees. [citation omitted] The EIR process protects not only the environment but also informed self-government.

Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 392.)

Thank you for your attention to this matter.

Very Truly Yours,

Tom Lippe

Thomas N. Lippe

cc:
Bruce Spaulding
Susan Brandt-Hawley
Osha Meserve
Josh Schiller

SOLURI MESERVE
a law corporation
tel: 916.455.7300 · fax: 916.244.7300
1010 F Street, Suite 100 · Sacramento, CA 95814

July 9, 2015

SENT BY U.S. MAIL AND EMAIL (warriors@sfgov.org**)**

Tiffany Bohee
Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Notice Regarding Incomplete Record for Warriors Event Center Environmental Review

Dear Ms. Bohee and Mr. Bollinger:

This firm represents the Mission Bay Alliance with respect to the Warriors Event Center project. Under Public Resources Code section 21186, which pertains to preparation of the administrative record for projects under the AB 900 "Environmental Leadership" process:

> (a) The lead agency for the project shall prepare the administrative record pursuant to this division concurrently with the administrative process.
> (b) All documents and other materials placed in the administrative record shall be posted on, and be downloadable from, an Internet Web site maintained by the lead agency commencing with the date of the release of the draft environmental impact report.
> (c) The lead agency shall make available to the public in a readily accessible electronic format the draft environmental impact report and all other documents submitted to, or relied on by, the lead agency in the preparation of the draft environmental impact report.

Upon review of the records posted at www.gsweventcenter.com it is apparent that all of the available documents that would be part of the record as defined by Public Resources Code section 21167.6, subdivision (e) are not included. For instance, references cited in the 2015 DSEIR, 2014 NOP/Initial Study, the 1998 Mission Bay SEIR and the 1990 Mission Bay EIR are not included. These references would fall under both Public Resources Code section 21186, subdivision (c) (documents relied upon by lead agency) as well as Public Resources Code section 21167.7, subdivision (e)(10) (materials relevant to compliance with CEQA). (See also CEQA Guidelines, § 15150, subd. (b)

("Where part of another document is incorporated by reference, such other document shall be made available to the public . . . .).)

As just one example, a cultural resources evaluation that was prepared for the 1990 Mission Bay EIR and referenced in the 2014 NOP/Initial Study that is the basis of the entire cultural resources section is also missing.[1] Since the 2015 DSEIR completely relies on analyses found in prior environmental review documents for analysis of cultural impacts (and several other resources), it is essential that the public have access to all of the documents that form the basis for this analysis. Additionally, some references in the 2015 DSEIR are not yet included on the website. For instance, the 2015 DSEIR cites to "54 Federal Register 38044, September 14, 1989." (DSEIR, p. 5.4-13, fn. 21.) This office has also already requested several reference documents cited in the NOP/Initial Study and other reference documents that are critical to analysis of seismic hazards for the site and appreciates your attempts to locate those documents. (See email attached as Exhibit A.)

Moreover, we believe that not all of the correspondence regarding the project has been posted. (See Pub. Resources Code, §§ 21167.6, subd. (e)(7), (10), 21186, subd. (c).) Specifically, all of the documents responsive to Mr. Spaulding's May 18, 2015 Sunshine Act/Public Records Act request would properly be included in the record and appear to not yet be posted on the record website.

AB 900 expressly mandates that a complete record be posted online at the time of release of the DSEIR in order to receive streamlining benefits. (Pub. Resources Code, § 21167.6, subd. (b).) As those documents already in existence that comprise the record have not yet been posted, the 45-day comment period has not properly commenced, and may only commence when all of the documents now in the City/OCII's possession that constitute the record are posted. The current comment deadline of July 20, 2015, will need to be extended accordingly. Until there is compliance with the record posting requirements of Public Resources Code section 21086, this project cannot proceed under the AB 900 process.

[1] "Cultural Resources Evaluation for the Mission Bay Project, San Francisco, CA" Dec. 1987, prepared by David Chavez & Associates. This report is cited at page VI.J.30 of the 1990 EIR and referenced on page 46 of the November 19, 2014 NOP/Initial Study. There is also a 1997 Archaeological resources review, also prepared by David Chavez & Associates, and referenced in the Initial Study that is not included in the online record.

Please feel free to call me to discuss proper resolution of the issue of the posting of a complete record as required under the AB 900 process. I also request immediate confirmation that the 45-day DEIR comment period will not commence until the necessary documents, as set forth above, are posted in compliance with AB 900. We look forward to your prompt response.

Very truly yours,

SOLURI MESERVE
A Law Corporation

By: 
Osha R. Meserve

ORM/mre

Attachment: Exhibit A

cc: Sarah Jones, Director of Environmental Planning (Sarah.B.Jones@sfgov.org)
John Rahaim, Director of SF Planning (John.Rahaim@sfgov.org)
Kate Stacy, Deputy City Attorney (kate.stacy@sfgov.org)

EXHIBIT A

Mae Empleo

From: Osha Meserve <osha@semlawyers.com>
Sent: Tuesday, July 07, 2015 4:38 PM
To: 'Warriors, PLN (CPC)'
Subject: RE: Request for EIR Reference Documents

Hi Brett,
Thank you for your call. The date of the report linked below is March 28, 2008, whereas the date of the document referenced on p. 3 of the April 11, 2014 Updated Phase I Assessment is March 7, 2008. The document title appears to be the same, but if there was a prior draft, we would request that as well.

Here are the additional source documents citations to references that my consultant has identified as essential to his review of the DSEIR:

1. The September 17, 1998 SEIR, Section V.H.5 cites a 1995 geotechnical investigation by Treadwell & Rollo, Inc. The reference listed "/15/" for that report cites to "The results of earlier geotechnical investigations are discussed in the 1990 FEIR, Volume One, pp. II.76-II.77, and Volume Two, pp. VI.K. 1-VI.K. 11, VI.K.24-VI.K.30.*"

   The 1995 Treadwell & Rollo report is needed for review.

2. Reference "/16/" cites to the following:
   Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, Lori A. Simpson, PE, and Frank L. Rollo, PE, Proposed UCSF Site, Mission Bay, San Francisco, CA, letter report to Kerstin Magary, Catellus Development Corporation, 31 October 1994, 2 pages accompanied by 38 figures; Treadwell & Rollo, Inc., Environmental and Geotechnical Consultants, Loft A. Simpson, PE, letter to EIP Associates, March 12, 1997, 1 page accompanied by 6 figures.

   The 1994 Treadwell & Rollo report letter report and 1997 letter report are needed for review.

3. Recent Geotechnical Reports: The only geotechnical report that is listed on the http://www.gsweventcenter.com/ site is a March 28, 2014 Preliminary Geotechnical Evaluation by Langan Treadwell Rollo. This letter report is lacking any site data or analysis. The report presents conclusions and recommendations based on unidentified previous site investigations. The supporting data/reports/analysis should be identified and presented for review.

4. According to the June 2015 Phase II ESA by Langan Treadwell Rollo, the following geotechnical reports have been completed for the site:

   Langan, 2011. Geotechnical Investigation, Blocks 29-32, Mission Bay, San Francisco, California. 21 December.

5. According to the April 11, 2014, Update Phase I, ESA by Langan Treadwell Rollo, the following geotechnical reports have been completed for the site:

   Treadwell & Rollo (T&R), 2007. Geotechnical Investigation, Block 30, Mission Bay, San Francisco, California. 17 October.
   T&R, 2008. Preliminary Geotechnical Evaluation, Blocks 29-32, Mission Bay, San Francisco, California. 7 March.

T&R, 2008. Preliminary Geotechnical Evaluation, Blocks 33-34, Mission Bay, San Francisco, California. 29 May.

I look forward to receiving the documents previously requested on July 3rd, as well as those listed above, as soon as possible as they are needed for our review and comment on the DSEIR.

Best regards,
Osha

Osha R. Meserve
(916) 455-7300

From: Warriors, PLN (CPC) [mailto:warriors@sfgov.org]
Sent: Tuesday, July 7, 2015 4:06 PM
To: Osha Meserve
Subject: RE: Request for EIR Reference Documents

The second of the 3 documents listed is included on the GSW AB900 website

http://www.gsweventcenter.com/Draft_SEIR_References/2014_0328_Prelim_Geotech_Eval.pdf

---

From: Osha Meserve [mailto:osha@semlawyers.com]
Sent: Friday, July 03, 2015 1:14 PM
To: Warriors, PLN (CPC)
Subject: Request for EIR Reference Documents

Dear Mr. Bollinger and Ms. Bohee,

We are trying to locate the references listed below from pp. 3-4 the Phase I Environmental Site Assessment dates April 11, 2014 that was prepared by Langan Treadwell Rollo that is posted at the Record website (http://www.gsweventcenter.com/). The direct link to the document is: http://www.gsweventcenter.com/Draft_SEIR_References/2014_0411_Updated_Phase_1_ESA.pdf.

Treadwell & Rollo (T&R), 2007. Geotechnical Investigation, Block 30, Mission Bay, San Francisco, California. 17 October.

T&R, 2008. Preliminary Geotechnical Evaluation, Blocks 29-32, Mission Bay, San Francisco, California. 7 March.

T&R, 2008. Preliminary Geotechnical Evaluation, Blocks 33-34, Mission Bay, San Francisco, California. 29 May.

Would you please provide these documents to me?

Thanks,
Osha

Osha R. Meserve
Soluri Meserve
1010 F Street, Suite 100
Sacramento, CA 95814
tel: 916.455.7300 ▪ *fax:* 916.244.7300 ▪ *mobile:* 916.425.9914 ▪ *email:* osha@semlawyers.com

MISSIONBAY
ALLIANCE

July 26, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045: **EIR Tiering**

Dear Director Bohee and Mr. Bollinger:

The undersigned counsel for the Mission Bay Alliance write on the Alliance's behalf regarding a threshold procedural issue affecting the Draft Subsequent EIR ("DSEIR") for the Warriors Event Center & Mixed Use Development (the "Project"). The DSEIR unlawfully tiers to prior CEQA documents.

The Mission Bay Alliance objects to the improper use of "tiering" to avoid analysis of important environmental issues in the DSEIR. Both the NOP/IS and the DSEIR announce that they "tier" to the 1998 Mission Bay EIR pursuant to CEQA Guideline 15168(c). (NOP/IS, pp. 23-24; DSEIR, pp. 1-1, 5.1-2, 3.) Both the NOP/IS and the DSEIR exclude resource topics from the DSEIR based on standards CEQA provides to determine when a subsequent EIR is required under Public Resources Code ("CEQA") section 21166 and Guideline section 15162. (See NOP/IS, pp. 23-25; DSEIR, p. 5.1-3.)

Based on these predicates, the City prepared a focused EIR and conducted no environmental review regarding Biological Resources, Aesthetics, Land Use, Cultural Resources, Paleontological Resources, Geology and Soils, Recreation, Hazardous Materials, and Population and Housing. The exclusion of those topics from the DSEIR is erroneous as a matter of law and precludes informed public review.

"Tiering" under CEQA is not permitted where the later project is a separate project from the earlier project, where the EIR for the earlier project did not include an analysis of the environmental impacts of the later project, or where the later project is inconsistent with the "program, plan, policy, or ordinance for which an environmental impact report has been prepared and certified" or is inconsistent with "applicable local land use plans and zoning of the city, county, or city and county in which the later project would be located." (*Center for Sierra Nevada Conservation v. County of El Dorado* (2012) 202 Cal.App.4th 1156, 1173 (*Sierra Nevada Conservation*); *Sierra Club v. County of Sonoma* (1992) 6 Cal.App.4th 1307, 1318; CEQA, § 21094(b).)

Here, as shown in the "Land Use" section of the July 26, 2015, letter from the Brandt-Hawley Law Group, the Project is not consistent with the Mission Bay Redevelopment Plan or with the land use plans and zoning controls that are subordinate to the Mission Bay Redevelopment Plan. None of them include, anticipate, or allow a 750,000 square foot Event Center! The 2015 DSEIR also states that the Project requires "amendments to the Mission Bay South Design for Development, and modifications to the Mission Bay South Signage Master Plan and Mission Bay South Streetscape Plan, and conditions of approval," among other changes, in the list of approvals required for the Project. (DSEIR, p. 3-51.)

These major differences between the project described in the 1998 FSEIR (that evaluated the effects of developing the Mission Bay plan area as described in 1998 [see DSEIR Figure 3-7]) and the Warriors Event Center and Mixed Use Development now being proposed, preclude tiering under CEQA section 21094. Therefore, the City cannot use a "tiered" EIR and the DSEIR must be reissued in "non-tiered" form.

Further, the exclusion of resource topics from the DSEIR is not, as the NOP/IS and DSEIR presume, governed by CEQA section 21166 and Guideline section 15162 or their standards. Pursuant to section 21151, the DSEIR must analyze the Project's impacts on any environmental resource for which substantial evidence supports a fair argument of significant impact. (*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099 ["EIRs must "consider and resolve every fair argument that can be made about the possible significant effects of a project."]; see also, *Sierra Nevada Conservation, supra*, 202 Cal.App.4th 1156, 1173 ["If a proposed new activity is a separate project, the "fair argument" test should apply to an agency's decision whether to require a tiered EIR.] Sierra Nevada Conservation cited the holding of *Sierra Club v. County of Sonoma, supra*, 6 Cal.App.4th 1307, 1318, that under the fair argument test, "deference to the agency's determination is not appropriate and its decision not to require an EIR can be upheld only when there is no credible evidence to the contrary." (Ibid.) *Sierra Club* applied the fair argument standard to a proposed project that was not "either the same as or within the scope of" the program described in the EIR. (*Sierra Club, supra*, 6 Cal.App.4th 1307, 1321.)

As discussed in comment letters submitted on behalf of the Mission Bay Alliance, evidence relating to these excluded resource topics meets the "fair argument" standard. Although CEQA section 21166 does not apply here, its standards are also met. Therefore, the City must prepare and recirculate for public review a Revised Draft EIR addressing all Project-related environmental impacts. (Since this is a stand-alone EIR, the title 'Subsequent' is a misnomer.)

To the extent the City chooses to use data from the 1990 or 1998 Mission Bay EIRs, that information must be restated in the Revised Draft EIR in a manner that results in a single, cohesive, understandable document meeting CEQA's mandates for adequacy, completeness, and a good faith effort at full disclosure. (Guideline § 15151.)

Thank you for your attention to this matter.

Sincerely,

Thomas N. Lippe   Susan Brandt-Hawley   Osha Meserve   Patrick Soluri

cc: Bruce Spaulding

\\Lgw-12-19-12\tl\Mission Bay\Administrative Proceedings\Co Counsel\C008b tiering comment.wpd

MISSIONBAY ALLIANCE

July 26, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045: **AB 900 and Litigation Streamlining**

Dear Director Bohee and Mr. Bollinger:

The undersigned counsel for the Mission Bay Alliance write on the Alliance's behalf regarding the Draft Subsequent EIR ("DSEIR") for the Warriors Event Center & Mixed Use Development (the "Project"). The City's failure to post online administrative record documents before starting the DSEIR comment period renders the Project ineligible for the litigation streamlining provisions of AB 900.

On July 9, 2015, the Mission Bay Alliance advised the City that it had failed to post available portions of the administrative record online as required by CEQA section 21186, subdivision (b), and as a result, the 45-day comment period on the DSEIR could not commence. The City responded on July 16, 2015, stating that the record was complete and that the documents alleged to be missing were not considered by the City in preparing the DSEIR. The City also extended the public comment period by a mere seven days, a decision it explained elsewhere was to "account for any time off that the public may have enjoyed over the Independence Day holiday." (July 15, 2015, Letter from OCII to Tom Lippe.)

The City's position ignores CEQA's statutory language regarding the required content of the record. Under CEQA section 21186, subdivision (a), preparing the "administrative record pursuant to this division" means that the record posted must include all of the available documents that are part of the record as defined by section 21167.6, subdivision (e).[1] The 45-day public comment period cannot begin until all existing administrative record documents are posted to the City's record website.

Regarding specific documents the City has omitted from its record website, the City has taken the position that references cited in the 2015 DSEIR, 2014 NOP/Initial Study, the 1998 Mission Bay SEIR and the 1990 Mission Bay EIR are not part of the record and that the online record is complete. But this position is entirely at odds with the City's reliance on a tiered SEIR. Since the 2015 DSEIR relies completely on analyses found in prior environmental review documents to avoid analysis in the DSEIR of at least half the CEQA mandated resource areas, it is essential that the public have access to all of the documents that form the basis for these analyses.

Additionally, the online record is missing additional categories of documents. For example, the City has failed to post correspondence among City employees and with consultants regarding the project. The Mission Bay Alliance understands that several different consultants and City agencies are involved in the project, yet there is not even a category on the record website for this correspondence. These materials are part of the record. (CEQA §

[1]The City cannot argue AB 900 implicitly repealed section 21167.6 because the Legislature is presumed aware of existing law when it acts (see, e.g., *Voters for Responsible Retirement v. Board of Supervisors* (1994) 8 Cal.4th 765, 779, fn. 3). This is especially true here, where the relevant definition is within the same statute the Legislature amended.

21167.6, subd. (e)(2).) The City has also failed to post agendas and staff notes from ongoing weekly City meetings regarding this Project and its environmental review.[2]

There has also been staff correspondence regarding the procedures applicable to the online record, such as a June 10, 2015, ESA memorandum entitled: AB 900 Administrative Record Update Procedures for the Golden State Warriors Event Center and Mixed Use Development at Mission Bay Blocks 29-32.

These are just a few examples of how the City has not carried out its obligation to post all available record documents online before commencing the 45-day comment period. Contrary to the position taken in the City's July 16, 2015, letter, which implies the public must identify the missing documents, it is the City's duty to locate, index, and post the documents comprising the record.

AB 900 requires the City to post all available record documents online when the DSEIR is issued in order to receive its litigation streamlining benefits. For this purpose, "record documents" is defined in CEQA section 21167.6, subdivision (e). The City cannot have it both ways. It cannot violate AB 900's record posting requirements and at the same time enjoy the benefits of AB 900's litigation streamlining provisions. Therefore, in order to take advantage of AB 900's litigation streamlining provisions, the City must post all existing record documents before commencing the 45-day comment period. Otherwise, the Project is ineligible for the streamlining provisions of AB 900.

[2] To the extent these documents are posted, they are not individually indexed as required. (See Cal. Rules Court, rule 3.2205.)

Thank you for your attention to this matter.

Sincerely,

Thomas N. Lippe   Susan Brandt-Hawley   Osha Meserve   Patrick Soluri

cc: Bruce Spaulding

\\Lgw-12-19-12\tl\Mission Bay\Administrative Proceedings\Co Counsel\C009e AB 900 streamlining comment.wpd

July 27, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

I am writing on behalf of the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter.

The Alliance opposes this Project because it will change the Mission Bay community and environment in ways never envisioned when the Mission Bay Redevelopment Plan was adopted in 1998, and because the City's Draft Subsequent Environmental Impact Report ("DSEIR") for the project does not present a good faith, adequate analysis of these impacts.

The Alliance has retained several experienced CEQA attorneys to review and comment on the DSEIR, including Tom Lippe of the Law Offices of Thomas N. Lippe, Susan Brandt-Hawley

of the Brandt-Hawley Law Group, and Patrick Soluri and Osha Meserve of Soluri Meserve. Counsels' comments letters, and their retained consultants' reports, are being submitted to the City under separate cover. A complete inventory of these letters to date is presented at the end of this letter.

The DSEIR is noteworthy because it concedes the Project will cause numerous significant impacts on the Mission Bay community and environment (e.g., traffic, air pollution, noise pollution, and many others). Nevertheless, the Alliance's counsel have discovered many deep flaws in the DSEIR that obscure the true scope and severity of the Project's impacts.

For example, based on the incorrect premise that the DSEIR is permitted to "tier" to a seventeen year old prior EIR, the DSEIR fails to even discuss half of the environmental topics that an EIR would ordinarily include. One of these excluded topics is "land use." This is truly remarkable considering that the 1998 Redevelopment Plan to which this DSEIR attempts to tier never contemplated a major sports and entertainment center of this type and scale. Instead, the Arena will divert land and civic resources away from the land uses, i.e., health sciences and biotechnology, that the 1998 Redevelopment Plan was intended to promote.

In another example, the DSEIR's analysis of the Arena's severe traffic impacts is artificially and arbitrarily limited to the Mission Bay area plus a handful of additional intersections and freeway ramps. The Alliance's traffic engineers demonstrate, in a more objective analysis, that the Arena's traffic snarling influence will extend much farther into SOMA, Downtown, and Dogpatch areas. The DSEIR also ducks revealing more bad news about the Arena's cumulative impact on traffic in the years following its construction. Instead of projecting cumulative traffic effects 5 to 10 years out, the DSEIR offers up a virtually meaningless projection for the year 2040, fully 25 years in the future.

The DSEIR also offers no data to support its conclusion that Arena events will not interfere with emergency access to UCSF Hospital. Instead, it offers weak rationalizations, such as the idea that drivers are supposed to get out of the way of emergency vehicles. But it is common knowledge that in special event situations, and even on normal days in SOMA, vehicles are often queued bumper-to-bumper and pedestrians are swarming the crosswalks. In these situations, drivers often cannot clear the way for emergency vehicles. Regardless of the DSEIR's prevarications to the contrary, this scenario *will* occur during basketball games and ambulances *will* be delayed.

Even the DSEIR's assumptions made about the available parking supply present a stark departure from the reality of parking conditions at Mission Bay and underscore the high level of wishful thinking involved in selling a project wholly incompatible with this region. The project itself only includes 200 onsite parking spaces specifically dedicated for the arena's use. Yet, rather than concede the limited onsite parking, the DSEIR suggests that ample parking will be available to serve the arena's needs by listing all 9,135 possible parking spaces in the Mission Bay region, including street parking. Unfortunately, the vast majority of those spots are currently reserved by UCSF hospitals, UCSF facilities, the Giant's stadium and neighboring businesses, and the DSEIR lacks any evidence to support the assumption that any of these spaces - let alone the majority - will be available for use by arena patrons. It also fails to explore the impact on neighboring communities in the Dogpatch and Potrero Hill areas that will bear the burden of accommodating the thousands of additional cars seeking, but unable, to park in Mission Bay.

These are but a few of dozens of legal defects the Alliance's counsel found in the DSEIR. The volume, scope, and depth of the DSEIR's legal flaws demand, and suggest, an explanation. It appears the Warriors and the City have been in such a rush to get this Project approved and built that they have ignored elementary principles of environmental analysis and CEQA law in the process. The sources of this haste are presumably the previous January 1, 2016, deadline, now extended to January 1, 2017, to certify the EIR in order to obtain the litigation streamlining benefits of AB 900, and the expiration, in late September of 2015, of the Warriors option to purchase the site from Salesforce.com.

Given the Arena's many severe environmental and community impacts, and the DSEIR's attempt to sweep many of these issues under the rug, the Alliance urges the City to slow down

and carefully consider both the legality of siting the Arena in Mission Bay as well as the lack of wisdom in doing so.

A list of the Alliance's counsels' and consultants' comment letters follow.

Thomas Lippe, Susan Brandt-Hawley, Patrick Soluri, and Osha Meserve have jointly submitted the following comment letters on Alliance letterhead:

1. July 26, 2015, letter regarding EIR tiering; and

2. July 26, 2015, letter regarding litigation streamlining under AB 900.

Thomas Lippe has submitted the following comment letters and consultant reports:

3. July 24, 2015, letter regarding impacts on Hydrology, Water Quality, and Biological Resources, including:

   a. July 21, 2015, letter report authored by Matt Hageman, P.G., C.Hg., QSD, QSP; and

   b. July 21, 2015, letter report authored by Erik Ringelberg, B.Sc., M.Sc., Ph.D candidate; and Kurt Balasek, PG, CHg, QSD.

4. July 25, 2015, letter regarding impacts on Noise and Vibration, including:

   a. July 24, 2015, letter report authored by acoustic engineer Frank Hubach.

5. July 26, 2015, letter regarding impacts on Air Quality, including:

   a. July 19, 2015, letter report authored by Greg Gilbert; and

   b. July 20, 2015, letter report authored by Paul Rosenfeld, Ph.D, and Jessie Jaeger.

6. July 27, 2015, letter regarding impacts on Transportation, including:

a. July 23, 2015, letter report authored by traffic engineer Dan Smith; and

b. July 21, 2015, letter report authored by traffic engineer Larry Wymer.

7. June 29, 2015, letter requesting an extension of the public comment period on the DSEIR.

Susan Brandt-Hawley has submitted the following comment letter:

8. July 26, 2015, letter regarding impacts on Land Use, Aesthetics, Cultural Resources, and Project Alternatives.

Patrick Soluri and Osha Meserve have submitted the following comment letters and consultant reports:

9. July 26, 2015, letter regarding impacts on Geology and Soils, Recreation, Hazardous Materials, , Greenhouse Gases, Wind and Shadow, Utilities and Service Systems, Public Services, Energy and Urban Decay, including:

a. July 22, 2015, letter report authored by air quality professionals Patrick Sullivan, CPP, REPA, and Joh Henkelman, regarding Greenhouse Gas Emissions;

b. July 22, 2015, letter report authored by geotechnical engineer Lawrence Karp, CE, CEG, regarding Geology and Soils impacts;

c. July 22, 2015, letter report authored by engineering geologist Marin Cline, CEG, and hydrogeologist Kurt Balasek, PG, CHg, QSD, regarding Geology and Soils impacts);

d. July 22, 2015, letter report authored by geotechnical engineer Martin Cline, GEG and Kurt Balasek, PG, CHg, QSD, regarding Hazardous Materials; and

e. July 22, 2015, letter report authored by economist Philip King, Ph.D., regarding Urban Decay.

10. June 29, 2015, letter regarding the City's failure to comply with AB 900 record keeping procedures and the resultant ineligibility of the Project for AB 900's litigation fast track procedures.

The Board of Directors of the Mission Bay Alliance fully supports and endorses the comment letters and reports listed above, and respectfully urges the City to remedy the DSEIR's informational deficiencies and circulate a Revised DSEIR for a 45 day public comment period.

Thank you for your attention to this matter.

Sincerely,

Bruce Spaulding
On Behalf of the Mission Bay Alliance

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July 26, 2015

Tiffany Bohee, OCII Executive Director
Brett Bollinger, EIR Coordinator
via email warriors@sfgov.org

Subject: Comments on the Draft Subsequent EIR
Warriors Event Center & Mixed Use Development
Mission Bay Blocks 29-32
OCII: ER 2014-919-97 Planning Dept.: 2014.1441E

Dear Director Bohee and Mr. Bollinger:

On behalf of the Mission Bay Alliance ("the Alliance"), please respond to these enumerated comments on the Draft Subsequent EIR vis-à-vis project alternatives as well as the analysis and mitigation of aesthetics, land use, and cultural resources impacts. Substantial omissions in these topic areas require revision and recirculation of the EIR to inform the discretion of the City and to apprise the concerned public.

1. The Mission Bay EIRs Did Not Consider an Event Center

EIRs, including the Draft Subsequent EIR ("the DSEIR"), are measured for "adequacy, completeness, and a good faith effort at full disclosure." (CEQA Guidelines, § 15151.) Whether the Event Center EIR analysis meets that measure presents a question of law. (*E.g., Vineyard Area Citizens v. City of Rancho Cordova* (2007) 40 Cal.4th 412, p. 435.)

An overarching problem with the DSEIR is its misapplication of CEQA via a conclusory reliance on earlier CEQA documents — the 1990 Mission Bay EIR and 1998 Mission Bay Subsequent EIR — prepared for the Redevelopment Plan for the Mission Bay South Redevelopment Project and its related Design for Development. The City cannot now rely on those EIRs because both the Redevelopment Plan and the Design for Development contemplated no uses comparable to the Event Center. Its environmental effects were *not* "adequately examined by an earlier EIR." (Pub. Resources Code, § 21094; Guidelines, § 15063.)

Every environmental issue that has potentially significant impacts must be addressed in a project-specific EIR for the Event Center, and feasible mitigations and alternatives must be identified. The City instead improperly "tiered" the DSEIR from the prior Mission Bay EIRs to evade full environmental analysis, as counsel for the Alliance have explained in a separate letter. Consequently, the DSEIR fails to analyze many of the potentially significant project-specific environmental impacts of the Event Center. As in *Center for Sierra Nevada Conservation v. County of El Dorado* (2013) 202 Cal.App.4th 1156, a revised stand-alone EIR must do so.

This letter will address the DSEIR's omitted analyses of critical project-specific impacts relative to land use, aesthetics, and cultural resources.

2. The Draft Subsequent EIR Must Address Land Use

The Notice of Preparation and Initial Study ("NOP/IS" or "Initial Study") acknowledges that, per the 1998 Mission Bay EIR, "the Mission Bay Redevelopment Plans and Design for Development documents … constitute the regulatory land use framework for the Mission Bay plan area." (NOP/IS, p. 30.) The Initial Study finds no need to address land use issues in the DSEIR, contending that the Event Center would not conflict with land use policy, divide a community, or substantially impact area character. (NOP/IS, p. 27). Without additional discussion, the DSEIR agrees, reiterating that project land use impacts are insignificant and that no environmental analysis is required. (DSEIR, pp. 1-49, 5.1.1.)

While clearly aware that CEQA requires revision of the DSEIR to address the project's conflicts with Mission Bay land use policies and significant adverse impacts to community character, the City simply kicks the can down the road:

> As part of the project approval process, OCII, the San Francisco Planning Commission, and other relevant regulatory agencies *would determine* whether the proposed project is consistent with their respective plans as applicable to the proposed project. Thus, the proposed project would have a less-than-significant impact with regard to conflicts with land use plans, policies, or regulations adopted for the purpose of avoiding or mitigating an environmental effect.

(NOP/IS, p. 31, italics added.) This statement implicitly acknowledges the requirements of

Appendix G of the CEQA Guidelines. Under Appendix G, Section X, a project's potentially-significant conflicts with land use plans that were adopted for environmental protection or mitigation must receive environmental review in an EIR. A rote finding by a lead agency that simply assumes that a project will comply with such land use plans via future action by involved regulatory agencies cannot substitute for the analysis contemplated by Appendix G. (*The Pocket Protectors v. City of Sacramento* (2004) 124 Cal.App.4th 903.)

The Event Center's Draft Subsequent EIR does just that; unlawfully deferring the analysis and enforcement of land use plan consistency. The DSEIR must be revised and recirculated to provide environmental analysis and mitigation. EIRs must "consider and resolve every fair argument that can be made about the possible significant effects of a project." (*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099.) Here, the record illustrates many inconsistencies with land use plans and policies that have potentially significant environmental impacts:

a. *The Event Center is not 'Nighttime Entertainment' as Defined in the Mission Bay South Redevelopment Plan*. The primary objective of the Warriors Event Center is to "[c]onstruct a state-of-the-art multi-purpose event center in San Francisco that meets NBA requirements for sports facilities […]" (DSEIR, p. 1-3.) The Mission Bay South Redevelopment Plan designates Blocks 29-32 as Commercial Industrial/Retail. While the mixed-use commercial/retail development portion of the project is an allowed primary use, the Event Center itself would have to qualify as "Assembly and Entertainment: Nighttime Entertainment" in order to be approved as an allowed "secondary use" under the Plan.

The Initial Study pronounces that the Event Center — the *primary* project use — is encompassed within the *secondary* "nighttime entertainment" use analyzed in the Mission Bay EIR and is thus allowed on the Commercial Industrial/Retail site. The City contends that the Event Center is a nighttime entertainment use per the 1998 EIR, although "the size and intensity of the event center use was not previously analyzed." (NOP/IS, p. 33.)

This is not based on fact. Aside from being a "secondary" use of the site, the Warriors Event Center does not meet the plain language of the "nighttime entertainment" designation that anticipates and encompasses small-scale clubs, restaurants, and bars. (Mission Bay South Redevelopment Plan, p. 50.) At the time of the 1998 EIR, several small neighborhood bars occasionally offered nighttime entertainment. This minor "secondary" use that existed in the area thus appeared to be compatible with the 3rd Street Corridor and the waterfront. Nothing in the definition of "nighttime entertainment" anticipates or

allows a venue of the type or at the scale now proposed for the Event Center.

The 1998 Mission Bay EIR focused on entertainment-oriented commercial development in Mission Bay North, "intended to complement" the San Francisco Giants Ballpark. The 1998 EIR anticipated almost 400,000 square feet of related entertainment-oriented retail ancillary to the ballpark, including a theater complex of up to 25 screens. If a regional event venue had been anticipated in Mission Bay South, the 1998 EIR would have called it out. It is also telling that "entertainment-oriented retail" in Mission Bay South was projected at only 56,000 square feet, 15% of the size anticipated in Mission Bay North. (1998 Mission Bay EIR, pp. III.2, 10-11; *see also* 1998 CEQA Findings, Mission Bay Plan [projecting only 50,000 square feet of entertainment-oriented retail].)

And while professional basketball games are nighttime events, the Event Center also anticipates 31 annual events "related to conventions, conferences, civic events, corporate events and other gatherings," with an estimated attendance of between 9,000 and 18,500 patrons. (NOP/IS, p. 15.) "[T]he majority of events are expected to occur during day time hours." (*Ibid.*) The definition of "nighttime entertainment" cannot reasonably stretch to consider over a month of daytime events never contemplated or considered by the 1990 and 1998 Mission Bay EIRs.

In these many respects, the Event Center is inconsistent with the adopted land use plan and has potentially significant impacts that require revision of the EIR.

***b. The Event Center Conflicts with Mission Bay South Design Criteria*.** Despite the Initial Study's contention that the Event Center would be consistent with adopted area land use policies established by the Mission Bay South Redevelopment Plan and the Design for Development, it concedes that the project sponsors seek material changes. The DSEIR anticipates amendments to the Mission Bay South Design for Development, the Mission Bay South Signage Master Plan, and the Mission Bay South Streetscape Plan. The Initial Study notes that the "unique nature of the proposed event center would require the sponsor to receive [City] approval of variations or amendments to some of these standards." (NOP/IS, p. 31.)

The Mission Bay South Redevelopment Plan codifies objectives and policies for urban design that must be applied to the Event Center, including:

> **Objective 3**: Emphasize in Mission Bay South the characteristic

San Francisco development patterns …

Policy 2: Design in consideration of protecting major views of the Bay, the Bay Bridge and the Downtown skyline from Mission Bay South … using street view corridors, open space, the careful placement of building forms and building massing.

Policy 3: Create a visual and physical access to San Francisco Bay and the channel of China Basin.

Policy 4: Recognize that buildings, open spaces and view corridors, seen together, will create the character of Mission Bay South.

Objective 4: Create a building form for the Mission Bay South area such that the scale of new development relates to the adjacent waterfront and to adjacent buildings.

Policy 1: Building heights should decrease as they approach water's edge.

The Event Center proposal creates at least 16 inconsistencies with the Design for Development (D4D), and its Appendix A recites amendments for:

- Raising maximum arena height limits from 90 to 135 feet
- Construction of a 160+ foot tower[1] close to another tower
- Increasing the bulk of the arena
- Changing arena setbacks, street wall heights, view corridors, public rights of way, and parking standards

The addition of large signage, electronic advertising, and nighttime light and searchlight effects that accompany basketball games and other large events also conflicts with design review standards and further impacts aesthetics/view corridors. The Commercial Industrial/Retail zone prohibits flashing signs, moving signs, and roof signs as well as business signs "above 1/2 of the base height of the building." (D4D, p.45.)

[1] The tower heights exceed 160 feet with the 16-foot mechanical parapet.

Even if amendments to the Design for Development could avoid legal inconsistencies, the proposed removal of codified urban design protections significantly impacts the design of the Mission Bay community and aesthetic environment and requires EIR analysis and mitigation.

The Design for Development also delineates urban design concepts that protect the community character of Mission Bay South via view corridors and a planned street grid that extends "San Francisco's historic urban pattern of Spanish measure Vara blocks." (D4D, p. 39.) "A Vara is an early Spanish unit of measure equal to 2.75 feet." (D4D, p.16.)

> First is an urban street grid which builds off of the primary existing streets and a traditional San Francisco pattern of Vara blocks, to allow for the transformation of an industrial pattern to one which welcomes the buildings and open spaces of a living/working/shopping neighborhood. In the tradition of cities by the water, this same framework of streets serves as view corridors that visually connect Mission Bay to the Bay and the City's downtown.
>
> View corridors are based on the following principles: to preserve the orientation and visual linkages to the Bay and Channel; as well as vistas to hills, the Bay Bridge and the downtown skyline; to preserve orientation and visual linkages that provide a sense of place within Mission Bay.

(D4D, pp. 39, 47.) The Design for Development specifies that "no building or portion thereof shall block a view corridor." (D4D, p. 39.)

As explained in the statewide planning publication *California Planning & Development Report* in a 1998 article praising the Mission Bay South Redevelopment Plan, "a 'vara block' is the same dimension as the first 10 blocks of San Francisco laid out by Vioget in 1839." (*CP&DR*, 1 September 1998, *attached*.) The vara block is not only of historic importance but "has near-ideal dimensions for an urban block" and "helps clarify, if clarity were needed, what precisely makes San Francisco the most walkable city in America: the dimensions of the grid …" "This new plan … promises to extend the pedestrian experience of San Francisco to the newest part of the city."

CP&DR marvels that the Redevelopment Plan takes a "giant canvas of largely undeveloped waterfront acreage" and uses vara blocks "to integrate this former railyard into the cultural and business life of the larger city." And "what is most remarkable about this scheme is how thoroughly the [UCSF] campus has been integrated into the grid … likened [] to residential blocks in Paris."

The Warriors Event Center proposes to eliminate four blocks, including two vara blocks and two smaller blocks, creating one large single block for the Event Center with structures that obscure both a north-south and east-west view corridor. The DSEIR must be revised to analyze and mitigate the environmental impacts of required amendments to adopted land use plans and policies, addressing the destruction of vara blocks and the related adverse impacts to aesthetics, view corridors, and pedestrian amenities.

While the Initial Study and the DSEIR rely upon Public Resources Code section 21099 to excuse the lack of analysis of aesthetics, claiming that such impacts of a mixed-use project on an infill site within a transit priority area are not subject to CEQA review, the DSEIR acknowledges that the Mission Bay South urban design standards apply to the Event Center project. The DSEIR must still consider aesthetic impacts that are addressed and protected by the City's design review ordinances.

These impacts are significant. The height and bulk of the project, sited directly on the waterfront, will disrupt views and alter the aesthetics and community character carefully planned for Mission Bay South for many years. The City's fundamental vision for Mission Bay would be forever compromised by dropping a tall, bulky sports arena at the water's edge, destroying planned vara blocks and historic view corridors.

The EIR must be revised to analyze and mitigate the project's inconsistencies with plans and policies in Mission Bay South adopted for environmental protection.

c. The Event Center Will Destroy Planned Community Character.
Development of Mission Bay South has been the subject of intensive planning for 25 years, as reflected in the 1990 EIR, the 1998 EIR, and the Mission Bay Redevelopment Plans. The character of the community revolves around medical and biotechnology development. "Because a major UCSF site would likely be a magnet for biotechnology research, an emphasis on biotechnology is anticipated." (1998 Mission Bay EIR, p. IA.89.)

The Warriors Event Center proposes a signature disruption in the long-planned development of Mission Bay South as a biotechnology and medical hub, and EIR analysis of that planned land use change is required. In comments on the Initial Study, research-based biotechnology company FibroGen, located adjacent to the project site, raised concerns about the Event Center's likely disturbance of the company's "operations, sensitive instrumentation, laboratories, and chemicals," all highly sensitive to noise and vibration. "… [G]iven the Project's significant scope coupled with the sensitivity of FibroGen's use and ongoing operations, … it is critical that the EIR thoroughly disclose and evaluate any potential land use incompatibilities with surrounding land uses."

This major planning detour requires EIR revision and recirculation.

3. The DSEIR's Analysis of Alternatives is Inadequate

Because the Event Center has significant impacts, it *cannot be approved* if feasible alternatives could reduce impacts and still accomplish most project objectives. (Pub. Resources Code, §§ 21002, 21081.) Our Supreme Court reiterated this substantive mandate of CEQA in *Mountain Lion Foundation v. Fish and Game Commission* (1997) 16 Cal.4th 105, pp. 123-134. The Court held that "[u]nder CEQA, a public agency must also consider measures that might mitigate a project's adverse environmental impact, and adopt them if feasible," due to "CEQA's substantive mandate that public agencies refrain from approving projects for which there are feasible alternatives or mitigation measures …"

Appropriately, EIRs explore ways for a project to meet as many applicant goals as possible while protecting the environment to the extent feasible. EIRs must evaluate project alternatives that accomplish most basic project objectives. (Guidelines, § 15126.6 (a).) The courts and the Guidelines require that EIRs analyze a "range of reasonable alternatives to the project, *or to the location of the project*" sufficient "to permit a reasoned choice" of alternatives "that would avoid or substantially lessen" any of the project's environmental impacts. (Guidelines, § 15126.6 (a), (c), (f), italics added.)

The Event Center EIR primarily focuses on three alternatives:

Alternative A: No Project
Alternate B: Reduced Intensity
Alternate C: Off-site at Piers 30-32 and Seawall 330

The EIR identifies significant project impacts relating to "traffic; wastewater treatment capacity impacts; crowd and amplified noise; UCSF hospital helipad safety; wind hazards; construction; water quality and hazardous materials; and bird collisions." (EIR, pp. 7-9). As already noted and as will be discussed further, there are other likely areas of significant impact as well.

a. *The No-Project Alternative Must Comply with Land Use Plans.* The point of an EIR's analysis of a No Project alternative is "to allow decisionmakers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project." (Guidelines, § 15126.6 (e)(1).) The DSEIR presents Alternative A as its No Project alternative, positing that the Warriors will temporarily remain at Oracle Arena in Oakland and will then likely rebuild or find another site. The EIR fairly assumes that Development at Blocks 29-32 would then occur according to the Mission Bay South Redevelopment Plan and the related Design for Development, without an arena.

However, the DSEIR's depiction of the No Project alternative assumes that without the Event Center the City would allocate most of the remaining development potential anticipated by the Mission Beach South Redevelopment Plan and Design for Development to this site at Blocks 29-32, thus prioritizing its development over other undeveloped sites in the same zone. The unsupported assumption that the site will host a second tower, among other things, overstates the No Project's environmental impacts.

The Design for Development dictates that three 160-foot towers can be permitted in Height Zone 5, where blocks 29 and 31 are located. (D4D, p. 23.) The No Project alternative assumes that construction of the final tower will be on Block 29. However, UCSF-owned Block 33 is also eligible. Even if the tower is appropriately-assumed to be sited on Block 29, the Design for Development requires that it not exceed 7% of developed area; to wit, 65,954 square feet. The No Project alternative assumes a tower of 208,000 square feet. Overstating impacts does not provide an adequate basis for comparing alternatives.

The No Project size is also inconsistent with other Design for Development requirements. Height Zone 5 permits a total developable area of 942,200 square feet. (D4D, p. 23.) The DSEIR assumes that the no project alternative would encompass 1,087,700 square feet. The DSEIR concedes in a footnote that its estimate of parking stalls exceeds the minimum required; another overstatement:

> Based on the requirements of the South Plan and the Design for Development, a minimum of 1,061 and maximum of 1,081 spaces would be needed for a proposed development of this size. With the inclusion of the 132 spaces at the South Street garage, the requirements for on-site parking would range from 929 to 949 spaces. Thus, the parking estimates used for the No Project Alternative exceed the requirements, though would likely be adjusted should an actual development proposal be submitted.

(DSEIR, p. 7-21 n.2.)

By overstating its size and scope, the No Project alternative defeats the purpose of providing the public and decisionmakers with comparisons to the proposed project and other alternatives. The DSEIR must be revised to analyze a No Project alternative that complies with adopted land use plans and does not overstate the scope of development: a low-rise development using vara blocks and that does not include a new tower, does not block the views of UCSF patients, and complies with Mission Bay's development plans.

b. *The DSEIR Must Analyze a Potentially-Feasible Alternate Site.* In considering whether an EIR's range of project alternatives complies with the "rule of reason," CEQA anticipates consideration of an off-site alternative:

> The key question and first step in analysis is whether any of the significant effects of the project would be avoided or substantially lessened by putting the project in another location. Only locations that would avoid or substantially lessen any of the significant effects of the project need be considered for inclusion in the EIR.

(Guidelines, § 15126.6 (f)(2)(A).) In light of the admitted and wide-ranging significant impacts of the proposed Event Center, it is particularly critical that the DSEIR consider a potentially-feasible alternate site or sites "… capable of avoiding or substantially lessening significant impacts of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly. …" (Guidelines, § 15126.6 (b).) Indeed considering an alternate location is one of the most important tasks for this DSEIR.

Instead, the DSEIR proposes just one off-site alternative, Alternative C, at Piers 30-32 and Seawall Lot 330 — a site already proven infeasible. The Warriors pursued and after considerable investment abandoned a plan to site the Event Center at this very location. The reason no doubt related to major City-wide public opposition based on significant traffic impacts, environmental harm to the San Francisco Bay during construction, blocked views of the Bay Bridge, and inappropriate use of publicly-owned waterfront property. The required vote of the San Francisco electorate that would be required for the project's excessive height was also problematic as increased heights on the northeast waterfront have been decidedly disfavored by City voters in multiple recent elections.

The project site also triggered extensive regulatory approvals from state and federal agencies, including the State Lands Commission, the San Francisco Bay Conservation and Development Commission, the Army Corp of Engineers, the U.S. Fish and Wildlife Service, and others. (DSEIR, pp. 7-17-18). And the project costs were substantially more than initially-projected, by many many millions of dollars, due to the need to replace crumbling piers and other unanticipated costs.

CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors." (Pub. Resources Code, § 21061.1.) The City knows that Piers 30-32 do not provide a feasible site and its selection as the sole off-site alternative fails to meet the rule of reason required for EIR alternatives. CEQA is not a game; the DSEIR must select and study another location for the Event Center to fulfill its mandate to provide good-faith analysis of a range of potentially-feasible alternatives, including an alternate location.

4. The EIR must assess Cultural Resources

The Initial Study and DSEIR contend that cultural resources were sufficiently addressed in the 1990 and 1998 Mission Bay EIRs. The Alliance disagrees. The DSEIR should be revised to provide project-specific analysis and mitigation as well as an updated investigation of resources as part of the environmental setting. The DSEIR description of the environmental setting is critical to provide a baseline of physical conditions from which to measure the significance of project impacts. (Guidelines, § 15125.)[2]

[2] Inadequacies in the EIR environmental setting and baseline led to inadequate analysis of environmental issues that will be addressed in other Alliance comment letters, including the jurisdictional wetlands identified on the project site.

To address impacts to paleontological and archaeological resources, the DSEIR proposes adoption of the mitigation measures recommended in the 1998 Mission Bay EIR, and concludes that environmental impacts will thereby be mitigated via standard archaeological testing, monitoring, and data recovery. (DSEIR, pp. 1-51, 1-57.)

The 1998 Mission Bay EIR relied on the 1990 Mission Bay EIR that in turn consulted a *Cultural Resources Evaluation for the Mission Bay Project* prepared in 1987 by David Chavez & Associates. (1990 EIR, p. VI.J.30, NOP/IS, p. 46.) As reflected in the prior EIRs, the shallows of Mission Bay were filled beginning in the 1860s and the Event Center site at Blocks 29-32 is on that filled land. The Initial Study references the Chavez report as stating that the filled land in Mission Bay had "no substantial potential for archaeological resources." (NOP/IS, p. 46; 1990 EIR, pp. II.64, VI.J.1-30.) However, the 1990 EIR nonetheless concluded that development could cause "significant impacts to subsurface prehistoric or historic archaeological resources … within the vicinity of Blocks 29-32," and identified mitigation measures. (*Ibid.*)

David Chavez and historian Jan Hupman subsequently prepared an *Archaeological Resources Review* report in 1997 for the 1998 Mission Bay EIR, concluding that "[t]he entire Mission Bay project area has at least some sensitivity for the presences of unknown archeological remains. Prehistoric cultural deposits could be encountered in three identified areas and *unknown historical features, artifact caches and debris areas could be located anywhere in the project area*." (Chavez & Hupman, *Archaeological Resources Review for the Mission Bay Project Subsequent EIR*, 1997, p. 7, italics added.)

Since then, geotechnical investigations at the project site in March 2014 identified a "medium dense to very dense sand, sand with clay, clayey sand, silty sand and sand with silt, known as the Colma Formation, [] encountered below the sand and clay in portions of the site." (Langan Treadwell Rollo Preliminary Geotechnical Evaluation, p. 2-3.) The Colma Formation involved sand between 5 and 35 feet thick, more than 19 feet below the ground surface. (Ibid.) That is a greater depth than the Event Center's projected excavations, but a 2014 report by ESA Associates Cultural Resources team suggesta pre-construction boring strategy as part of an Archaeology Testing Program ("ATP"):

> The ATP will need to include a pre-construction geoarchaeological boring strategy across the project area to determine: (a) whether the upper surface of the Colma Formation is intact or was eroded away in antiquity (and therefore whether there is even the potential for archaeological materials to be present); and (b) if the upper surface of the Colma Formation is intact, whether there are, in fact, any archaeological materials present.

The actual boring strategy is not known. A firm called Archeo-Tec made a proposal, but it was criticized by the ESA team: "The Archeo-Tec proposal only specifies trenching beginning at a depth of 10-15 feet below ground surface (after mass excavation has already started)." ESA noted that the Archeo-Tec plan did "not correlate with ERO standards" and was "not in line with Planning Department requirements for the project area." Further, "trenching will not address [City archaeologist Randall Dean's] specific concerns …"

The 1987 Chavez report had conceded that "[w]ith the exception of some limited archaeological testing in sensitive areas" the "actual areal extent, specific nature and location of historic features and artifact caches, and depositional integrity of the archaeological deposits" in South Mission Bay are unstudied. Further, "specific information of that nature is important in determining the actual significance of archaeological resources and in developing appropriate mitigation plans." (Chavez, *Cultural Resource Evaluation For the Mission Bay Project*, p. 105.)

Years later, archaeologist Dean properly criticized the Initial Study's cursory review of archaeological impacts, pointing out that:

> … [w]e know a lot more than we did 20 years ago about both buried and submerged potential horizontal and vertical locations and types of prehistoric deposits that may be present throughout SF. The project site lies within the mudflats of Mission Bay subject to shallow tidal waters but well within the paleoshorelines of 5,000 B.P. [...] the type of prehistoric deposits that might be affected would be within the Middle Holocene epoch which would make them of significant scientific value.

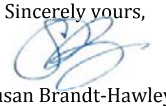
Incomplete information regarding cultural resources conflicts with CEQA's requirements for an adequate environmental setting/baseline to provide "special

emphasis" on "resources that are rare or unique …" (Guidelines, § 15125 (c).) Mitigation measures proposed in the Initial Study and DSEIR, including the Archaeological Testing Program, must be preceded by updated analysis of affected resources and performance standards. Since the Initial Study and the DSEIR rely on outdated information from the 1990 Mission Bay EIR, there is a higher potential for subsurface archaeological resources at the site than previously evaluated. The EIR must be revised to include a current analysis of cultural resources, potentially significant impacts, and performance-based mitigation.

****

Thank you for your attention and responses to each of these environmental issues.

Sincerely yours,



Susan Brandt-Hawley
Skyla V. Olds

CP&DR CALIFORNIA PLANNING & DEVELOPMENT REPORT

The Power of Grid

1 September 1998 - 12:00am
Morris Newman

Restraint is rarely touted as a virtue in urban design. Often, instructors in the History of Urban Design tend to treat the subject as a series of Greatest Hits - of grand interventions by such magnificently meddlesome people as Andre LeNotre or Baron Haussman or Robert Moses. Teachers in graduate seminars rarely show slides of, say, a Midwestern town and exclaim, "Look at how well the urban designers held themselves back!"

The blockbuster mentality makes the current master plan of Mission Bay, the 300-acre redevelopment area in San Francisco, all the more remarkable. Here, after all, is a giant canvas of largely undeveloped waterfront acreage in a major U.S. city. The first impulse (at least for eternal first-year design students, like myself) is to create a miniature city with a hierarchy of major and minor roads, a radial plan with diagonal streets, major and minor axes, formal green spaces with equestrian statues and topiary plantings - in other words, the whole nine yards of Beaux Arts planning, or its poor relation, the New Urbanism.

The current master plan, which is the fifth to be done in 20 years, resists the temptation to make a grand statement, however. Instead, the plan by Johnson Fain Partners opts to impose a more-or-less regular grid over the area that corresponds, in the dimensions of the blocks, to the original 10 blocks of downtown San Francisco. And while the restraint of this plan may or may not seem intuitively like the most exciting or most elegant solution, a close examination of the program suggests that this is the most urbane and best integrates this former railyard into the cultural and business life of the larger city.

Indeed, the history of planning efforts at Mission Bay shows the tensions between the need to integrate the area into the city, while creating a memorable place in itself. The site itself is also especially tempting for planners, because it sits at the crossroads of two grids: the commercial-industrial grid, on northeast-southwest coordinates, and a residential neighborhood, on north-south coordinates, immediately south of the commercial area.

The first four of the five plans done in the past 20 years, in fact, succumb to the temptation to bring the grids together in dramatic juxtaposition. The first plan, done 20 years ago by John Carl Warnecke envisioned a set of high-rise buildings (office and hotel) on either side of the Mission Bay Channel, which conforms to the commercial-industrial grid. The same plan pulled the north-south grid north of 16th street, to bring housing into Mission Bay. The density and height of the scheme aroused public opposition.

In the I.M. Pei/WRT scheme of 1985, the designers attempted to maximize the waterfront by carving out an oval-shaped channel south of Mission Bay Channel; ingeniously, this channel, and the resulting island at its center, are the formal devices to divide the commercial grid from the residential grid. This plan was also opposed for its density. And like the Warnecke plan before it, the Pei scheme was largely lacking in open space along the precious bay waterfront.

The third scheme by the Mission Bay Planning Team, led by EDAW and Dan Solomon, is an elegant, Beaux-Arts design that provides a clear hierarchy of streets arranged around a linear park or "common." This scheme also sets aside some bayfront land for a linear park. Pleasing as a graphic design, the plan arguably may have created some confusion on the ground, however, because streets are frequently changing in direction. Those same diagonal streets also disturb the views of the bay that could otherwise be available with streets that run straight east and west. The subsequent Skidmore Owings Merrill plan of 1989 is an inelegant truncation of the Solomon-EDAW that reflects the consensus of public hearings. This plan offers a further elongation of the bay front linear park, while providing more space for commercial construction.

New uses at Mission Bay, including a new baseball stadium immediately north of the site and a new campus for UC San Francisco, occasioned the fifth and current plan, this time by Johnson Fain Partners. The campus plan, which conforms to the larger scheme, is by the East Coast firm of Machado + Silvetti. As part of a Willie Brown-endorsed ambition to create a "synergy" between a research university and bio-tech businesses in San Francisco, landowner Catellus donated 43 acres of Mission Bay to UC San Francisco. That acreage is located smack-dab in the center of the master plan.

The great achievement of the scheme is to knit Mission Bay into the existing fabric of the city, rather than setting it apart as a separate "campus" or miniature city of its own. Faced with the difficulty of planning around a centrally located campus, the Johnson Fain team, led by principal William Fain, chose to organize most of the site with the north-south (residential) grid; the diagonal streets are limited to either side of the channel. Medium-to-high-density residential blocks (with densities averaging 110 units per acre) can be found both north and south of the channel. Happily, the plan preserves the common of the Solomon/EDAW scheme. A small traffic circle at the far west is the anti-climactic device that connects the two grids.

What is most remarkable about this scheme is how thoroughly the university campus has been integrated into the grid. This contrasts with the typical University of California campuses, which are master planned as separate cities and communicate poorly with the cities that surround them. In a competition winning scheme, Machado + Silvetti, has responded with a very urbane, non-hierarchical scheme that uses open spaces as the landmarks, rather than big buildings. Jose Begazo, Johnson Fain's project architect, has likened the campus design to residential blocks in Paris.

Importantly, the Johnson Fain designers chose to base the new grid on the historic "vara" block, the same dimension of the first 10 blocks of the city laid out by Vioget in 1839. A vara is a Spanish linear measure equal to 2.75 feet. The vara block is 100 by 150 varas, or 275 feet by 413 feet. Johnson Fain principal William Fain argues that the vara block, beyond its historic associations, has near-ideal dimensions for an urban block.

The use of the urban Vara block, in fact, helps clarify, if clarity were needed, what precisely makes San Francisco the most walkable city in America: the dimensions of the grid. No longer an abstract issue, the dimensions of grid here become elements in the sensuous enjoyment of cities - providing the energizing sense of movement through a regular tempo of streets and blocks.

This new plan, by relying heavily on the grid rather than special effects, promises to extend the pedestrian experience of San Francisco to the newest part of the city. In a sense, the Johnson Fain/Machado Silvetti scheme could be described as the scheme that resists the temptation to be grand, and in favor of being appropriate. Whether or not college lecturers add Mission Bay to their teaching syllabi remains to be seen. Even so, the scheme is a quiet but convincing argument about the power of the grid.

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July 26, 2015

SENT VIA EMAIL (warriors@sfgov.org)

Tiffany Bohee
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Comments on Environmental Review for Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Dear Ms. Bohee:

This firm represents the Mission Bay Alliance, an organization dedicated to preserving the environment in the Mission Bay area of San Francisco. This letter is submitted on behalf of Mission Bay Alliance regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Project"), and provides comments on the following topical areas: Greenhouse Gases, Geology and Soils, Hazardous Materials, Utilities and Service Systems, Recreation, Energy, Wind and Shadow, Project Description, and Urban Decay. These comments are supported by five subject matter expert reports, attached as Exhibits A-E, which are discussed and summarized below. In addition to responding to this letter, please provide responses to the detailed comments contained in the reports that are incorporated by reference and attachment to this letter. (CEQA Guidelines, § 15132, subd. (d), 15088.)

The comments set forth in this letter and its attachments address deficiencies contained in the DSEIR's analyses as well as subject areas where the DSEIR impermissibly failed to provide any substantive analysis. The Notice of Preparation / Initial Study ("NOP/IS") for the Project determined that nine topical areas were adequately analyzed in the 1990 and 1998 EIRs prepared for the Mission Bay Redevelopment Plan, and therefore no additional analysis was required in the present DSEIR for these specific areas. A fundamental problem with this approach is that the Mission Bay Plan was 303 acres and lacked site-specific review of the current 11-acre site. In the Mission Bay Redevelopment Plan, the four-block Project area was designated as "Commercial Industrial (Mixed Use including Retail)." (DSEIR, Figure 3-3.) This land use was then analyzed at a very general level. As described in the letter as shown in the "Land Use" section of the July 27, 2015 letter from the Brandt-Hawley Law Group, the Project is not consistent with the Mission Bay Redevelopment Plan or with the land use plans and zoning controls that are subordinate to the Mission Bay Redevelopment Plan.

In addition to the Project itself being different, the conditions under which the Project is undertaken, as compared to 1998, have changed substantially. Changed conditions include both changes in standards and practices for analyzing impacts, changes in overall environmental conditions, and changes to the site itself. As described in the comment letter submitted by the Mission Bay Alliance regarding tiering, all of these changes, in combination with the massive and impactful Project now being proposed, require preparation of a new EIR that examines every resource area at project-level detail. The City's strategy of relying on a very general environmental review document that is over 17 years old for topics required to be analyzed *and* mitigated in detail does not work for the public, nor is it compliant with CEQA's most basic requirements.

1. <u>Greenhouse Gas Emissions are Not Adequately Analyzed – DSEIR Chapter 5.5.</u>

Under AB 900, a "Leadership Project" receives an expedited CEQA review process and other streamlining benefits. (Pub. Resources Code, § 21178 et seq.) Leadership projects are supposed to create high quality permanent jobs and innovative measures to reduce environmental impacts, including greenhouse gas ("GHG") emissions. As a result of the certification received under AB 900, the DSEIR claims that the Project will "not result in any net additional GHG emissions." (DSEIR, p. 5.5-10.)

As explained below and in the attached technical comments by SCS Engineers, dated July 20, 2015 ("SCS" attached as <u>Exhibit A</u>), the AB 900 Application process does not meet minimum standards for calculation of GHG emissions, nor does it provide a substitute for CEQA's EIR process or substantive standards. The DSEIR relies entirely on the existence of the AB 900 certification for its analysis of the Project's contribution to the cumulative impact to GHG emissions. While the AB 900 certification is not subject to judicial review (Pub. Resources Code, § 21184, subd. (b)(1)), the content of the Application for AB 900 certification does not substitute for an adequate analysis of GHG emissions in the DSEIR. As a result, the DSEIR fails to meet minimum standards of disclosure and also incorrectly concludes that GHG emissions are less than significant. These flaws in the DSEIR require revision and recirculation of the DSEIR with an adequate GHG analysis.

a. The AB 900 Application Conflicts with State GHG Policies.

As explained in the SCS Memo (pp. 4-6), the AB 900 Application severely underestimated the emissions from this Project. It did so by overestimating the baseline for comparison, and then by underestimating Project emissions. The AB 900 Application made several unsupported assumptions to minimize the baseline conditions against which the Project's GHG emissions would be compared, including:

- Assuming a 76 percent reduction in baseline GHG emissions from Oracle arena due to relocation of the team to San Francisco, potentially omitting emissions that would occur if Oracle continues to emit more than 24 percent of its current GHG emissions (SCS, p. 4); and

- Overestimating, possibly by a factor of two, the trip linking benefits provided by location of the arena adjacent to other uses (SCS, p. 5).
The AB 900 Application then underestimated the Project's GHG emissions by:

- Omitting from its analysis entirely the GHG emissions for structures other than the arena that are planned as part of the Project, including the two 160 foot office towers, the gatehouse, the food hall, Warriors Headquarters, and retail uses, which comprise approximately 730,000 square feet of new uses that clearly will emit GHG (SCS, p. 5; see also NOP/IS, p. 11).

Additionally, the GHG mitigation offered in the AB 900 Application is not effective. After miscalculating the GHG emissions of the Project, the Application simply states that "with offsets purchased, there will be no net greenhouse gas emissions from the operation of the project." (Leadership Application, p. 9.) Yet, as explained by SCS Engineers (pp. 6-8), there are several flaws with this approach, including:

- Not requiring that any GHG emissions offsets be purchased unless the Project has a 90 percent utilization rate, raising the possibility that GHG emissions offsets would not be purchased at all (SCS, p. 7);

- The failure to require that purchased GHG emissions offsets are verified by the California Air Resources Board ("CARB"), consistent with California GHG reduction policies and AB 32, to ensure that they are real, permanent, quantifiable, verifiable, enforceable, and additional and thus will actually result in GHG emissions reductions (SCS, pp. 2-3, 8; see also Health & Saf. Code, § 38562, subd. (d)(1),(2));

- Not requiring that the emissions offsets purchased as mitigation for the Project be retired so that the offsets cannot be reused later to allegedly mitigate other projects' GHG emissions (SCS, pp. 2, 8);

- Only requiring that GHG emissions from the Project be offset for the first 30 years, ignoring GHG emissions that the Project would continue to produce after that point (SCS, p. 7);

- Using the faulty GHG inventory to estimate total GHG emissions from the Project over a 30-year period now, and allowing the applicant to purchase 30 years of GHG emissions offsets now, rather than continuing to use updated data regarding actual Project GHG emissions (SCS, p. 6); and

- Not including ongoing monitoring to ensure that estimated Project GHG emissions are similar to actual emissions and that purchased GHG offsets are actually effective in reducing GHG emissions (SCS, pp. 7-8).

In addition to these technical flaws (described in more detail by SCS Engineers in Exhibit A), the reliance on offsets to reduce GHG emissions is inconsistent with the intent of AB 900 to promote use of innovative measures to reduce GHG emissions. (Pub. Resources Code, § 21178, subd. (g).) Design features and/or mitigation measures could actually reduce the project's GHG emissions and create other environmental benefits. Instead, the Project simply plans to write a check to an unknown entity to supposedly "offset" GHG emissions.

Further, the deduction for GHG emissions based on the assumption that Oracle will only host 21 events into the foreseeable future is unwarranted in light of the City of Oakland's express plans to turn "Coliseum City" into an economically viable sports and entertainment hub. (See pp. 10-12 of July 19, 2015 Comments Regarding Air Quality Impact Analysis and Mitigation; Event Center and Mixed-Use Development at Mission Bay Blocks 29 – 32 by Autumn Wind Associates, Inc., attached as Exhibit 1 to the July 26, 2015 letter from the Law Offices of Thomas N. Lippe regarding the Project's Air Quality Impacts.

b. The Flawed AB 900 Application Cannot Substitute for an Adequate Analysis Under CEQA in the DSEIR.

The DSEIR simply refers to the result of the AB 900 certification process, providing no additional analysis or disclosure in the DSEIR itself regarding the expected GHG emissions of the Project or how those impacts would be mitigated. To the extent

the DSEIR intends to incorporate the faulty AB 900 Application into the DSEIR instead of setting forth the analysis in the DSEIR, it did not follow procedures required to do so. CEQA Guidelines section 15150 requires that "the incorporated part of the referenced document shall be briefly summarized where possible or briefly described if the data or information cannot be summarized." The AB 900 Application was not summarized or described in the DSEIR, nor was it included as an appendix. If the AB 900 Application is to be offered as environmental analysis in the DSEIR, it would have to be included as an appendix to the DSEIR so that the public could review it. (CEQA Guidelines, § 15147; *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 442 (where lead agency "relied on information not actually incorporated or described and referenced in the FEIR, it failed to proceed in the manner provided in CEQA").)

Nor can the DSEIR rely on analysis in the 1998 FSEIR. Though GHG emissions are briefly mentioned in the 1998 FSEIR (DSEIR, p. 5.5-1), this Project being proposed years later was not analyzed. Moreover, the approach to GHG emissions has changed dramatically in the intervening years.

The approach to calculating GHG emissions in the AB 900 Application is also inconsistent with basic CEQA principles as well as the DSEIR's approach to analysis of other impacts of the Project. As described above, large components of the Project to which the AB 900 certification and the "no net increase in GHG emissions" allegedly apply were simply omitted from the inventory, including over 700,000 square feet of retail and office uses. (DSEIR, Figure 3-5 and Table 3-1.) While there is no discussion in the DSEIR, the AB 900 Application claims that these other uses were "fully vested legal rights" permitted by the land use plan, and therefore did not quantify the GHG emissions from that part of the Project. (Leadership Application, p. 8.)

The Leadership Project application process does not provide any direction to exclude aspects of the project from the Leadership Application. (Pub. Resources Code, § 21183, subd. (c).) Nor does it substitute the AB 900 certification for an adequate analysis under CEQA. Certainly if the Legislature had intended that an approved Leadership application could substitute for mandated analysis in an EIR, it would have so stated; it did not. As the certification is for the entire complex, including office and retail, there is no justification to exclude part of the project from the analysis. The result is an impermissible decrease of the GHG emissions calculated to occur as a result of the Project.

The notion that having a vested right to do something affects the obligation under CEQA to disclose the impact of doing it has been squarely rejected. (*Communities For A*

Better Environment v. South Coast Air Quality Management Dist. (2010) 48 Cal.4th 310, 323-25, citing Pub. Resources Code, §§ 21002.1, subd. (b), 21081, subd. (a)(1); CEQA Guidelines, § 14, §§ 15040, 15126.4, subd. (a)(2) [lead agency ability to condition project]; § 21081; CEQA Guidelines, § 15042 [lead agency ability to deny the project].) Moreover, consistency with a plan does not preclude the need for analysis. (See *Environmental Planning & Information Council v. County of El Dorado* (1982) 131 Cal.App.3d 350, 354.) Notably, neither the air quality nor the traffic impact chapters of the DSEIR attempt to include credit for baseline development claimed as"vested." The completely different approach taken by the DSEIR with respect to analysis of GHG emissions is unsupported and must be corrected; the correct baseline is "no project."

The "mitigation" proposed for GHG emissions impacts is also contrary to CEQA's most basic requirements. Mitigation must be enforceable in order to be effective.. (CEQA Guidelines, § 15126.6, subd. (a)(2).) Here, as described above, the purchase of offsets may never occur, or if it does occur, may do nothing to reduce GHG emissions. The DSEIR's failure to identify enforceable mitigation measures is an error of law. (See *Federation of Hillside & Canyon Associations v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1260–1262*; Lincoln Place Tenants Association v. City of Los Angeles* (2005) 130 Cal.App.4th 1491, 1508 ["mitigating conditions are not mere expressions of hope. . . ."].) To the extent that the City intends to incorporate the purchase of offsets as a "design feature" or otherwise incorporate it into the project description, recent case law clarifies that this strategy violates CEQA's mandate to disclose project impacts and separately address feasible mitigation measures. (*Lotus v. Department of Transportation* (2014) 223 Cal.App.4th 645, 655-56 (incorporating mitigation measures for redwood trees into the project description violated CEQA "[b]y compressing the analysis of impacts and mitigation measures into a single issue . . ."].)

As a result of the City's improper approach to analysis of GHG emissions from the Project, the GHG analysis is incomplete and must be rewritten. Moreover, the "less than significant" determination for the Project's GHG emissions is based on errors of law described above, including splitting the Project into smaller pieces and excluding several of these pieces from the GHG calculation and failing to identify enforceable mitigation measures. According to air quality experts versed in GHG emissions and the use of GHG offsets: "The GHG analysis provided and proposed MM I-C-GG-1 are not sufficient to demonstrate that the Project will result in no net increase in GHG emissions" and "the determination in the [DSEIR] that GHG emissions are a less than significant impact is erroneous." (SCS, p. 2.)

2. <u>The DSEIR Was Required under CEQA to Analyze Impacts Related to Hazardous Materials – 1998 FSEIR Chapter 5.J.</u>

The NOP/IS correctly identified hazards and hazardous materials as an impact area generally requiring analysis under CEQA. (NOP/IS, pp. 106-122.) However, the DSEIR did not address hazardous materials at all (DSEIR, p. 1-9) because the NOP/IS concluded that there were no new or more severe impacts within this category than addressed in the 1998 FSEIR (NOP/IS, pp. 106-107.) This approach fails under any standard of review because the currently-proposed Project is different than the project described in the 1998 FSEIR, the 1998 FSEIR relies on outdated data and methodology to analyze impacts, and conditions have changed such that the 1998 FSEIR does not even describe the present contamination at the site. The recirculated DSEIR will need to include a full analysis of this issue that includes a thorough review of the extensive history of contamination of this site, and the resulting potentially significant impacts and mitigation required in the context of this Project.

These comments are supported by expert analysis from the firm BSK Associates. BSK reviewed several documents, including the DSEIR, NOP/IS, 2006 Revised Remedial Action Plan ("2006 RRMP"), and 1998 SEIR, and prepared a report addressing the adequacy of these documents and the potentially significant impacts associated with existing contamination by hazardous materials within the Project site. The BSK HazMat Report is attached as <u>Exhibit B</u>.

a. The 1998 SEIR Cannot be Relied Upon to Analyze Impacts Associated with Hazardous Materials.

The BSK HazMat Report explains that the 1998 SEIR cannot serve as a basis for any analysis of impacts associated with hazardous materials because that document relies upon long-outdated methodology for analyzing such impacts. (BSK HazMat Report, comment A1.) For example, the 1998 SEIR's analysis of risk to human health relied upon preliminary remediation goals developed by the EPA, and yet this methodology has been replaced by Environmental Screening Levels developed in 2013. Further, the 1998 SEIR relied upon averaged concentrations of chemical contaminants even though the total number of samples was too low to use such average values. (BSK HazMat Report, comment A2.) The BSK HazMat Report identifies further technical deficiencies that render the methodology followed in the 1998 SEIR inadequate for present use. (BSK HazMat Report, pp. 1-4.) It is telling that the NOP/IS never mentions the outdated methodology utilized in the 1998 SEIR, much less attempts to explain how applying current methodologies would achieve the same result.

b. Petroleum Hydrocarbon Contamination Has Always Been Just One Component of the Site's Overall Contamination.

Setting aside the issue of outdated methodology, the 1998 SEIR cannot serve as the basis for CEQA review because it does not adequately disclose current contamination at the Project site. Implicitly acknowledging that the 1998 EIR fails to disclose and analyze all contamination at the site in light of the characterization/remediation efforts following certification of the 1998 EIR, the NOP/IS purports to correct this admitted gap by providing a discussion entitled, "Actions Completed Since Publication of the Mission Bay FSEIR." (NOP/IS, p. 116.) However, this discussion misleads the public by suggesting that petroleum hydrocarbons are presently the only contaminant of concern onsite. The NOP/IS fails to adequately supplement the 1998 SEIR because it ignores contaminants other than petroleum hydrocarbons.

The NOP/IS asserts that there is no remaining soil and groundwater contamination at issue because, following the 1998 SEIR, remediation occurred in compliance with the San Francisco Bay Regional Water Quality Control Board ("RWQCB") Order R2-2005-028, which was ultimately rescinded in 2014. (NOP/IS, pp. 117-118.) What the NOP/IS fails to mention, however, is that Order R2-2005-028 and the subsequent remediation effort **solely addressed petroleum contamination, and no other contaminants onsite**. This limited scope is demonstrated with clarity in, for example, the RWQCB's subsequent Order R2-2014-0022 rescinding the prior order RS-2005-0028. Order R2-2014-0022 explained that the prior order only "address[ed] the existence of separate phase petroleum hydrocarbons products." Further, Order R2-2014-0022 explained that rescission of that prior order was appropriate because, "Post-remediation groundwater monitoring has shown that the residual petroleum products have very limited impact on the groundwater beneath the site." (Order R2-2014-0022.)

The limited nature of this remediation effort is further demonstrated in the subsequently-prepared Revised Risk Management Plan dated August 2006 ("2006 RRMP"). As the BSK HazMat Report explained:

> [T]here was no discussion of the semivolatile organic chemicals that were detected in soil and groundwater at the site. Summary tables presented in Appendix A of the RMP indicate that polycyclic aromatic hydrocarbons (PAHs) were detected in the soil at various locations and in groundwater collected from MW-11. A possible source and significance of the PAHs was not presented in the RMP.

(BSK HazMat Report, comment B2.)

In other words, even though other contaminants were identified in the 1998 SEIR, the subsequent RRMP focused only on petroleum hydrocarbon remediation. While both the City and the applicant clearly understood this limited scope of the remediation efforts following the 1998 SEIR (NOP/IS, p. 118 [explaining that remediation "has effectively removed free petroleum products in the Pier 64 area . . ."]), this understanding was in no way communicated to the public in the NOP/IS. To the contrary, the NOP/IS, misrepresents the current status of contamination at the site by asserting in relevant part:

> While the completion of remedial actions described above would be considered substantial changes that have occurred at the project site, implementation of these actions has effectively removed free petroleum products in the Pier 64 area and reduced risks to human health and the environment in this area compared to conditions described in the FSEIR.

(NOP/IS, p. 118.)

These statements mischaracterize the status of the Project site by ignoring the presence of other contaminants. As acknowledged in the NOP/IS, the site was previously used for "bulk fuel storage and distribution; railroad operations; a machine shop; boiler house; steel mill; well casing manufacturer; warehousing, shipping and receiving operations for a variety of products; fruit cannery, junk yards vehicle parking and maintenance facilities and a ready-mix concrete facility." (NOP/IS, p. 115.) Even the 1998 SEIR acknowledged that the Project site could contain other contaminants and that insufficient surveys at that time had been performed to characterize the contamination and resulting risk. (1998 SEIR, pp. V.J.1 – 110.) With respect to metals, for example, the 1998 SEIR stated, "All 17 metals that were included in the list of analytes tested . . . were detected in varying concentrations in soil throughout Mission Bay South." (1998 SEIR, p. V.J.36.) The same was true for asbestos and creosote as well. (1998 SEIR, pp. V.J.15 – 16.)

Thus, contaminants other than hydrocarbon were identified as early as 1998, which is not surprising based on the various historical uses of the Project site. Notwithstanding this, the only remediation identified in the NOP/IS relates to hydrocarbon contamination. The NOP/IS fails as an informational document because other contaminants that are contained in the soil have not been publicly disclosed. As discussed more fully below, these other contaminants create potentially significant impacts that must be addressed.

c. Activities Following the 1998 SEIR Have Increased the Project Site's Contamination.

The 1998 SEIR cannot be relied upon for environmental analysis of hazardous materials impacts of the Project because subsequent activities at the site have significantly altered the nature and scope of contamination. As explained in the BSK HazMat Report, a Phase II Environmental Site Assessment prepared by Langan Treadwell Rollo, dated June 2015 ("2015 Phase II Report"), identifies additional contamination following the 1998 SEIR that has been ignored in the present NOP/IS and DSEIR. (BSK HazMat Report, comments A3, A4, B3, B4.)

Based upon review of the 2015 Phase II Report, the BSK HazMat Report explains that additional hazardous waste materials were actually imported onto the Project site during petroleum hydrocarbon remediation activities in 2005. Specifically, contaminated construction debris and other hazardous waste were used as backfill in 2005 in violation of the Mission Bay remedial action plan ("RMP"). (BSK HazMat Report, comments A3, B5.) While the prior Mission Bay RMP may have allowed the movement and reuse of certain levels of contaminated soils, "DTSC's determination does not apply to building debris or waste soils or other waste materials for any necessary remediation activities." (BSK HazMat Report, comments A3.) In other words, while the occurrence of petroleum hydrocarbon contamination may have been reduced as a result of subsequent remediation activities, the occurrence and associated risk posed by other forms of contamination actually increased following the 1998 SEIR. While the 1998 SEIR could not have addressed this new contamination because it occurred in 2005, this does not excuse the omission of this critical information from the NOP/IS and DSEIR.

The BSK HazMat Report also finds, based in the 2015 Phase II, that significant amounts of both previously-existing and subsequently-imported hazardous waste remain on the site today. The presence of this existing hazardous waste raises many unaddressed issues. First, it appears that this hazardous waste will need to be excavated and removed in order to construct the proposed Project. The BSK HazMat Report explains, "Significant volumes of soil classified as hazardous waste will need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase." (BSK Hazmat Report, comment C1.) According to the NOP/IS, "[T]he maximum depth of excavation on-site would be approximately 30 feet below San Francisco City Datum; this would require approximately 350,000 cubic yards of soils on-site to be excavated and removed from the site" (NOP/IS, p. 17.) It is not clear how this estimate was derived or how it relates to the actual excavation needed for purposes of removing contaminated soils. The excavation, removal, transport, and disposal of this

massive volume of contaminated soil creates potentially significant impacts that have not been disclosed. (CEQA Guidelines, Appendix G, section VIII (a), (b), (c).)

Other serious questions arise if all or even some portion of the hazardous waste is not ultimately removed from the Project site. If not removed, what is the remediation plan to reduce risk of exposure to the public? How will workers be protected during construction of the Project? Does the 350,000 cubic yards include excavation associated with stormwater and other infrastructure remediation work, or will that construction occur in the contaminated soil that remains? Will any of this contaminated soil be used to create the 3.2 acres of open space, or the additional open space located across the street at the Bayfront Park? Will an impermeable cap be used to separate contaminated soil from at-grade landscaped open space? Since much of the landscaped open space appears to be elevated, is this a design feature intended to quietly address the human health risk associated with the contaminated soil? The DSEIR fails to address these important questions.

The presence of contaminated soil within the Project site cannot be swept under the rug. The contamination must be quantified along with its appropriate exposure risks. These risks and adequate mitigation measures must be disclosed to the public in a revised and recirculated DSEIR that complies with CEQA.

d. The DSEIR's Treatment of Hazardous Materials Fails under Any Applicable Standard.

As established above, the City's strategy of relying on the 1998 SEIR as supplemented with updated information from the NOP/IS violates CEQA.

First, this strategy fails to provide an adequate project-level informational document because the 1998 SEIR does not describe current conditions, and the supplemental information provided in the NOP/IS misleads the public by ignoring all hazardous constituents other than hydrocarbon contamination.

Second, the DSEIR is inadequate because substantial evidence supports a fair argument that constructing the Project on the existing contaminated soil will result in potentially significant impacts. The information contained in the DSEIR, together with the BSK Hazmat Report and the 2015 Phase II Report, demonstrate that the present contamination poses potentially significant hazards due to proposed construction in soil containing hazardous waste, and transport and disposal of the same hazardous waste.

Third, even if the City were to rely on Public Resources Code section 21166, the subsequent remediation activities that increased the presence of certain hazardous waste constituents following the 1998 SEIR represents a change in circumstances that requires preparation of a supplemental EIR. The proposed site plan with several acres of landscaped open space also constitutes a change to the project that was described in 1998 (simply a land use plan for 303 acres) and significantly increases the potential public hazard by exposing people to hazardous waste in the soil even if the RMP is followed. A recirculated DSEIR must include a thorough analysis of hazardous materials using current methodologies.

e. The City Cannot Rely on Mitigation Measures for Hazardous Materials without Analyzing the Impacts.

Seemingly in furtherance of an implicit goal to avoid substantive public disclosure of hazardous materials impacts in the DSEIR, the City takes the remarkable position in the NOP/IS that it can adopt mitigation measures without analyzing and disclosing impacts. This approach is employed with respect to risks associated with naturally occurring asbestos (NOP/IS, pp. 113-115) as well as risks associated with exposed contaminated soil prior to site development as regulated in the City by the Maher Ordinance (NOP/IS, p. 116). This approach is fundamentally flawed, however, because CEQA does not permit an agency to adopt mitigation measures in lieu of fully assessing a project's potentially significant environmental impacts. A mere acknowledgment that an impact would be significant is inadequate; the EIR must include a detailed analysis of "how adverse" the impact would be. (*Galante Vineyards v. Monterey Peninsula Water Management Dist.* (1997) 60 Cal.App.4th 1109, 1123*; Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831.)

The flaw in this approach is easily seen in both contexts. With respect to compliance with the Maher Ordinance, for example, section 2(b) of this letter explains that the NOP/IS fails to describe the existing heavy metals and other hazardous waste contained in the soil.[1] The DSEIR's failure to mention this contamination prevents public disclosure of its scope, its implications for future construction work onsite, and potential exposure to the public during occupancy of the Project. As a document of public information, the DSEIR cannot avoid meaningful disclosure of this information by announcing that compliance with the Maher Ordinance will fix everything. That strategy is the opposite of informed decision-making and public participation.

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1 It is noted that the NOP/IS does not attempt to make compliance with the Maher Ordinance an enforceable mitigation measure.

The same analysis applies to the acknowledged asbestos-containing backfill material located onsite. First, it is not at all clear that California Air Resources Control Board's ("CARB") Asbestos Airborne Toxic Control Measure ("ATCM") even applies because this is not an instance where construction is occurring in an area of naturally occurring asbestos material. (Cal. Code Regs., tit. 17, § 93105, subd. (b).) As acknowledged in the NOP/IS, the material is processed (i.e., crushed) asbestos containing rock that was imported onto the site and used as backfill material. Accordingly, CARB's Asbestos ATCM does not apply here. Consistent with this misapplication of the Asbestos ATCM in the NOP/IS, the "no visible emission at property boundary" standard (NOP/IS, p. 114) does not apply because it is inadequate for both public and worker safety. Rather, the Project must comply with BAAQMD Regulation 11, Rule 2.

Second, even if the NOP/IS had identified the proper regulatory standard, the underlying strategy of relying on promises to comply with regulatory standards does not satisfy CEQA's informational disclosure mandates. The City has the duty under CEQA to investigate and disclose the extent of the potentially significant impact prior to setting forth potential mitigation measures. (*Galante, supra,* (1997) 60 Cal.App.4th at 1123.) Considering that many other flaws will require preparation of a Recirculated DSEIR, there will be ample opportunity to include the results of further study of contamination in that forthcoming document.

3. <u>Geology and Soils – 1998 FSEIR Chapter 5.H.</u>

According to the NOP/IS, there are no new or more severe Geology and Soils impacts associated with the Project than were analyzed in the 1998 FSEIR. (NOP/IS, pp. 85-86.) Thus, the DSEIR did not address Geology and Soils. (DSEIR, p. 1-9.) The omitted analysis fails under any standard of review because the currently-proposed Project is different than the project described in the 1998 FSEIR and conditions have changed such that the 1998 FSEIR does not adequately describe it. The 1998 FSEIR also relies on outdated data and methodology to analyze Geology and Soils impacts. Moreover, the Project has never been subject to a thorough analysis regarding Geology and Soils Impacts in any document.

As described in the attached reports prepared by geotechnical engineer Lawrence Karp, CE, CEG ("Karp Geotech", attached as <u>Exhibit C</u>), BSK engineering geologist Martin Cline, CEG, and hydrogeologist Kurt Balasek, PG, CHG, QSD ("BSK Geotech", attached as <u>Exhibit D</u>), the 1998 EIR fails to provide adequate analysis of impacts related to Geology and Soils. In particular, the seismic and tsunami risks associated with the site and the Project have not been analyzed or mitigated to an acceptable level. As explained below, these unanalyzed impacts put the public at unnecessary risk and require that the

DSEIR be revised and recirculated for public review. The recirculated DSEIR must include a thorough review of geotechnical conditions of this site and the resulting potentially significant impacts and mitigation required in the context of this Project.

a. Seismic Hazards.

i. The Seismic Standards for the Site have Changed Since 1998.

The NOP/IS claims that there are "no new or more severe effects," ignoring "[s]ignificant changes to the California Building Code and the standard of practice for analyzing ground motion and liquefaction evaluation have occurred since the 1998 SEIR was published." (BSK, comment B1.) At the time the 1998 EIR was written, the San Francisco Building Code was based on different maps and seismic design standards were much less stringent. (Karp Geotech, p. 3.) Later mapping by the State delineates the site as subject to liquefaction-induced ground displacement, and no analysis of the parameters used in 1998 and those applicable today has been prepared to support the claim that there are no new or more severe impacts than discussed in the 1998 FSEIR. The ground motion parameters required of a public assembly use are also much more stringent now, as described by Dr. Karp. (Karp Geotech, pp. 3-4.)

ii. A Complete Geotechnical Investigation Has Not Been Completed.

The proposed Project, which is a "public assembly use" for occupancy greater than 300 requires a different and more thorough analysis with respect to seismic hazards than the "Commercial Industrial (Mixed Use including Retail)" land use designation analyzed in 1998. (Karp Geotech, p. 1; see also DSEIR, Figure 3-3.) The site has not been properly classified for a public assembly use and the prior geotechnical reports prepared for the site underestimate public response. Public assembly uses for occupancies greater than 300 require a different approach to engineering than a typical project.

The evaluation reports prepared for the site after the 1998 EIR do not address the Risk Category III Importance under the Building Code[2] and the data underestimates site response to strong motion. (Karp Geotech, p. 1.) Moreover, later documents, such as the

[2] According to the California Building Code, § 1604.5: Risk Category III includes those "[b]uildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300."

2011 Langan Treadwell Rollo Geotechnical Investigation, were prepared for previously-proposed office buildings, not an arena. The other more recent report by the same firm states it is "Privileged and Confidential – For Discussion Purposes Only" (BSK Geotech, comment B.2; Karp Geotech, p. 1) and is not stamped by an engineer. In any case, neither the 1998 EIR or these more recent reports classify the current site use or address Risk Level III Importance requirements.

iii. Seismic Risk Is Underestimated.

The site is subject to two geotechnical risks, liquefaction and amplification. (Karp Geotech, p. 2.) The liquefaction risks were not adequately analyzed in 1998 EIR for this Project type, and the 1998 EIR does not analyze amplification. Liquefaction and amplification "hazards are different but related; liquefaction potential (sand) can be mitigated but the structure must be designed to resist soft ground (clay) amplification from strong motion." (Karp Geotech, p. 2.)

With respect to liquefaction, the risk can be mitigated with various ground improvement techniques. (Karp, p. 5.) Techniques include overexcavation and compaction, however the extent of excavation needed to fully address liquefaction has not yet been determined. (BSK Geotech, p. 5.) According to the NOP/IS, excavation on-site would extend approximately 30 feet, requiring approximately 350,000 cubic yards of soils on-site to be excavated and removed from the site" (NOP/IS, p. 17, 89.)[3] No explanation is provided, however, as to how this amount of excavation was determined, or how it relates to the amount of material that must be removed due to contamination, or for geotechnical purposes. (BSK Geotech, comment A5; see also *ante* section 2. regarding Hazard Impacts.) Additionally, once soils are excavated, the 1998 SEIR and the NOP/IS do not specify when or how engineered fill would be used as opposed to other types of fill. All of these details would be part of a complete seismic analysis.

iv. The Pile System is Not Adequately Developed and is of Limited Assistance to Protect the Public.

The 1998 EIR and the NOP/IS refer to the use of piles for structural stability. (1998 FSEIR, p. II.20, V.H.12; NOP/IS, pp. 17, 86, 87, 88-91.) Piles would be subject to

[3] See also comments on Air Quality submitted by Tom Lippe. The failure to accurately quantify the amount of soil excavation that will be required to address liquefaction and site contamination (see section 3. *infra*) also make the air emissions estimates and traffic impacts analysis unreliable. Additionally, availability of disposal sites cannot be analyzed without a reasoned estimate of needed excavation.

amplification, which was not studied in the 1998 DSEIR. (Karp Geotech, p. 5.) Moreover, piles are discussed only in the context of the arena structure. However, "[p]ile support systems do little to provide mitigation from liquefaction and settlement of surrounding utilities/roads and other support systems that may be damaged during a seismic event." (BSK Geotech, comment A1.) Settlement due to sand boils is a potential concern that has not yet been fully addressed in terms of impacts to supporting structures and necessary mitigation standards. (BSK Geotech, comments A10, A11.) These Project details must be studied in the context of an EIR. (See BSK Geotech, comment A4.)

v. Impacts of Dewatering and Pile Driving Have Not Been Studied.

Dewatering necessary for construction has not yet been studied to the degree of detail needed to understand the required mitigation. A 2015 Langan Treadwell Rollo memorandum discusses dewatering, but does not address engineering effects of dewatering, such as the increase in effective stress that causes areal subsidence. (Karp Geotech, p. 6.) The NOP/IS unreasonably dismisses these risks with no analysis. (BSK Geotech, comment B6.) Vibrations from pile driving can also create additional risks, which have not been analyzed for this Project. (Karp Geotech, p. 6.) Test programs, dynamic analyses and site-specific engineering are needed, and have not yet been completed, to identify the nature and extent of the impacts and the necessary mitigation to address these impacts. (Karp Geotech, p. 6.)

vi. Hazards of Lateral Spread and Liquefaction Induced Boils Are Not Addressed.

In 1998, mapping for lateral spread risk did not include the site. (BSK Geotech, comment B5.) Liquefaction-induced sand boils have also been identified as a hazard since 1998. (BSK Geotech, comment C4.) These hazards individually and jointly must be analyzed in the context of an EIR in order to fully inform the public regarding the potential impacts of the Project consistent with CEQA. (See generally Pub. Resources Code, § 21002.)

In summary, a thorough analysis of all seismic risks that utilizes the most current methodologies must be performed to adequately protect the public. Candlestick Park provides a relevant case study of the need to ensure thorough analysis and mitigation. In 1985, Lawrence Karp was involved in a study of how Candlestick Park would perform in a serious seismic event, and attended a summary meeting in City Hall with Norm Karasick, the City architect. The discussion was about the cost of rebuilding the deteriorated concrete bleachers to then-current standards. It was recognized that one or more sections could collapse in an earthquake. Mr. Karasick pointed out that the City

probably would not want to spend the money to strengthen the bleachers, stating, "What are the odds there would be an earthquake during a game?" The City ultimately decided to do the work, and on October 17, 1989 the Loma Prieta earthquake occurred during a World Series game. Nobody was injured at the game. Had the City not engaged in that updated study, and mitigated to current standards, the result might have been disastrous. The same practice must be followed here. The City must correct its outdated and deficient seismic analyses in the recirculated DSEIR.

b. Tsunami Hazards Are Not Addressed.

According to the 1998 FSEIR, the "likelihood of tsunami inundation is very slight." (1998 FSEIR, p. II.20.) The 1975 model used in the 1998 EIR to determine potential tsunami hazards is outdated. (BSK Geotech, Comment A.6.) The current approach for assessing tsunami risk is to perform a Probabilistic Tsunami Hazard Analysis, which has not been done for this site. (BSK Geotech, comment A.6.)

Since 1998, part of the Project site was mapped as a Tsunami Hazard Zone established by the State of California (California Emergency Management Agency, June 15, 2009 Map). (BSK Geotech, comment A.2; see also Figure 1.) This updated map indicates that the tsunami hazard is now considered significant. (BSK Geotech, comment A.2.)

The 1998 FSEIR, NOP/IS and DSEIR do not address the tsunami hazard in the context of extreme high tides or sea level rise. (BSK Geotech, comments A7, B9, C1.) The 1998 FSEIR and the NOP/IS relied on "datum established in the 19th century," which has not been updated to reflect current sea level data. (BSK Geotech, comments A8, B8.) The 1998 FSEIR and NOP/IS minimize the tsunami hazard based on these outdated methodological approaches. Reliant upon these conclusions, the DSEIR discounts the risk of tsunami and provides no analysis of the impact. (BSK Geotech, comment C3.)

Currently, structures designated as Risk Category III are specifically prohibited in a Tsunami Hazard Zone under the California Building Code. (BSK Geotech, comment A9; see also Figure 1.) The NOP/IS and the DSEIR fail to mention this important fact. (BSK Geotech, comment C5.) The DSEIR must be rewritten and recirculated to address tsunami hazards.

c. Inadequate Mitigation is Provided for Geology and Soils Impacts.

i. There are No Effective Seismic Mitigation Measures.

No mitigation in the form required by CEQA is included for Geology and Soils Impacts despite the discussion of the need for mitigation measures identified in more recent site-specific geotechnical reports. (BSK Geotech, comment C2.) The NOP/IS relies on a combination of old and inadequate mitigation from the 1998 EIR, compliance with the Building Code, and future geologic and other investigations. All mitigation for the serious impacts associated with Geology and Soils has been impermissibly deferred.

While the NOP appears to point to mitigation developed in 1998 as applicable to the Project, DSEIR Appendix-MIT indicates that there are no mitigation measures listed that apply to the Project's Geology and Soils impacts. Yet the findings and conclusions of the geotechnical work completed for the site by Langan Treadwell Rollo identify numerous conditions requiring mitigation, including: "excessive static and dynamic settlements, liquefaction including sand boils, lateral spread, intense ground motion, shallow groundwater and corrosive soils." (BSK Geotech, comment C2.)

In 1998, the site's soils were identified as highly corrosive, which can damage concrete and metal used in foundation measures and other underground infrastructure. (See Karp Geotech, p. 5.) The NOP/IS states that Mitigation Measure H.7 from the 1998 FSEIR would require testing of the soil. (NOP/IS, p. 86.) Yet, Appendix MIT of the 2015 DSEIR states that this Mitigation Measure H.7 is not required. (DSEIR, MIT-22.)

With no site-specific or Project specific mitigation, the NOP/IS relies primarily on the Building Code to mitigate for seismic impacts. (NOP/IS, p. 87, 88, 90.) Yet reliance on a regulatory standard is inadequate when the underlying impacts have never been analyzed in the first place. While mitigation may properly be deferred in some instances (CEQA Guidelines, § 15126.4, subd. (a)(1)(B)), the "perfunctory listing of possible mitigation . . . [that] are non-exclusive, undefined, untested and of unknown efficacy," is inadequate. (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 74, 93.) Here, the DSEIR's lack of seismic analysis addressing this Project and this site severely compounds the problem.

According to the IS/NOP (pp. 87, 93) future geotechnical investigations will disclose the conditions and the required mitigation. Neither the future study nor the alleged future mitigation are enforceable. Moreover, to the extent these references relate to the contemporary geotechnical evaluations and investigations, such as the 2011 Langan Treadwell Rollo report for office buildings, they are inapplicable to the building

type now proposed. These more recent reports also clearly state that they are not to be used for design purposes.

According to Dr. Karp, the current documents for the Project do "not include sufficient countermeasures to liquefaction" risks. (Karp Geotech, p. 5.) For instance, ground improvement measures also need to lessen the effects of strong motion in the underlying Bay Mud during earthquakes. (Karp Geotech, p. 5.) Countermeasures could include various actions, but those actions must be compatible with a piling system that would be subject to liquefaction loads and motion amplification from Bay Mud. (Karp Geotech, p. 5.) Specific measures to address differential settlement have not yet been developed. (BSK Geotech, comment B3, B6.) Mitigation must be developed in the context of a contemporary environmental review process. A test program should also be developed to evaluate these measures. (Karp Geotech, pp. 5-6.)

In addition to proper design of the Project, mitigation must address public safety concerns regarding evacuation from an earthquake or tsunami. Even if overexcavation and fill and other measures could be effective to address liquefaction at the site, surrounding utility roads and emergency support systems would not be protected by the proposed supporting piles discussed in the 1998 DSEIR and the IS/NOP. (BSK Geotech, comments A1, A10.) Additionally, adequate escape routes from the area must be available in the event of an earthquake or a tsunami. A collapse of the Third Street Bridge was previously identified as subject to damage in a major earthquake and limiting escape routes out of Mission Bay. (1988 DEIR, Vol. II, Chapter VI.D.3, 9 and 44.)

ii. No Mitigation is Provided for Tsunami Risk.

While the NOP/IS discusses possible mitigation for tsunami in the text, none of those measures are included in the Mitigation Measures. (BSK Geotech, comment B10.) Additionally, it is unclear why mitigation is being provided at all if the risk is indeed less than significant. (BSK Geotech, comment C1.) Additional mitigation in the form of design parameters that could assist in reducing the risk are not specified or required. (BSK Geotech, comment B11.) And flood improvements are a feasible mitigation measure required for the portion of Mission Bay subject to Addendum 9 to the 1998 FSEIR. (FSEIR, Addendum 9, Mitigation Measure K.06.) It appears that these measures would also be appropriate for the Project.

In conclusion, the United States Geological Survey forecasted a 67% probability that an earthquake of magnitude 7.0 or greater will occur on the San Andreas or Hayward faults by the year 2020. (Karp Geotech, p. 2.) This Project will draw up to 18,500 people into a zone subject to many risks. A full environmental analysis, with a testing program and adequate mitigation must be included in a recirculated EIR. Risks to the public from earthquakes and tsunamis are too dire to ignore or treat lightly based on decades-old environmental review and outdated models and standards.

4. <u>The DSEIR's Analysis of Utilities and Service Systems Violates CEQA – DSEIR Chapter 5.7.</u>

The DEIR's analysis of utilities and service systems fails to comply with CEQA's mandates. First, the DSEIR relies upon a water supply assessment for an earlier, different project, in a different location, prepared before the City had its water rights curtailed. The DSEIR also fails to address necessary stormwater infrastructure issues and relies on the prior NOP/IS that affirmatively misrepresents the capacity of that anticipated system. Finally, the DSEIR impermissibly defers virtually all substantive analysis and mitigation regarding needed wastewater infrastructure.

a. Inadequate Analysis of Water Supply and Conveyance Facilities.

The DSEIR impermissibly fails to consider whether the Project will result in the construction or expansion of any water conveyance facilities that may result in significant environmental impacts. This approach is based on the claim that the NOP/IS establishes that there are no significant impacts. (DSEIR, p. 5.7-9.) The NOP/IS, however, fails to provide sufficient information to make any conclusion in this issue by deferring any meaningful analysis. (NOP/IS, pp. 68-69.)

More specifically, the NOP/IS acknowledges:

> If the water distribution system as approved under the Mission Bay Infrastructure Plan is inadequate to meet the project's demand, the project sponsor would be responsible for funding the construction of required new water mains and appurtenances. The construction of the new water mains and appurtenances would require excavation, trenching, soil movement, and other activities typical of construction of development projects in San Francisco.

(NOP/IS, p. 69.)

This analysis is flawed in several respects. First, having acknowledged that the infrastructure may not be adequate for the Project, and that construction of an unknown scope may be necessary to install this infrastructure, the SDEIR may not simply defer analysis of whether the infrastructure is adequate. And yet that is precisely what the City

purports to do, stating in relevant part: "As part of the standard permit review process, the Mission Bay master developer, in coordination with the project sponsor, would be required to request a hydraulic analysis of the SFPUC water distribution system to confirm that the existing and planned water distribution system is adequate to meet the project's water distribution demands, including fire suppression system pressure and flow demands." (NOP/IS, p. 69.) No explanation is given as to why this assessment could not have been made prior to the release of the DSEIR, which is the intended vehicle to provide public disclosure of these very issues. As a result, the decision-makers and the public are left completely in the dark about the very matter at issue, namely whether additional infrastructure is required and, if so, the scope of construction work that may be necessary to install that infrastructure.

The environmental impacts of construction may not be lightly dismissed as done in the NOP/IS. (NOP/IS, p. 69.) While construction of water conveyance facilities might, generally speaking, be "typical of construction of development projects in San Francisco," the Project site includes soil and groundwater contamination that make such construction activities anything but "typical." (<u>Exhibit B</u>, comments A1, A2, A3, B1, B3, B4, B5, B6, C1.)

The DSEIR fails as an informational document because it impermissibly defers any meaningful analysis of water conveyance facilities. Moreover, there is substantial evidence of a fair argument that construction of these facilities, if required, may result in significant environmental impacts. The recirculated DSEIR needs to address this issue.

Similarly, the DSEIR dismisses the question of adequate water supply without analysis, relying on the lack of potentially significant impacts identified in the NOP/IS. (DSEIR, p. 5.7-1.) The NOP/IS states that the City is relying on a water supply assessment ("WSA") prepared in May 2013 for the then-proposed arena site located at Piers 30-32 ("2013 WSA"). The DSEIR fails as in informational document with respect to water supply issues because it may not rely on the 2013 WSA.

First, the DSEIR does not address how the proposed Project is a revision of the Piers 30-32 project for purposes of Water Code section 10910. While the two projects may share some common features of an arena, there are considerable differences. The projects are at different locations. Further, the prior project proposed 208,844 square feet of residential uses and 178,406 square feet of hotel uses, that are eliminated in the current Project that proposes 580,000 square feet of commercial uses. The basic site plans are different for the two projects.

Second, even if the proposed Project could be considered a revision to the abandoned Piers 30-32 project, the DSEIR may not rely on the prior WSA because there has been a significant change in circumstances since preparation of the 2013 WSA. (Wat. Code, § 10910, subd. (h).) Water Code section 10910, subdivision (h)(2) provides that a prior WSA may not be subsequently relied upon when there are "[c]hanges in the circumstances or conditions substantially affecting the ability of the public water system . . . to provide a sufficient supply of water for the project." The ongoing drought is a major change in circumstances that substantially affects the City's ability to provide water to the Project. On June 26, 2015 the State Water Board sent the City a notice curtailing its pre-1914 water rights. With no relief to the drought in sight, it is reasonable to expect further curtailments to the City's water rights. This change in circumstances prohibits the City from relying on the 2013 WSA for the project. And the DSEIR's failure to discuss this critical water supply issue renders it inadequate as an informational document.

b. The DSEIR Provides a Misleading Discussion of Stormwater Treatment Facilities.

The DSEIR also fails as an informational document with respect to its analysis of stormwater treatment because it provides both inconsistent and misleading information about the facilities intended to handle stormwater runoff.

First, the DSEIR is internally inconsistent with the NOP/IS, upon which it purportedly relies. With respect to stormwater facilities, the NOP/IS asserts that the impact is potentially significant (IS, p. 64 Table 11.c) and will be analyzed in the DSEIR (IS, p. 72.) The subsequent DSEIR, however, states that it is not providing a project level analysis of the issue, asserting in relevant part:

> With respect to stormwater facilities, however, the stormwater system improvements already construction and currently under construction address both the near-term and long-term needs. . . . ***A separate project impact analysis is not provided***.

(DSEIR, p. 5.7-10 (emphasis added).)

The DSEIR violates CEQA because it fails to address the potentially significant impacts of project-level stormwater infrastructure. While the DSEIR provides some analysis of cumulative stormwater impacts, it concludes that the impact is less than significant with no need for any mitigation. (DSEIR, p. 5.7-18.) Thus, the NOP/IS and the DSEIR play a shell game with respect to analysis of stormwater impacts. It is unclear

what the DSEIR's ultimate conclusion is regarding project-level stormwater infrastructure impacts, and no substantial evidence supports this unknown conclusion.

Setting aside the internal inconsistency, the DSEIR's ultimate conclusion of less than significant cumulative impact is based on a misleading characterization of the Project's stormwater infrastructure. The DSEIR asserts:

> The project stormwater analysis completed for the project sponsor concluded that the capacity of the separated stormwater system as built is adequate to serve the project as well as other development projects that would be constructed at full buildout of Mission Bay South.

(DSEIR, p. 5.7-18.)

This representation is inaccurate and misleading. A technical report, referenced in a footnote but not actually attached as an Appendix to the DSEIR, describes the stormwater facilities very differently. (DSEIR, p. 5.7-18, fn 20 citing "BKF, Mission Bay Blocks 29-32 – Stormwater Memorandum, January 6, 2015" ("Stormwater Memorandum").) The Stormwater Memorandum provides a more accurate description of the stormwater infrastructure, and provides in relevant part:

> The storm drain system and pump station are designed to handle runoff from a 5-year storm event. During larger events such as a 100-year storm event, runoff is conveyed through the streets to a controlled overflow to the Bay.

(Stormwater Memorandum, p. 6.)

Thus, the Project's stormwater system can in no way handle project-level stormwater runoff, much less the Project's runoff in combination with cumulative projects. This is because the system has the capacity to handle only up to five-year storm events, which is significantly smaller than the 100-year capacity typically required. Any storm larger than a five-year event will result in flooding the streets.[4] In light of this anticipated flooding, the Project, which includes multiple levels below grade, will "be

[4] The Stormwater Memorandum asserts that use of public streets to channel storm flows in this manner was analyzed in a *Revised Summary Drainage Study for the South of Channel Watershed for Mission Bay Project*, dated December 1, 2000, yet this document was not posted on the OCII as required for the project to comply with the streamlining requirements of AB 900.

sufficiently flood proofed to prevent 100-year overland flow in perimeter streets from entering below grade structures or inundating utilities and equipment." (Stormwater Memorandum, p. 6.) The necessity to flood proof the Project due to inadequate stormwater facilities was never addressed in the DSEIR. Moreover, to the extent that increasing impervious surfaces on the Project site will result in additional flooding in the public streets that are shared by other structures, the DSEIR fails to address the need for additional flood proofing of other buildings in the area.

The analysis contained in the Stormwater Memorandum is also inconsistent with the DSEIR's analysis of flooding risks, which is based on the NOP/IS's analysis of Impact HY-4. Contrary to the information provided in the NOP/IS, the Project would result in exposing people and structures to a significant risk of loss and injury due to flooding for any event above the five-year event. (CEQA Guidelines, Appendix G, Section IX(i).) This is true for both the Project site as well as offsite. Finally, the strategy of relying on public streets as de facto spillways significantly contributes to substantial additional sources of polluted runoff. (CEQA Guidelines, Appendix G, Section IX(e).) This represents a new significant impact that was never addressed in the DSEIR.

The resulting public safety risk created by this situation cannot be overstated. The Project includes an 18,000-seat arena. In instances where arena events occur during moderate storm events (anything above a five-year event), thousands of visitors to the arena will exit onto streets that are serving as flood channels for stormflow. The combination of flooded streets, thousands of densely-packed pedestrians, at-grade transit cars and automobiles – all at night – presents a very dangerous situation that has never been discussed, analyzed, or mitigated in the DSEIR.

c. The DSEIR Deferred Analysis of Wastewater Impacts.

The DSEIR's analysis with respect to wastewater capacity and infrastructure is similarly flawed. After acknowledging that the City does not have sufficient wastewater capacity to address project-level impacts, the DSEIR very generally mentions vague "interim improvements to temporarily increase the dry-weather capacity" of the Mariposa Pump station. (DSEIR, p. 5.7-12) In failing to explain when these interim improvements will be completed or to analyze their environmental impacts, the DSEIR fails as an informational document. (*Ibid.*)

The DSEIR's analysis of cumulative wastewater impacts also fails to provide necessary information to the public and decision-makers. While acknowledging that permanent improvements are necessary, the DSEIR fails to provide any information

about the environmental impacts of these improvements. (DSEIR, pp. 5.7-13 – 14.) The DSEIR dismisses this deficiency because "SFPUC has not completed the planning and design of specific improvements," (DSEIR, 5.7-14), but this does not alleviate the duty of a lead agency to disclose available information. (CEQA Guidelines, § 15144.) One critical piece of information with respect to future construction activity, ignored in the DSEIR, is that a substantial amount of such construction would likely occur in areas of existing soil and groundwater contamination. (Exhibit B, comments A1, A2, A3, B1, B3, B4, B5, B6, C1.) The DSEIR's conclusory dismissal of the impacts associated with constructing necessary wastewater infrastructure fails to address that issue.[5]

5. The DSEIR Improperly Excluded Analysis of Impacts to Recreation – 1998 SEIR Chapter 5.M.

The DSEIR did not address the Project's impacts on recreational facilities because the NOP/IS determined that no new or more severe significant impacts would occur than previously identified in the 1998 SEIR. As set forth more fully below, the information contained in the DSEIR supports a fair argument that use of Bayfront Park by thousands of crowded arena visitors will accelerate its substantial deterioration, which will be a significant environmental impact. (CEQA Guidelines, Appendix G, section XV(a).) A fair argument exists that the Project's recreation-related construction,at Bayfront Park will result in significant environmental impacts through possible exposure to hazardous materials. Even if the Project is considered a "revision" to the project analyzed in the 1998 SEIR, the addition of a massive, 18,000-seat arena will have a significantly greater impact to Bayfront Park than disclosed in the 1998 SEIR requiring analysis in a recirculated DSEIR.

a. Crowds From the Project May Substantially Degrade Bayfront Park.

The DSEIR failed to include an analysis of impacts to recreation based on the NOP/IS's determination there would be no new or more severe impacts than identified in the 1998 SEIR. (NOP/IS, pp. 61-64.) This conclusion is in error because a fair argument exists that the Project will result in potentially significant impacts to recreation and recreational facilities.

The fundamental flaw in the NOP/IS's analysis is seen in the following statement: "The increase in demand for recreational facilities generated by the project would

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5 Further discussion regarding the City's abdication of its CEQA duties with respect to wastewater treatment is addressed in the July 26, 2015, letter submitted by Tom Lippe.

generally be consistent with that described in the Mission Bay FSEIR." (NOP/IS, p. 63.) This remarkable conclusion is unsupported by any citation or factual support. Rebutting this statement is the project description itself: an arena with a capacity of more than 18,000 seats holding up to 225 events per year. The expected huge crowds, and employees associated with the 580,000 square feet of commercial uses, would be crammed into an 11 acre parcel. The only respite to the congested arena environment would be 3.2 acres of alleged open space. While at first blush this might appear adequate, in reality this "open space" consists of small, disjointed spaces. Many of these spaces are located on the tops of buildings and unavailable to thousands of arena visitors.

In contrast to the functionally unusable "open space" within the Project site, immediately across the street from the Project is the planned Bayfront Park – a single, expansive, ground level, landscaped park of 5.5 acres. It is very likely that the near-daily crowds of congested arena visitors will use Bayfront Park to gather both before and after shows rather than the oddly disjointed "open spaces" located on top of various buildings throughout the site.

These thousands of additional arena visitors are in addition to the people associated with the Project's 580,000 square feet of office space, the Project's 125,000 square feet of retail space, and all other people within the larger Mission Bay area who are anticipated to visit Bayfront Park. The open space needs of such arena crowds were nowhere contemplated in the 1998 SEIR. The Project will result in significantly accelerated physical deterioration of Bayfront Park, not disclosed in the 1998 SEIR, and is a significant impact under CEQA. (CEQA Guidelines, Appendix G, section XV(a).)

b. The Project Will Require Construction of Bayfront Park That May Have an Adverse Impact on the Environment.

The DSEIR acknowledges the development of the Project triggers development of Bayfront Park and must be completed prior to occupancy. (DSEIR, p. 3-37-38.) In other words, development of the Project requires construction of Bayfront Park. (See, e.g., CEQA Guidelines, Appendix G, section XV(b).) Accordingly, construction of Bayfront Park is a "reasonably foreseeable consequence of the initial project," and requires analysis in the DSEIR. (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal. 3d 376, 396.) It may not, as occurred here, be dismissed as a separate project for purposes of CEQA. (DSEIR, p. 3-37.) Serious questions exist about whether construction of Bayfront Park will result in adverse physical effects on the environment due to the presence of hazardous materials on that site. (*Ibid.*)

As set forth above, the NOP/IS failed to disclose the present existence of hazardous waste in the soil within the Project site. The soil underlying the future Bayfront Park is similarly contaminated. (2006 RRMP, p. 2-5.) This contamination has not been disclosed in the NOP/IS or the DSEIR. Since it appears that Bayfront Park will be constructed along with the Project, the same questions are raised about hazardous materials impacts as discussed in sections 2(b) and (c) of this letter.

The potentially significant impacts regarding hazardous materials are exacerbated because Bayfront Park will be a ground-level landscaped park. Having failed to disclose that the soil underlying Bayfront Park is contaminated, the NOP/IS also fails to explain whether such contaminated soil will be left in place and thereby expose visitors to hazardous materials. There is no discussion of whether an impermeable cap will be used to protect future park visitors from the existing contaminated soil.

The failure to address these critical issues supports a fair argument that the Project will require construction of a recreational facility (i.e., Bayfront Park) that will have an adverse effect on the environment by facilitating the exposure of contaminated soils to humans and the environment. (CEQA Guidelines, Appendix G, section XV(b)). The City may not dismiss this potentially significant impact based on its own failure to conduct a reasonable analysis of the issue. (*Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 311 ("[t]he agency should not be allowed to hide behind its own failure to gather relevant data . . . . If the local agency has failed to study an area of possible environmental impact, a fair argument may be based on the limited facts in the record").) The recirculated DSEIR will need to analyze this potential significant impact.

6. <u>The DSEIR Failed to Disclose Energy Impacts.</u>

The DSEIR is fatally defective because it fails to provide information about the Project's energy requirements as mandated by Appendix F of the CEQA Guidelines ("Appendix F"). A California appellate decision recently reaffirmed the need for a detailed analysis of energy consumption and mitigation in EIRs, stating in relevant part:

> Under CEQA, an EIR is "fatally defective" when it fails "to include a detailed statement setting forth the mitigation measures proposed to reduce wasteful, inefficient, and unnecessary consumption of energy." (*People v. County of Kern* (1976) 62 Cal.App.3d 761, 774.) The requirement to adopt energy impact mitigation measures "is substantive and not procedural in nature and was enacted for the purpose of requiring the lead agencies to focus upon the energy problem in the preparation of the final EIR." (*Ibid.)*

(*California Clean Energy Committee v. City of Woodland* (2014) 225 Cal.App.4th 173, 209 (*CCEC*).)

The City failed to comply with this mandate to prepare a detailed statement in the DSEIR. In fact, the DSEIR fails altogether to address the issue of energy consumption because the NOP/IS inaccurately determined that the issue was sufficiently addressed in the 1998 SEIR. (DSEIR, 1-9; NOP/IS, pp. 122-125.) This did not happen.

As explained in *CCEC*, Appendix F lists the information that satisfies CEQA's mandate to "assure that energy implications are considered in project decisions." (CEQA Guidelines, Appendix F; *CCEC*, *supra*, 225 Cal.App.4th at 209.) As just one example, the list includes "total energy requirements of the project by fuel type and end use." (CEQA Guidelines, Appendix F, Section II(A)(2). The 1998 SEIR failed to prove this information. With respect to construction energy requirements, the NOP/IS concedes: "The FSEIR did not estimate energy consumption specific to the development of proposed on Blocks 29-32 or the amount of water that would be used during construction.") (NOP/IS, p. 123.) With respect to operational energy requirements, the NOP/IS concedes, "The amount of fuel use attributable to development on Blocks 29-32 was not specifically calculated in the FSEIR." (NOP/IS, p. 123.) Finally, with respect to transportation energy requirements, the NOP/IS concedes: "The amount of fuel use attributable to development on Blocks 29-32 was not specifically calculated in the FSEIR." (NOP/IS, p. 123.)

The 1998 SEIR thus failed to address the issue of energy demand and mitigation for the project proposed in 1998, much less for the very different Project now proposed. Contrary to the conclusion in the NOP/IS, the 1998 SEIR cannot be relied upon to avoid providing the analysis in the DSEIR.

The NOP/IS and DSEIR make much of the proposed LEED certification for the Project. While LEED certification may be relevant to a lead agency's duties under Appendix F, referencing LEED certification alone is inadequate. The *CCEC* decision addressed this point in the context of Title 24 building energy code standards:

> Although the Building Code addresses energy savings for components of new commercial construction, it does not address many of the considerations required under appendix F of the CEQA Guidelines. These considerations include whether a building should be constructed at all, how large it should be, where it should be located, whether it should incorporate renewable energy resources, or anything else external to the building's envelope.

CCEC, *supra*, 225 Cal.App.4th at 211.)

The same analysis applies to LEED certification. While relevant, LEED certification does not end the discussion or obviate the lead agency's duty to comply with Appendix F. What is more, as explained in the context of GHG emissions a lead agency may not avoid its duty to disclose project impacts and mitigation measures by incorporating mitigation measures into the project description. To the extent that the City intends to incorporate the purchase of offsets as a "design feature" or otherwise incorporate it into the project description, recent case law clarifies that this strategy violates CEQA's mandate to separately disclose project impacts and feasible mitigation measures. (*Lotus*, *supra*, 223 Cal.App.4th 645, 655-56 (incorporating mitigation measures for redwood trees into the project description violated CEQA "[b]y compressing the analysis of impacts and mitigation measures into a single issue").) To the extent that LEED certification reduces the Project's energy demand, the DSEIR must disclose the Project's unmitigated energy consumption and show how LEED certification reduces that consumption.

In summary, the City's failure to address the Project's energy demands as required by Appendix F renders the DSEIR "fatally defective." (*CCEC*, *supra*, 225 Cal.App.4th at 209.)

7. <u>Wind and Shadow – DSEIR Chapter 5.6.</u>

a. Wind Impacts are Inadequately Analyzed.

According to the DSEIR, a wind impact would be significant if it would alter wind in a manner that would substantially affect public areas. (DSEIR, p. 5.6-6.) Thus, the wind analysis only addresses offsite areas. (DSEIR, pp. 5.6-10 to -13.) Yet, this Project is so large that it also contains publicly accessible areas within the Project. While the DSEIR includes a discussion of wind impacts in these areas, it does so only for "informational purposes." (DSEIR, p. 5.6-18.) This analysis shows that exceedances of the criteria will occur, yet no mitigation is required. Instead, the DSEIR discusses "refinements that could be incorporated into the project . . . ." (DSEIR, p. 5.6-19.)

The City's approach to addressing wind impacts violates CEQA's mandates that an EIR identify potentially significant impacts and set forth with specificity all feasible mitigation measures. The DSEIR must identify potentially significant impacts to public spaces within the Project site, and cannot conflate public disclosure of that impact with the separate and distinct analysis of feasible mitigation measures. (*Lotus*, *supra*, 223

Cal.App.4th at 655-56.) Further, the DSEIR may not defer formulation such mitigation measures in the absence of any performance standards and explanation as to why deferral is necessary. (*Communities for a Better Environment, supra,* 184 Cal.App.4th at 93.)

b. Shadow Impacts are Undisclosed.

According to the DSEIR, the Project would have a significant shadow impact if it substantially affected a publicly-accessible open space area, such as Bayfront Park. (DSEIR, p. 5.6-6.) With respect to the methodology for assessing the Project's impacts, the DSEIR refers to the South Design for Development. (DSEIR, p. 5.6-8.) However, the land use designation in the Mission Bay Redevelopment Plan for the four-block Project area was designated as "Commercial Industrial (Mixed Use including Retail)." (DSEIR, Figure 3-3.) The proposed Project will require that the South Design for Development be modified to accommodate the arena and accompanying development, so it is not clear that the standards developed for the 1998 land use plan apply in this circumstance. Moreover, conditions have likely changed such that the South Design for development, which did not require any analysis of shadow for the months from October to February, no longer reflects current practices and values. Especially with the increased visitors to the area as a result of the Project throughout the year, shadow impacts on the very parks those people will use should be fully analyzed.

The DSEIR's approach of ignoring the generally-applicable City standard is also inconsistent with the DSEIR's approach to analysis of wind impacts. With respect to wind, the DSEIR relies on Planning Code section 148 to determine what level of wind would constitute a substantial alteration, even though it is superseded by the South Design for Development Standards. (DSEIR, p. 5.6-6.) Yet the DSEIR does not mention the typically applicable standard – Section 295 of the Planning Code, also known as "Proposition K" and "the Sunlight Ordinance." The absence of a substantive standard for shadow is all the more reason to refer to Section 295 for purposes of analyzing shadow impacts.

> Section 295 mandates that new structures above 40 feet in height that would cast additional shadows on properties under the jurisdiction of, or designated to be acquired by the Recreation and Parks Department can only be approved by the Planning Commission if the shadow is determined to be insignificant or not adverse to the use of the park. Also, a recommendation from the Recreation and Parks Commission is required prior to the Planning Commission hearing.

(S.F. Planning Department Application Packet for Shadow Analysis, available at: http://www.sf-planning.org/Modules/ShowDocument.aspx?documentid=539.) Impacts to Bayfront Park should be analyzed according to Section 295 to ensure that shadow impacts are disclosed and mitigated.

In conclusion, the analysis in the DSEIR fails to adequately address the wind and shadow impacts of the Project under current conditions, using standards developed by the City to ensure public spaces are comfortable and enjoyable. The DSEIR should be revised and recirculated to provide a thorough analysis and incorporate all feasible mitigation. Such mitigation may include changes to the structures to address wind and shadow impacts both on and off the Project site.

8. <u>The DSEIR's Project Description is Inconsistent.</u>

The DSEIR is fundamentally flawed because the project description is internally inconsistent, thwarting intelligent public participation relating to the Project and its impacts. (*County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 197.) As described more fully below, the DSEIR appears to variously include and exclude the departure of the Warriors from the existing Oracle Arena.

DSEIR section 1.1.2 (Project Objectives) provides in relevant part:

> The Golden State Warriors currently play their home games at Oracle Arena, located at 7000 Coliseum Way in Oakland, California and lease their management offices and practice facility at the Oakland Convention Center at 1011 Broadway in downtown Oakland. The proposed project would consolidate these facilities in one location.

(DSEIR, p. 1-3.)

Consistent with this approach, the Project's AB 900 Application expressly incorporates into the project description reduced events at the existing Oracle Arena in order to reduce the Project's greenhouse gas emissions. This strategy is depicted both textually and graphically in the AB 900 Application:

> Though the Oracle Arena will no longer host GSW games, it is assumed that approximately 50% of the non-game events will still occur at the Oracle Arena, or 24% of a typical year's game and non-game events will still occur at the Oracle Arena. Thus, emissions calculations for the

remaining non-game events at Oracle Arena use a 24% scaling factor to account for this reduction in number of events.

(AB 900 Application, p. 63.)

Table 1. Project Description

Element	Oracle Arena and GSW Oakland Headquarters	Event Center Project
First Operational Year Considered	2017	2017
Oracle Arena	500 KSF	500 KSF
GSW Games [1]	100%, 47 games	No games
Non-game Events [2]	100%, 42 events	50%, 21 events
Mission Bay Event Center	-	750 KSF
GSW Games [1]	-	100%, 47 games
Non-game Events [3]	-	100%, 161 events
GSW Headquarters	Oakland	Mission Bay, 25 KSF

1. Number of GSW games in both scenarios is based on the 2013-2014 season. Averages for the previous years were skewed by the 2011 NBA lockout.
2. Number of non-game events at Oracle Arena is based on the schedule from recent years. In the Event Center Project scenario, half of the non-game events are assumed to remain at Oracle Arena while the other half are transferred to the Mission Bay Event Center.
3. Number of non-game events at Mission Bay Event Center is based on the Notice of Preparation dated 11/19/2014.

Consistent with the DSEIR's discussion of project objectives on page 1-3 as well as in the AB 900 Application, the DSEIR's analysis of greenhouse gas emissions incorporated event reductions at Oracle Arena for purposes of decreasing the Project's carbon footprint. (DSEIR, p. 5.5-11.) Page 5.5-11 of the DSEIR provides in relevant part:

> As part of the AB 900 application, the project sponsor has committed to purchase carbon credits from a qualified GHG emissions broker in an amount sufficient to offset all GHG emissions from project construction and operations, as reiterated in Improvement Measure I-C-GG-1, Purchase Voluntary Carbon Credits. Net additional GHG emissions would be

> calculated in accordance with the methodology agreed upon by CARB in connection with the AB 900 certification of the project.[6]

Thus, while not expressly stated in the text of the DSEIR's analysis of GHG emissions, the analysis nonetheless incorporates reduced events at Oracle Arena for purposes of calculating the project's net GHG emissions.

While taking the environmental "benefit" of lower mobile-source GHG emissions resulting from reduced events at Oracle Arena, the DSEIR deftly avoids analysis of the environmental consequences of this component of the overall Project. For example, the project description includes continued operation of Oracle Arena even though it is predicted to host merely 21 events per year. (AB 900 Application, pp. 63, 81 of 155.) As explained by Ph.D. economist Philip King, it would be unreasonable for Oracle Arena to continue to operate with so few events. Dr. King concludes that one likely scenario is that Oracle Arena would need to close as a result of the reduced demand, which in turn creates the potential for urban decay at the Oracle Arena site. The DSEIR never analyzed the resultant potential for urban decay. Nor did the DSEIR analyze the impacts associated with demolition of the existing Oracle Arena as a result of its shuttering.

The DSEIR is thus flawed because the project description is internally inconsistent. The project description includes reduced events at Oracle Arena when doing so helps to minimize the Project's environmental impacts, but excludes operation of Oracle Arena in order to avoid addressing its problematic environmental impacts. This inconsistency misleads the public about the Project and its impacts. (See, e.g., *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 655-656 ("By giving such conflicting signals to decision makers and the public about the nature and scope of the activity being proposed, the Project description was fundamentally inadequate and misleading").)

The same analysis applies to the DSEIR's inconsistent treatment of the construction of Bayfront Park and realignment of Terry Francois Blvd. The DSEIR notes, consistent with the redevelopment plan, that both the Bayfront Park and realignment are triggered by the Project, which makes them "reasonably foreseeable consequence[s] of the initial project" requiring analysis in the DSEIR. (*Laurel Heights, supra*, 47 Cal. 3d at 396.) Even though these are components of the Project as a matter of law, the DSEIR purports to characterize Bayfront Park and the roadway alignment as

6 Curiously absent from the DSEIR's discussion is any reference that the "net additional GHG emissions" from the AB 900 certification expressly relies upon credits from reduced events at Oracle Arena.

separate projects for purposes of CEQA. (DSEIR, p. 3-37.) As a result of this inconsistent project description, the DSEIR fails to address potentially significant hazardous materials impacts associated with construction and occupancy of Bayfront Park.

In summary, a lead agency may not concurrently expand and contract the described scope of a proposed project – and may certainly not do so when the result is to avoid analysis of potentially significant impacts. The recirculated DSEIR will need to provide a stable and consistent project description.

9. <u>The DSEIR Fails to Analyze Possible Urban Decay in Oakland.</u>

"Under CEQA, a lead agency must address the issue of urban decay in an EIR when a fair argument can be made that the proposed project will adversely affect the physical environment." (*CCEC*, *supra*, 225 Cal.App.4th at 188.) An EIR is to disclose and analyze the direct and the reasonably foreseeable indirect environmental impacts of a proposed project if they are significant. (CEQA Guidelines, §§ 15126.2, 15064, subd. (d)(3).) Economic and social impacts of proposed projects are outside CEQA's purview. (Guidelines, § 15131.) However, when there is evidence that economic and social effects caused by a project could result in a reasonably foreseeable indirect environmental impact, such as urban decay or deterioration, then the CEQA lead agency is obligated to assess this indirect environmental impact. (*CCEC*, *supra*, 225 Cal.App.4th at 188; *Anderson First Coalition v. City of Anderson* (2005) 130 Cal.App.4th 1173, 1182; *Citizens for Quality Growth v. City of Mt. Shasta* (1988) 198 Cal.App.3d 433, 446 ("The potential economic problems caused by the proposed project could conceivably result in business closures and physical deterioration of the downtown area").)

Here, substantial evidence supports a fair argument that the Project will result in economic impacts that would foreseeably lead to urban decay in Oakland. The DSEIR explains that the project include relocating the Warriors home games from the existing Oracle Arena in Oakland to San Francisco. (DSEIR, p. 1-3.) In addition to relocating all NBA games from Oakland to San Francisco, the Project description also includes relocating half of all existing non-NBA games from Oakland to San Francisco. (AB 900 Application; DSEIR, p. 5.5-11.) Thus, a direct economic impact of the Project is to reduce Oracle Arena events from 89 to 21 per year. As explained by economist Philip King, this is a severe direct economic impact from the Project. (See <u>Exhibit E</u>, a memorandum from Philip King, Ph.D., dated July 13, 2015 ("King Report"), pp. 6-7.)

Such a dramatic economic impact may reasonably be expected to have indirect impacts. Dr. King explains that revenues from a mere 21 events per year will not likely

justify the ongoing operational costs of maintaining such a facility. (King Report, pp. 7-8.) Accordingly, a likely indirect impact is the ultimate shuttering of Oracle Arena. Repurposing such a massive facility is difficult to impossible, and so it is very likely that the facility will likely stand dormant and invite the physical deterioration that is characteristic of urban decay. (King Report, pp. 8-9; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 184, 1212 [urban decay characteristic of "long-term vacancies that deteriorate and encourage graffiti and other unsightly conditions"].)

Despite acknowledging that the Project would have significant detrimental economic impacts in Oakland, which in turn may result in physical deterioration, the DSEIR ignores the issue of urban decay. It thus fails as an informational document on this issue. The recirculated DSEIR will need to provide an analysis of the economic impacts in Oakland resulting from the predicted reduction of events at Oracle Arena, the potential for physical deterioration to result, and feasible mitigation measures to address these potentially significant impacts. (*CCEC*, *supra*, 225 Cal.App.4th at 188-190.)

* * *

Thank you for the opportunity to provide comments on the Project. For the reasons discussed above, and in the attached expert reports, the Mission Bay Alliance objects to certification of this EIR and approval of this Project.

Very truly yours,

SOLURI MESERVE
A Law Corporation

By:
Patrick M. Soluri

By:
Osha R. Meserve

PMS/mre

Cc (via email): Bruce Spaulding, Mission Bay Alliance (<u>spauldingbw@gmail.com</u>)

Attachments:

Exhibit A: July 20, 2015 letter report authored by air quality professionals Patrick Sullivan, CPP, REPA, and John Henkelman, regarding Greenhouse Gas Emissions

Exhibit B: July 22, 2015 letter report authored by geotechnical engineer Martin Cline, GEG and Kurt Balasek, PG, CHG, QSD, regarding Hazardous Materials

Exhibit C: July 21, 2015 letter report authored by geotechnical engineer Lawrence Karp, CE, CEG, regarding Geology and Soils impacts

Exhibit D: July 20, 2015 letter report authored by engineering geologist Marin Cline, CEG, and hydrogeologist Kurt Balasek, PG, CHG, QSD, regarding Geology and Soils impacts

Exhibit E: July 13, 2015 letter report authored by economist Philp King, Ph.D., regarding Urban Decay

EXHIBIT A

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July 20, 2015
File No. 01215159.00

MEMORANDUM

TO: Osha Meserve, Soluri Meserve

FROM: Patrick S. Sullivan, SCS Engineers
John Henkelman, SCS Engineers

SUBJECT: Greenhouse Gas Analysis for Golden State Warriors Event Center

SCS Engineers (SCS) has reviewed the greenhouse gas (GHG) analysis prepared for the proposed Golden State Warriors (GSW) Event Center (Project). The GHG analysis was performed to demonstrate that the GHG emissions from the proposed Event Center would meet the requirements under Assembly Bill 900 (AB900), including that it would result in "no net increase" in GHG emissions. SCS has performed many GHG analyses for purposes of permitting, mandatory reporting, verification, CEQA and other requirements. The resumes of Patrick Sullivan and John Henkelman are provided as an attachment.

The documents reviewed include the following:

- *Application for CEQA Streamlining: GHG Emissions Methodology and Documentation*, Environ 2015
- *Application for Environmental Leadership Development Project, Golden State Warriors, Event Center and Mixed-Use Development at Mission Bay Blocks 29-32*, Golden State Warriors 2015
- *ARB Staff Evaluation for Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32*, ARB Staff 2015
- *Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 Draft Subsequent EIR*, Office of Community Investment and Infrastructure 2015

SCS does not agree with the conclusion of the AB900 determination letter from the California Air Resources Board (CARB) dated April 20, 2015 stating that the Project would not result in any net additional GHG emissions for purposes of certification under AB900. The methodology used to conclude there would be no increase in GHG emissions is inconsistent CARB GHG policies such as the *First Update to the Climate Change Scoping Plan* (CARB 2014) and furthermore does not substitute for an adequate analysis of GHG under CEQA.

The Project quantified the expected GHG emissions for the construction and operating phases of the Project. The construction emissions were quantified using the California Emissions Estimator Model (CalEEMod) with some site-specific inputs. Operational emissions analysis includes the emissions from the existing Oracle Arena, the existing GSW headquarters, and the proposed

Event Center in the analysis. The emissions from the Oracle Arena were quantified using some site-specific values and some intensity factors obtained from CalEEMod and projected electricity intensity factors from CalEEMod. GHG emissions for the proposed Event Center were calculated using a similar methodology, but all electricity and utility use must be projected using CalEEMod factors. The GHG emission calculations for the Event Center also include GHG reductions for energy efficiency and trip linking.

The Project proposes to achieve GHG neutrality through the acquisition of GHG emission offsets equal to the projected GHG emissions from the Project over a 30-year Project life. The Project includes Mitigation Measure (MM) I-C-GG-1, which requires offsets for GHG emissions from construction and operation of the proposed Event Center.

The GHG analysis provided and proposed MM I-C-GG-1 are not sufficient to demonstrate that the Project will result in no net increase in GHG emissions for the following reasons:

- GHG methodology includes inappropriate Project operational emission baseline
- Monitoring of GHG emissions is not sufficient to demonstrate that GHG emissions are net zero
- MM I-C-GG-1 does not require use of offsets consistent with California GHG policy

As a result, the determination in the Draft Subsequent Environmental Impact Report (DSEIR) that GHG emissions are a less than significant impact is erroneous.

GHG OFFSETS BACKGROUND

GHG offsets are a critical element of the MM I-C-GG-1, which the GHG evaluation indicates would result in net zero GHG emissions from the Project. The concept behind a GHG offset is that a project developer creates GHG emission reductions above and beyond what is considered to be "business as usual" (BAU), meaning that the GHG reduction would not have occurred in the absence of the GHG reduction project. For a GHG reduction offset to be generated for use in the CARB Cap and Trade (C&T) program, the reduction must be *real, additional, quantifiable, permanent, verifiable, and enforceable*. The GHG reduction registries that may create GHG offsets under the C&T program, Climate Action Reserve[1] (CAR), the American Carbon Registry[2] (ACR), and the Verified Carbon Standard[3] (VCS), also adhere to similar principles when creating their GHG offset protocols.

The "Real" requirement for eligible offset sources means that reductions must result from demonstrable action and the methodology used to quantify that reduction must account for appropriate GHG emission sources, sinks, and reservoirs. "Real" assures that GHG generated by

[1] Climate Action Reserve Program Manual (CAR October 2011)
[2] American Carbon Registry Standard v4.0 (ACR January 2015)
[3] VCS Program Guide (October 2013)

GHG offset projects is accounted for and that projects emitting more GHG than they reduce do not generate offsets.

Offset "additionality" means that the GHG reduction activity must produce a result better than BAU. The activity cannot be the normal practice. For example, destruction of ozone depleting substances (ODS) by governments is common practice but that destruction is not commonplace for commercial or industrial facilities. Thus, destruction of ODS is not additional when the ODS is sourced from a government but it is additional when the ODS comes from a company facility.

Quantifiable, verifiable, and enforceable assure that the GHG reduction can be measured, that a third party can confirm the quantification, and that CARB can hold a party liable for performing the GHG offset activity if necessary. These principles provide assurance that GHG reductions are calculated accurately and the supporting data have been reviewed by CARB and a third party verifier.

The principles of real, additional, quantifiable, permanent, verifiable, and enforceable are critical to achieving the goal of reducing GHG in the atmosphere. The need for these assurances is shown by problems with some markets and programs, such as the Clean Development Mechanism (CDM) and Chicago Carbon Exchange (CCX), which have suffered from a lack of confidence in the legitimacy of the generated GHG reduction offsets.

CARB currently allows GHG reduction credits for forest projects, livestock projects, ozone depleting substance (ODS) projects, and mine methane capture (MMC). CARB has proposed the adoption of a rice cultivation project type. The livestock, ODS, and MMC projects achieve GHG reduction through the destruction of gases with a high potential for global warming (methane or ODS). For forest projects, the carbon reduction occurs by setting aside forested land where trees remove carbon from the atmosphere and store it as wood and plant material.

When the GHG offset developer wishes make the offsets available for purchase on the market, the developer uses a third-party verifier to confirm that the project meets program requirements and that reductions have been accurately quantified. The offset registry (CAR, ACR, or VCS) then issues the offsets to the developer. If the protocol was one of those eligible under the C&T regulation, those offsets are traded in the CARB offset market and used for regulatory compliance under the C&T regulation. If those GHG offsets are not generated under a C&T protocol, as apparently intended with the Warriors Arena, they are traded through environmental offset brokers. Non-C&T GHG offsets can be retired at the request of the offset holder to remove those offsets from the market, thereby finalizing the GHG reduction.

FLAWS IN PROJECT OPERATIONAL EMISSIONS CALCULATION

The GHG analysis in the AB900 Certification by CARB and the *Application for CEQA Streamlining: GHG Emissions Methodology and Documentation* makes several assumptions about the Project operational emissions that are not appropriate, including an assumption that the

number of events at the Oracle Arena will be limited to 21 and in the reduction of emissions from the Oracle Arena by a factor of 76 percent.

Unsupported Oracle Arena Emission Reductions

The GHG analysis underestimates GHG emissions from the Project by using the operation of the Oracle Arena as the baseline emissions (*Application for CEQA Streamlining: GHG Emissions Methodology and Documentation*, Environ 2015). The new arena Project emissions are then calculated by subtracting the projected Oracle Arena emissions from the proposed Project emissions. Operational emissions for the Oracle Arena in the Project scenario assume that all GSW games plus 50 percent of all non-GSW events that occur at the Oracle Arena will be held at the new arena location in San Francisco. This assumption results in a reduction of emissions from Oracle Arena by 76 percent (based on the current 47 GSW games and non-GSW 42 events per year).

No basis for the validity of this assumption is provided in the GHG analysis. The GHG analysis includes the Oracle Arena in the baseline condition then limits the number of events at the Oracle Arena in the Project scenario, providing the Project with a large and unenforceable GHG credit at the outset of the calculation.

When assumptions are made that limit impacts from a Project, those assumptions must be the result of enforceable conditions. In this case, MM I-C-GG-1 does not limit the events at the Oracle Arena to a maximum of 21. With no enforceable condition limiting the number of events at the Oracle Arena, it is not appropriate to assume that the number of events will decrease. The GHG analysis has already assumed that arena events will be generated by the Project based on the 89 events at Oracle Arena in the baseline scenario and 229 events in the Project scenario (21 at Oracle Arena, 47 GSW games at the Event Center, 161 non-GSW events at the Event Center). The GHG Analysis provides no justification for the reduced number of events at the Oracle Arena while assuming that the total number of events will increase.

If an enforceable condition were to be added to limit the number of events at Oracle Arena to only 21, it would be appropriate to reduce GHG emissions in the Project scenario. However, the methodology used to calculate the reduction in emissions associated with the reduced number of events at the Oracle Arena is not appropriate.

The emissions from the Oracle Arena are also directly scaled using the 76 percent reduction factor based on the number of events. This is unreasonable because it assumes that no emissions occur when events are not scheduled. It is unlikely that the Oracle Arena will cease all energy and utility use while not holding an event. It is even more unlikely that the emissions from area sources (e.g. landscaping equipment) will directly scale with the number of events.

Application Omits GHG Non-Arena Buildings

The AB900 Application does not include any GHG emissions from the non-Arena buildings that are included in the Project. Only the GHG emissions from the proposed Event Center were included in the AB900 Analysis. Emissions from other structures, including the two 160-foot office towers, the gatehouse, the food hall, GSW headquarters and retail uses for instance, are not included in the analysis, which are 730,000 square feet of space. (DSEIR, p. 2-18 to 2-19, Figure 3-5 and Table 3-1.) This omitted square footage is comparable to the square footage of the Event Center (750,000 square feet), and the emissions could equal or exceed the emissions from the Event Center. The AB900 analysis for the Project scenario omits any GHG emissions from these structures because they are assumed to be "fully vested legal rights" in the Project scenario. (Application, pp. 2, 8.)

This approach of omitting the GHG emissions from non-Arena facilities in the Project scenario because it is a "fully vested legal right" is inappropriate because those buildings have been included in the Project Description and they do not already exist. Excluding those buildings because of "fully vested legal rights" is inconsistent with CEQA requirements that impacts be evaluated based on the actual (i.e. existing) baseline condition, not a possible (i.e. permitted) condition. Also, since the AB900 certification is for the entire Project, GHG emissions from all project components must be included for the inventory to be complete.

Double Counting of Emission Reductions from Trip Linking

The Project includes a significant GHG emission reduction (7 percent of total before reductions) from trip linking. This GHG reduction accounts for some trips which would combine retail trips and trips to the arena. Some of the project operational GHG emissions were calculated with CalEEMod, and CalEEMod already includes factors for trip linking in its emission calculations for mobile sources. The GHG analysis offers no justification for why the trip linking described in the GHG analysis is not already accounted for in the CalEEMod emission calculation. This error overestimates the benefits of trip linking.

Project Methodology is Not Rigorous and is Poorly Defined

The description of the Project in the AB900 Application performed by Environ and relied upon in the GSW AB900 Application is internally inconsistent. The Environ document describes the Project as "development of a new arena." (Application p. 1.) The Environ Project Description shows the proposed land uses near the proposed Event Center, but does not clearly include the buildings in the Project. The Environ AB900 Application then proceeds with the GHG analysis from only the proposed Event Center, omitting emissions from all other buildings and implying that the Project consists of only the Event Center. That Project described in the Environ Application does not discuss the two office buildings, a gatehouse, food hall, GSW headquarters, and retail uses, and consequently uses inappropriate boundaries when analyzing the GHG emissions from the Project.

The Project described in the DSEIR consists of the proposed event center as well as two office buildings, a gatehouse, food hall, GSW headquarters, and retail uses.

, That Project Description is consistent with the Project description in the CARB Analysis, and the GSW Application, which includes the Event Center plus several other buildings including the

two office buildings, the gatehouse, food hall, and retail uses; however, no emissions from these other sources are included in the evaluation.

Throughout the AB900 Analysis, the boundaries of the analysis are poorly defined and no justification for the boundaries is provided. The CARB Analysis confirmed the GHG calculations are accurate but failed to analyze the appropriateness of the boundaries or the concept of "vested legal rights" used in the AB900 Analysis.

The baseline scenario includes the Oracle Arena, though the Project itself involves no modifications to the Oracle Arena. The Project scenario assumes a 76 percent reduction in the emissions from Oracle Arena without proposing modifications to the facility or limiting activity at the Oracle Arena. The Project excludes GHG emissions from towers included in the Project Description from the Project GHG emission calculation. All of these inconsistencies serve to increase the baseline scenario GHG emissions while reducing the Project scenario GHG emissions, resulting in an artificially small increase in GHG emissions from the Project. The actual GHG emissions increase is likely to be significantly larger than the projected increase due to these inconsistent boundaries.

THE ALLEGED PROJECT EMISSIONS REDUCTIONS LACK MONITORING AND ENFORCEABILITY

The AB900 Application and the 2015 DSEIR refer to mitigation in the form of the acquisition of GHG offsets. MM I-C-GG-1 requires that the Project acquire GHG offsets for the GHG emissions for a 30-year period. As described above, the GHG emissions methodology utilized relied on CalEEMod and projected emissions forward for 30 years. This mitigation is insufficient because it is based on modeled emissions rather than actual emissions, and GHG emissions are projected well into the future with no confirmation that predicted emissions are accurate.

30-Year Evaluation Period

The evaluation of the Project's operational emissions for purposes of offset purchases is for a 30-year period, which is too long to be consistent with California's GHG policy. Evaluating the GHG emissions for such a long period is not reasonable and not consistent with California's GHG offset program. GHG offsets generated for use in California's C&T program only have a ten year crediting period, with the exception of forestry offsets. This ten year accounting period is consistent with other GHG evaluation programs such as the CAR, ACR, and VCS. Similarly, the California GHG Scoping Plan requires updates every five years. Projecting GHG emissions 30 years into the Project lifetime, and then purchasing offsets for 30 years into the future from an unverified source is unreasonable and will certainly be inaccurate in terms of matching the actual GHG emissions of the Project.

While the 30-year evaluation period is too long to be consistent with accepted GHG accounting periods, there is no reason to arbitrarily end the Project's GHG emissions after the 30-year period. Oracle Arena opened in 1966, 49 years ago. The proposed Event Center should have a similar operating lifespan of 49 or more years. The analysis of GHG emissions after 30 years is unaccounted for in the GHG evaluation. The conclusion that the Project results in no net GHG emissions is based on MM I-C-GG-1, which requires that the Project acquire GHG offsets for the GHG emissions for a 30-year period. Any GHG emissions after this 30-year period would not be offset, resulting in emissions greater than zero from the Project. The Project must include enforceable conditions to require offsetting of emissions beyond the 30-year period or require cessation of emission after that period.

Operational Mitigation Trigger Requirement too Lenient

As discussed above, MM I-C-GG-1 requires that operational GHG emissions be offset. The offset requirement is triggered when the Event Center reaches 90 percent utilization. Thus, it is possible that the offset requirement is never triggered. Oracle Arena currently holds 89 events per year. Even if every one of these events were moved to the proposed Event Center, it would be at only 42 percent of the number of events in the Project GHG evaluation. There is no mechanism in the Project or mitigation measures that would require that offsets from the Project be offset if the Project does not reach 90 percent utilization.

No GHG Monitoring Plan

Monitoring of the mitigation for GHG emissions is inadequate. It has been the experience of SCS that Projects that result in GHG emissions prior to mitigation should be required to submit GHG monitoring plans for relatively small periods of time, typically three to five years. Such periodic reevaluation of GHG emissions is consistent with the California Scoping Plan, which must be updated every five years. Such a plan must require quantification of GHG emissions since the previous GHG monitoring plan and a projection of GHG emissions until the next GHG monitoring plan. The quantification of historical GHG emissions in each plan must rely on as much site-specific data as feasible. At a minimum, those data must include the electricity use, natural gas use, other utility and fuel use, the number of events, and the event attendance or trip count.

Such monitoring is also needed to confirm that the energy efficiency assumed in the GHG evaluation due to the Leadership in Energy and Environmental Design (LEED) gold certification is accurate. By using actual measured electricity use to calculate GHG emissions, uncertainties in the actual energy efficiency of the structures would be removed. This monitoring is critical due to the failure of many LEED certified buildings to achieve expected energy use reduction predictions.

The GHG monitoring plan must also include all facilities included in the GHG emission calculations, including the Oracle Arena. If the Oracle Arena is included in the GHG monitoring plan, GHG emissions resulting from more than 21 events in a year would be then captured by the evaluation. An ongoing GHG monitoring plan would also resolve the issue of GHG emissions after the 30-year evaluation period.

MITIGATION APPROACH INCONSISTENT WITH STATE GHG POLICIES

The AB900 Application and MM I-C-GG-1 require that the Project proponents obtain GHG emission offsets for the GHG emissions resulting from the Project. However, there is no assurance that the GHG offsets will be consistent with CARB GHG reduction goals.

The Project is only required to purchase GHG offsets from a “qualified GHG emissions broker.” To be consistent with state GHG policy, the offsets should meet California GHG reduction goals and be required to be real, additional, quantifiable, permanent, verifiable, and enforceable. The offsets purchased to meet mitigation requirements should also be thereafter retired and removed from circulation. As written, this “mitigation” allows the credits to be sold again, allowing those same offsets to be used again as mitigation on other projects.

Because neither the AB900 Document nor MM I-C-GG-1 require that the GHG offsets be obtained from a registry that demonstrates that the offset will result in real, additional, quantifiable, permanent, verifiable, and enforceable GHG offsets, and the language allows the GHG offsets to be sold after acquisition, the measure does not provide any assurance that the Project GHG emissions will be net zero or less than significant.

CONCLUSIONS

The GHG analysis used to support the determination that the Project met the requirements of AB900 is insufficient to demonstrate that the GHG emissions from the Project will be net zero and less than significant under CEQA for the following reasons:

- The GHG analysis makes unsupported assumptions about Oracle Arena, trip linkage, and energy use which artificially lower the expected GHG emissions from the Project and do not provide an accurate evaluation of the GHG emissions that can be expected to result from the Project.

- The GHG analysis does not require project monitoring and periodic GHG reporting to assure the accuracy of the projected emissions.

- The GHG offsets proposed as a mitigation measure are not required to be consistent with California GHG reduction goals and policies, could be used for other projects, and may not ever be required for the operational emissions.

Attachment:
Resumes

PATRICK S. SULLIVAN, CPP, REPA

Education

BA – Harvard University, Biology/Ecology, 1989

Professional License/Certifications

Approved Lead Verifier under California Air Resources Board (CARB) AB 32 Greenhouse Gas (GHG) Program
South Coast Air Quality Management District, Certified Permitting Professional (No. A-1716)
Registered Environmental Property Assessor, No. 519692, National Registry of Environmental Professionals

Professional Affiliations

Solid Waste Association of North America (SWANA): Vice Chairman of Landfill Gas (LFG) Division
Air and Waste Management Association (AWMA); Vice Chairman, Mother Lode Chapter
Technical Advisory Group; Cal Recycle, LFG
Technical Advisory Group, CARB, AB 32 Landfill Methane Rule
Waste Industry Air Coalition (WIAC); Co-Chairman
California Biomass Collaboration; Executive Board
Solid Waste Industry Group in California
Solid Waste Industry for Climate Solutions (SWICS), Co-Chairman
Society for Risk Analysis

Professional Experience

Mr. Sullivan has over 24 years of experience in the area of environmental engineering, specializing in solid waste-related issues. He is the Managing Director of SCS Engineers' (SCS) consulting and engineering operations within the Southwestern United States; the largest of all of SCS's engineering business units. He also serves as the Practice Leader for SCS's Solid Waste Practice in the same region. Mr. Sullivan is the National Partner for SCS's companywide Air Quality and GHG programs. He also oversees SCS's company-wide Risk Assessment program and one of the national experts on risk assessment and toxic exposure issues for solid waste facilities. Mr. Sullivan is a company Senior Vice President and Principal-in-Charge for compliance and permitting projects for related to solid waste facilities as well as related engineering services. SCS has published over 25 technical papers in industry journals and publications and presented at over 35 conferences, seminar, and workshops.

Because of this expertise, Mr. Sullivan has been the Principal-in-Charge and/or lead technical expert on a variety of projects related to solid waste facility investigations, risk assessments, LFG management, air quality and GHG, as well as other environmental issues at landfills and solid waste facilities.

Air Quality

Title V Permit Applications and Documentation for Industrial Facilities and Landfill Sites. Mr. Sullivan has been involved with over 100 Title V permitting projects, including Title V compliance reporting for over 75 facilities.

New Source Review (NSR)/Prevention of Significant Deterioration (PSD) Permit Applications and Documentation for Industrial Facilities and Landfill Sites. Mr. Sullivan has been involved with over 50 NSR/PSD permitting projects for various types of industrial facilities. This includes permitting for over 30 landfill expansions in California and over 30 energy facilities.

New Source Performance Standard (NSPS) Applicability Reviews and Compliance Activities. Mr. Sullivan has overseen the completion of NSPS Tier 1 and 2 emission rate studies and reports, LFG system (GCCS) design plans, surface emission monitoring plans, and other documentation for over 100 landfills under the NSPS program, including NSPS compliance reporting for over 75 landfill sites. In addition, Mr. Sullivan has worked on NSPS compliance activities for various other sources, including boilers, incinerators, engines, turbines, etc.

National Emission Standards for Hazardous Air Pollutants (NESHAPs)/Maximum Achievable Control Technology (MACT) Compliance Activities. Mr. Sullivan has been involved with over 75 NESHAPs/MACT projects for various regulated sources, including development of Startup, Shutdown, and Malfunction (SSM) plans and various other compliance documents. This has included landfills and various industrial facilities, such as aerospace facilities, boilers, incinerators, engines, etc.

Development and Teaching of Training Courses for Air Quality and GHG Compliance at over 40 Seminars. Compliance and regulatory issues that have been taught included Title V, NSPS, NESHAPs/MACT, NSR/PSD, Urban Air Toxic Strategy (UATS), Tailoring Rule, federal GHG reporting rule, and related state and local requirements.

Regulatory Advocacy for the Landfill Industry on the NSPS Rule, Title V Operating Permit Programs, NESHAPSs rule, and other regulations, where landfills are included as a regulated source. Mr. Sullivan has developed industry comments and negotiated with the agencies on behalf of the industry.

Preparation of Numerous Local Air District, State, and Federal Permitting Documents for the installation of air pollution control devices and industrial equipment, including boilers, cooling towers, air strippers, wastewater treatment plants, biogas collection systems and flares, biogas and recovery plants, and various industrial systems. Mr. Sullivan has managed over 100 state or local air permitting projects for landfills.

Permitting, Compliance, and Due Diligence Projects for over 35 Renewable Energy Projects throughout the United States. Some of these projects have also included registration of GHG credits, facilitation of trades for GHG credits, and development of methodologies for estimation of GHG reductions as well as all of the air quality and GHG permitting tasks. Mr. Sullivan has permitted over 30 biogas to energy and biomass plants across the country.

Air Quality, GHG, and Risk Assessment Sections of Environmental Impact Reports (EIRs) for approximately 35 landfill expansions, new landfills, transfer stations, other solid waste facilities, and various commercial/industrial projects in California, including evaluations of health risks, air quality, GHG, and/or odors. This has included the preparation of a variety of California Environmental Quality Act (CEQA)/National Environmental Policy Act (NEPA) documentation.

Air Quality Solid Waste Assessment Tests (SWATs) for various landfill sites in California.

Air Sampling and Source Testing for Various Emitting Devices, including sampling for volatile organic compounds (VOCs), criteria pollutants, particulate heavy metals, and asbestos fibers. Oversight of sources testing at over 75 landfill sites and development of a database of landfill source tests for use in the work of the WIAC.

Mr. Sullivan has completed air permitting and compliance activities for the following types of industrial facilities:

- Solid waste incinerators.
- Biomass energy plants.
- Landfills.
- Recycling facilities and transfer stations.
- LFG recovery plants.
- Cement and asphalt plants.
- Chemical manufacturing facilities.
- Aerospace facilities.
- Jewelry manufacturing facilities.
- Sand and gravel facilities.
- Electronics facilities.
- Site remediation projects.
- Paint and solvent manufacturing plants.
- Boat manufacturing plants.

Completed Landfill Air Quality Services in the Following Air Districts in California and States: San Joaquin Valley Air Pollution Control District (APCD), Bay Area Air Quality Management District (BAAQMD), South Coast AQMD, Sacramento Metropolitan AQMD, San Diego County APCD, Yolo-Solano AQMD, Feather River AQMD, Kern County APCD, Ventura County APCD, Santa Barbara County APCD, Shasta County APCD, Antelope Valley APCD, Mojave

Desert AQMD, Placer County APCD, North Coast Unified AQMD, Butte County APCD, and El Dorado County APCD. States of Nevada, Oregon, Washington, Hawaii, Arizona, Idaho, Montana, New Mexico, Colorado, Utah, Texas, Ohio, Pennsylvania, Illinois, Kansas, Oklahoma, and several others.

Landfill Gas

Principal-in-Charge for Design, Bidding Support, and Construction Oversight for LFG Control System, Highway 59 Landfill, Merced County, CA. The system was initially designed to prevent LFG migration and provide corrective action for groundwater impacts. The system successfully remediated LFG migration and brought the facility in compliance with Resource Conservation and Recovery Act (RCRA) Subtitle D requirements. Currently, Mr. Sullivan oversees the operations and maintenance (O&M) of the LFG system. Recently, Mr. Sullivan oversaw the design and construction quality assurance (CQA) for a major expansion of the existing LFG system to meet federal and state air quality and GHG requirements. In addition to the LFG services, Mr. Sullivan has completed a variety of air quality and GHG tasks for the project, including permitting and compliance reporting as well as closure design and groundwater corrective action.

Principal-in-Charge, Completion of Various LFG Engineering/Construction Oversight and Groundwater Services, Various Waste Management, Inc. (WM) Landfills. Landfill sites have included Bradley, Simi Valley, Columbia Ridge, DADS, Lancaster, Redwood, Lockwood, Antelope Valley, Rio Rancho, Butterfield, Northwest Regional, Anderson, and El Sobrante. Engineering tasks have included design of wellfield expansions, new blower/flare stations, header upgrades and replacements, groundwater monitoring and reporting, groundwater corrective action plans, as well as a variety of air quality services.

Principal-in-Charge, LFG Engineering, American Avenue Landfill, Fresno County, CA. SCS first developed a LFG master plan for the site. Upon completion of the conceptual plan, Mr. Sullivan oversaw the completion of the engineering design, including preparation of formal plans and specifications for bidding for the original and one expansion to the LFG system. Bid assistance was provided to the County as well as construction management and CQA services. The County expanded SCS's contract to include O&M of the LFG system as well as design of two subsequent phases of LFG system expansion. In addition to the LFG services, Mr. Sullivan has completed a variety of air quality and GHG tasks for the project.

Principal-in-Charge, Completion of LFG Planning and Engineering for Various Republic Services (Republic's) Landfills. Landfill sites have included Otay, Sycamore, Vasco Road, West Contra Costa Sanitary, Foothills, Tower Road, ECDC, Wasatch, Ox Mountain, Wasatch, and Central Landfills. Engineering tasks have included design of wellfield expansions, new blower/flare stations, and header upgrades and replacements as well as CQA. Under SCS's direction, SCS upgraded Republic's LFG Master Plans and prepared a LFG remediation plan to address LFG migration issues. In addition to the LFG services, Mr. Sullivan has completed a variety of air quality and GHG tasks for the projects.

Principal-in-Charge, Planning, Design, and Construction Oversight for LFG System at Recology's Landfills, California. Project Director and Manager for the planning, design, and construction oversight for an expansion to the LFG system at Recology's Pacheco Pass, Ostrom Road, and YSDI Landfills to address air quality requirements, LFG migration, and groundwater impacts. These projects were completed on a design-build basis. In addition to the LFG services, Mr. Sullivan has completed a variety of air quality and GHG tasks for Recology landfills.

Principal-in-Charge, Completion of LFG Planning and Engineering for Waste Connections, Inc.'s (WCI's) Landfills. Sites have included Chiquita Canyon, Fairmead, Potrero Hills, Cold Canyon, LRI, and Avenal Landfills. Engineering tasks have included design of wellfield expansions, new blower/flare stations, and header upgrades and replacements as well as CQA. SCS has upgraded WCI's LFG Master Plans and developed long-term cost estimates for LFG system expenditures. In addition to the LFG services, Mr. Sullivan has completed a variety of air quality and GHG tasks for the sites.

Principal-in-Charge, Various Other LFG Planning or Engineering Projects throughout California, Arizona, Nevada, Oregon, and Colorado, including Stanislaus County's Geer and Fink Road Landfills, Butte County's Neal Road Landfill, Sunnyvale Landfill, L&D Landfill, Sacramento County's Kiefer Landfill, Madera County's Fairmead Landfill, Yolo Central Landfill, as well as various other smaller closed landfill sites. Many of these projects included engineering design, CQA, and/or design-build of LFG system expansions.

CEQA/NEPA Analyses

CEQA Air Quality Analysis and Toxics Risk Assessment, Proposed Expansion to Fink Road Landfill, Stanislaus County, CA. As part of an EIR for a proposed expansion to the Fink Road Landfill in Stanislaus County, California, SCS completed an air toxics risk assessment, which evaluated the potential human health impacts due to current and future exposures from the project. The risk assessment was part of a larger air quality analysis completed for the expansion EIR. The analysis included an evaluation of health risk due to diesel exhaust from heavy equipment and refuse hauling vehicles at the landfill. As part of this project, SCS also researched the conversion of refuse hauling fleets to alternative fuels in order to generate ERCs for CEQA mitigation measures.

CEQA Air Quality Analysis and Toxics Risk Assessment, Salinas Valley Solid Waste Authority Landfill Project, Monterey County, CA. SCS completed air quality and risk assessment sections of a large EIR being prepared for long-term refuse collection and disposal options for the Salinas Valley Solid Waste Authority's Regional Landfill Project. The project included three landfills and 10 transfer stations, which were combined into four different project scenarios. The project included emissions estimates, air dispersion modeling, and risk calculations. The analysis included an evaluation of health risk due to diesel exhaust from heavy equipment and refuse hauling vehicles at the landfills and transfer stations, which were part of the project.

CEQA Mitigation Measures Development and Implementation for El Sobrante Landfill, Corona, CA. SCS was enlisted to develop a series of mitigation measures for fugitive dust emissions from landfill construction and operations at the El Sobrante Landfill in Corona, California. SCS also developed an implementation plan for the CEQA Mitigation Monitoring and Reporting Program (MMRP), which was required as part of the approval of the EIR. SCS is currently doing ambient monitoring for particulate matter less than 10 microns (PM10) levels and working with the SCAQMD to develop a long-term strategy to reduce dust emissions.

Landfill Risk Assessment, Closure and Post-Closure Development BKK Landfill, West Covina, CA. As part of an EIR for proposed closure and post-closure development of the Class III portion of the BKK Landfill, SCS completed a risk assessment that evaluated the potential human health impacts due to current and future exposures to contaminants in LFG and other environmental media. The risk assessment was part of a larger air quality analysis completed for the EIR. Through reasonable risk estimates, SCS was able to demonstrate that the proposed development of the landfill (i.e., golf course and Business Park) could occur without causing adverse health effects above CEQA significance levels.

CEQA Air Quality/GHG Analyses and Toxics Risk Assessments and Air Permitting, Proposed Landfill Expansions. Projects included expansions to the Newby Island, Forward, Crazy Horse, Johnson Canyon, Jolon, Fairmead, Keller Canyon, Redwood, Altamont, and various other landfills. As part of EIRs for the proposed expansions, SCS completed an air quality impact analyses that included risk assessments evaluating the potential human health impacts due to current and future exposures to contaminants from the project. The risk assessments were part of larger air quality analyses completed for the expansion EIRs. The projects included emissions estimates, air dispersion modeling, GHG evaluation, and risk calculations.

Landfill Investigation and Risk Assessment

Landfill Investigation, LFG Engineering, Human Health Risk Evaluation and Impact Assessment, Proposed Residential Developments, Adjacent to the Otay Landfill, Chula Vista, CA. Project activities at the site have included an evaluation of LFG migration, LFG engineering and testing, air quality permitting and compliance, soil and LFG sampling and analysis, human health risk assessment and nuisance/odor evaluation, CEQA assistance, operations and maintenance of the LFG collection and control system, and other landfill engineering and construction services. The risk assessment and odor/nuisance analysis was completed to support residential development adjacent to the landfill.

Environmental Investigations and Risk Assessment at the Former BKK Main Street Landfill in Los Angeles County. This landfill is a closed site that may have received both hazardous and non-hazardous wastes; it is currently occupied by two golf courses and other commercial and residential developments and is being considered for additional redevelopment. Project work at this facility has included completion of soil vapor surveys, installation and monitoring of LFG migration probes, LFG sampling/analysis, oversight of cover and subsurface soil and groundwater sampling, completion of a human health risk assessment, CEQA assistance, and negotiations with regulatory agencies. The site is currently being considered for listing on the

National Priorities List (NPL) as a potential Superfund site. Oversight of the landfill is provided by EPA Region IX, Department of Toxic Substance Control (DTSC), and the Los Angeles County landfill local enforcement agency (LEA).

LFG Assessment, Cover Maintenance, and Monitoring, Cogen Kramer Landfill, Los Angeles, CA. The site is located adjacent to residential development and two County correctional facilities have been developed on landfill property. Project tasks include LFG assessment, installation of LFG migration probes, emergency cover repair and ongoing cover maintenance, preparation of LFG and cover assessment work plan, regulatory liaison with the Los Angeles County LEA, Cal Recycle, and the South Coast AQMD. In addition, methane monitoring is conducted associated with the use of one of the closed jail facilities for TV and movie productions.

Environmental Monitoring and Postclosure Care, Cal-Compact Landfill, Carson, CA. The site is a former hazardous waste landfill that is being considered for redevelopment. The site is currently under the oversight of the DTSC. Project tasks have included LFG assessment, LFG engineering, design of methane protection systems, and development of a LFG monitoring program. In addition, Mr. Sullivan currently oversees the completion of post-closure care services at the site, including LFG monitoring, LFG system operations and maintenance (O&M), groundwater sampling and analysis, cover maintenance and repair, site security, storm water sampling/analysis and inspections, and regulatory liaison.

LFG Assessment, Cover Maintenance, and Monitoring, Lane Road Disposal Site, Irvine, CA. The site is located adjacent to residential development and has been redeveloped into a golf course. Project tasks have included LFG assessment, including methane testing in nearby homes, installation of LFG migration probes, cover repair and ongoing cover maintenance, preparation of LFG assessment and cover maintenance plan, regulatory liaison with the Orange County LEA, Santa Ana Regional Water Quality Control Board (RWQCB), CIWMB, and SCAQMD. SCS also completed the design and installation of LFG collection and control system to prevent migration onto residential properties.

Burn Dump Investigation in San Joaquin County, CA. As part of this project, Mr. Sullivan provided technical oversight for investigations of a burn dump site, which included soil investigations, trenching investigations to determine extent of refuse, LFG migration assessment, waste sampling/analysis, hazardous waste determination, and other project tasks. The project site was slated for residential development; therefore, all project elements we completed in consideration for this type of development.

Investigation, Risk Assessment, and Remediation Kaiser Ventures Inc. Facilities, Fontana, CA. For the former Kaiser Steel plant in Fontana, Remedial Investigation (RIs)/Feasibility Studies (FSs), Remedial Action Plans (RAPs), and Remedial Designs were prepared for three on-site operable units under DTSC's oversight. Mr. Sullivan was responsible for a number of individual soil, groundwater, surface water, and waste investigations at the Kaiser site, including treatability studies, risk assessments, RAPs, and hydrogeological studies, storm water pollution prevention plans, and spill prevention, control, and countermeasure (SPCC) plans. These projects included investigations of two landfill sites, with both hazardous and non-hazardous wastes, including

soil, waste materials, hazardous waste, groundwater, and surface water issues. The site has been redeveloped into the California Speedway, a NASCAR race track.

Investigation, Risk Assessment, and Remediation Feasibility Study, Mission Bay Landfill, San Diego, CA. For this site, Mr. Sullivan managed a significant forensic investigation and site assessment of the former landfill site, which is located next to a river, bay, and amusement park and is used heavily for recreational purposes. This work has included investigations of extent of refuse, cover thickness, LFG composition and migration, soil, surface water, groundwater, and other environmental media associated with Mission Bay. The field investigations will be followed by a risk assessment, and given the highly visible and public nature of the landfill project; focus on risk communication will be of primary importance. Ultimately, several candidate risk-based remediation methods applicable to the site will be identified with typical costs associated with each method. This project included interface with the San Diego County APCD, RWQCB, LEA, and DTSC.

Landfill Engineering, LFG Migration Assistance, and Human Health Risk Assessment, Geer Road Landfill, Modesto, CA. Mr. Sullivan has managed and been involved with a variety of project at the Geer Road site including closure design and CQA services, cover repair, LFG engineering, air quality compliance, human health risk assessment, LFG system O&M, LFG and groundwater monitoring, as well as acted as an expert witness in defending the landfill against a citizen lawsuit. Project work was under the jurisdiction of the landfill LEA and RWQCB.

Odor Evaluations

Air Quality and Odor Analysis for proposed municipal solid waste (MSW) landfill and composting operation in Mariposa County, CA.

Air Quality and Odor Analysis, including ambient air testing and air dispersion modeling, for MSW landfill, composting facility, and materials recovery facility (MRF) in Placer County, CA.

Air Quality and Odor Analysis, including air dispersion modeling, for MSW landfill in Chula Vista, CA.

Odor Analysis for proposed MRF in San Bernardino County, CA.

Odor Analysis for an MSW landfill expansion in Kings County, CA.

Odor Analysis for an MSW landfill expansion in Santa Clara County, CA.

Compliance Review and Odor/Air Quality Impact Assessment for existing composting operation in San Diego, CA, which is adjacent to a proposed residential development.

Development of Expert Report and review of opposing experts' work on air quality and odor analyses of a composting facility in Adelanto, CA.

Air Quality Permitting and Compliance, including Odor Analyses, for landfills and composting facilities in Vacaville, Milpitas, and Novato, CA.

Feasibility Analysis, Best Available Control Technology (BACT) Cost-Effectiveness Analysis, and Hydrogen Sulfide Testing for the evaluation of sulfur removal technologies as odor control for LFG-derived odors for 10 landfill sites.

Odor analyses as part of the air quality sections of over 10 EIRs for landfill expansions.

Management of numerous LFG design projects related to odor control of LFG emissions.

Litigation Support

- **Expert Witness Experience:**
  - Last 4 years
    - Crane et al vs. County of Merced. Expert report and deposition and trial testimony.
    - Brian Kahn vs. The Dewey Group. Expert deposition and trail testimony
    - Tommy McCarty, et. al., vs. Oklahoma City Landfill, LLC. Expert report and deposition.

Litigation Support and Preparation of Expert Report in Defense of a Landfill Company in Pittsburgh, PA, which was sued under the third-party provisions of the federal Clean Air Act. Project tasks including emissions estimation, regulatory applicability review, and preparation of an expert report. The case was settled in favor of our client.

Litigation Support as part of a CERCLA Cost Recovery Action Filed by a Group of PRPs Against Various Municipalities and Public Agencies that Disposed Refuse at a Mixed Hazardous and Municipal Solid Waste Landfill in California. Project tasks included review of depositions, evaluation of industrial and hazardous waste disposed in the landfill, and development of a draft report on the contribution of the various PRPs to contamination in the landfill. Our clients were successful in the litigation.

Litigation Support in Defense of a Landfill Company in San Antonio, Texas Against Enforcement Action Brought by the State of Texas. Project tasks including emissions estimation, odor assessment, and air modeling. The case was settled in favor of our client.

Litigation Support in a Lawsuit Filed by a Landfill Owner/Operator in New Mexico Versus the State Environmental Agency with Respect to Air Quality Permitting for Landfills. The case included litigation support and preparation of expert reports.

Litigation Support and Expert Testimony as Part of a Toxic Tort Litigation filed by a Local Residence Against a County-owned Closed Landfill in Modesto, CA. Project tasks included a

site investigation, risk assessment, groundwater evaluation, and expert testimony (deposition and trial). The case was settled with minimal damages for our client.

Litigation Support and Expert Testimony as Part of a Toxic Tort Litigation filed by a Local Residence against a County-owned Active Landfill in Merced, CA. Project tasks included a LFG assessment, site investigation, risk assessment, groundwater evaluation, and expert testimony (deposition and trial). The case was ruled in favor of our client.

Litigation Support and Expert Testimony in Defense of a Nuisance Claim and a CERCLA Cost Recovery Action Filed Against an Electronic Relay Manufacturing Facility in Los Angeles, CA. Project tasks included a remedial investigation, feasibility study, remedial design, remedial action, risk assessment, and expert testimony (deposition only). The first case was settled with insurance coverage; the second case was settled for deminimis contribution from our client.

Litigation Support in Defense of a CERCLA Cost Recovery Action Filed Against an Electronic Relay Manufacturing Facility in Azusa, CA. Project tasks included a review of documents and preparation of a technical response to U.S. EPA's proposed settlement offer.

Litigation Support and Expert Testimony as Part of a Toxic Tort Litigation Filed by a Plaintiff Group against a Large Aerospace Company in Burbank, CA. Project tasks included emissions estimation, air dispersion modeling, air toxics risk assessment, and expert testimony before arbitration judge. The case was settled in favor of our clients.

Litigation Support and Preparation of an Expert Report as Part of a Toxic Tort Litigation in Defense of a Metal Heat Treating Facility in Phoenix, AZ. Project tasks included emissions estimation, air dispersion modeling, and air toxics risk assessment. The case was settled in favor of our client.

Litigation Support and Expert Testimony as Part of a Nuisance Lawsuit Filed by the Current Owner of a Screw Manufacturing Facility against the Former Owner in Santa Fe Springs, CA. Project tasks included a site investigation, compliance audit, evaluation of on-site disposal of waste oil, and expert testimony before an arbitration judge.

Litigation Support as Part of an Insurance Claim Filed by an Aerospace Facility Against Its Insurance Carrier in Natick, MA. Project tasks included review of soil vapor data, vadose zone modeling, determination of the vapor-phase plume, and preparation of exhibits to be used in court. Our client was successful in the litigation.

Litigation Support in Defense of a Nuisance Claim and a CERCLA Cost Recovery Action Filed Against a Steel Mill in Fontana, CA. Project tasks included a remedial investigation, feasibility study, remedial design, remedial action, risk assessment, and assistance in the cross-examination of opposing experts. The case was settled in favor of our client.

Litigation Support in two Lawsuits Where Contractors Were Unwittingly Exposed to Asbestos during Building Demolition after the property owners claimed that the buildings did not have asbestos-containing materials.

Litigation Support as Part of a Property Damage Filed by the Property Owner Against its Former Tenant at a Plastic and Rubber Manufacturing Plant in Ontario, CA. Project tasks included a site investigation, remediation, risk assessment, and expert testimony (deposition only).

Mr. Sullivan's litigation experience includes the following Proposition 65 cases in California. These cases include preparation of exposures and risk analyses and participation in settlement conferences:

- Litigation support for a defendant in a Proposition 65 lawsuit concerning exposure to methylene chloride in a silk flower cleaner.
- Litigation support for a defendant in a Proposition 65 lawsuit concerning exposure to dichlorobenzene and toluene in a bicycle tire repair kit.
- Litigation support for a defendant in a Proposition 65 lawsuit concerning exposure to lead in PVC grips and handles for various tools and equipment.
- Litigation support for a defendant in a Proposition 65 lawsuit concerning exposure to lead in cosmetics.
- Litigation support for a defendant in a Proposition 65 lawsuit concerning exposure to chromated copper arsenate in treated wood used for children's playground equipment.
- Litigation support for a defendant in a Proposition 65 lawsuit concerning the exposure to various pollutants emitted from landfills and other solid waste facilities in California (six total facilities).

Greenhouse Gas

CARB, Approved Lead Verifier or Internal Senior Reviewer

- Alameda Municipal Power[1]
- Biggs Municipal Utility[1]
- Cal Portland Company – Mojave Plant[2]
- Cal Portland Company – Colton Plant[2]
- California Steel Industries
- City of Lompoc[1]
- City of Roseville, CA[1]
- City of Ukiah, Electric Utilities Division[1]
- City of Victorville[1]
- Collins Pine Company
- JP Morgan Chase Bank[1]
- Kinergy[1]
- Lodi Electric Utility[1]
- Metropolitan Water District[1]
- Orange County Sanitation District
- Pacific Ethanol[1]
- Port of Oakland[1]
- Port of Stockton, CA[1]
- Riverside Wastewater Treatment Plant
- San Francisco Hetch Hetchy Water & Power[1]

- Corn Products
- Georgia Pacific
- Gridley Electric Utility[1]
- Healdsburg Electric Department[1]
- Hilmar Cheese Company
- Imperial Irrigation District[1]
- Imperial Irrigation District – Coachella Gas Turbines
- Imperial Irrigation District – El Centro Generating Station
- Imperial Irrigation District – Niland Gas Turbines Plant
- Imperial Irrigation District – Rockwood Gas Turbines
- Truckee Donner Public Utility District[1]
- Temple Inland University of California at Davis
- University of California at Irvine
- University of California at Santa Cruz
- University of California at San Diego
- Western Area Power Authority[1]

[1] Verification includes electrical/fuel transactions.
[2] Verification included process emissions (landfill, wastewater treatment, geothermal, or other process emissions).
[3] Verification includes oil and gas emissions.

Climate Action Reserve (CAR) GHG Project Reduction Services

Landfill Protocol

- Dalton-Whitfield Regional Solid Waste Management Authority
- L & D Landfill
- Larimer County Landfill Electric Generation Project
- Hay Road Landfill Feasibility Study
- Montana-Dakota Utilities Billings Landfill
- YSDI Landfill Feasibility Study Central Landfill, Citrus County, Florida
- Raleigh County Solid Waste Authority
- Pendleton County Landfill
- Eagle Point, Wolf Creek, and Stones Throw Landfills Project

Organic Waste Composting OWC) Protocol

- American Organics OWC
- Grover Environmental Products
- Jepson Prairie Organics
- South Valley Organics

AB32 Mandatory Reporting. Completed State of California Mandatory GHG reporting under AB32 for the following general stationary combustion facilities:

- Altamont Landfill
- Bradley Landfill
- CalEnergy Geothermal Plants City of Fresno Wastewater Treatment Plant
- El Sobrante Landfill
- G2 Ostrom Road
- Kirby Canyon Landfill
- Mid-Valley Landfill
- Penrose Landfill Gas Conversion, LLC
- Redwood Landfill
- San Bernardino County Solid Waste Mgmt. - MVSL
- Simi Valley Landfill
- Sunnyvale WWTP Toyon Landfill Gas Conversion, LLC

GHG Compliance for Landfills. Completed GHG compliance services for over 75 landfills related to the AB32 mandatory reporting rule, AB32 landfill methane rule, and federal "Tailoring" rule for GHG.

U.S. EPA GHG Reporting Rule. Management and oversight for over 250 U.S. EPA GHG mandatory reporting rule projects for landfills.

GHG Emissions Inventory and Verification of Creditable GHG Reductions. Performed GHG emissions inventory services, verification of creditable GHG reductions, and development of GHG management plan under CEQA for Kern County Waste Management Department, California.

GHG Consulting. Provided GHG consulting services for Sacramento County, Los Angeles County, City of Carlsbad, City of Alameda, and the City of Palo Alto and virtually all of the major solid waste companies. Acted as the primary consultant supporting the membership of the SWICS group. As part of this effort, Mr. Sullivan has developed protocols for landfill GHG emission estimates and lead SWICS advocacy efforts on the proposed AB 32 early action rule for landfills.

GHG Emissions Inventory and Certification of Donated GHG Reductions (to make event GHG neutral), Super Bowl, Houston, TX.

Certification of Donated GHG Reductions (to make event GHG neutral), Winter Olympics, Salt Lake City, UT.

GHG Inventory and CCAR Reporting for Republic Services, Inc. Under Mr. Sullivan's direction, SCS prepared an entity-wide GHG inventory for Republic's solid waste operations and facilities in California. In addition, SCS completes federal GHG reporting for all Republic landfills nationally.

SWICS Group. Involvement with the leadership of the SWICS group. As part of this effort, Mr. Sullivan has developed protocols for landfill GHG emission estimates and led SWICS advocacy efforts on the proposed AB32 early action rule for landfills, cap and trace, as well as the AB32 and federal GHG mandatory reporting rules.

Private Waste Company GHG Consulting. Provided GHG consulting for all of the large private waste management companies.

Development of GHG Guidance Document. Developed the guidance document titled, *"Technologies and Management Options for Reducing Greenhouse Gas Emissions from Landfills,"* under contract to the California Integrated Waste Management Board (CIWMB).

Publications and Presentations

Sullivan, Patrick S., and Zbozinek, Jasenka V., *Exposure Assessment and Toxic Distribution Modeling In Toxic Tort Litigation: Air and Soil Pathways*, Seminar Proceedings, Phoenix Chapter of the State of Arizona Bar Association, One-Day Technical Meeting, November 1996.

Sullivan, Patrick S., and Lister, Kenneth H., *Use of Screening Level Risk Assessment for Risk-Based Corrective Action*, Conference Proceedings, Association for the Environmental Health of Soils, 7th Annual West Coast Conference on Contaminated Soil and Groundwater, Oxnard, California, February 1997.

Sullivan, Patrick S., Nuno, Julio A., and Lister, Kenneth H., *The Use of Risk-Based Corrective Action in Site Mitigation Projects*, Conference Proceedings, Environmental Engineering Conference, Canadian Society of Civil Engineers/American Society of Civil Engineers (CSCE/ASCE), Edmonton, Alberta, July 1997.

Albert, Lon, Kubis, Elizabeth L., and Sullivan, Patrick S., *Ongoing Challenges of Emission Inventories at Municipal Solid Waste Landfills*, Conference Proceedings, Emission Inventory Conference, Air and Waste Management Association (AWMA), Raleigh-Durham, North Carolina, October 1997.

Kubis, Elizabeth L., Rankin, Sue, and Sullivan, Patrick S., *Strategic Planning for Landfill Gas and Air Quality Compliance at Municipal Solid Waste Landfills*, Conference Proceedings, 28th Annual SWANA Western Regional Symposium, South Lake Tahoe, Nevada, April 1999.

Pierce, Jeffrey L., and Sullivan, Patrick S., *NSPS, NESHAPs, NSR, and Title V: The Impact of Federal Air Quality Regulations on Landfill Construction and Operation*, Conference Proceedings, 28th Annual SWANA Western Regional Symposium, South Lake Tahoe, Nevada, April 1999.

Sullivan, Patrick S., *A Practical Approach to Clean Air Act Compliance for Landfills*, Presentation at the Annual WASTECON Conference, Reno, Nevada, October 1999.

Sullivan, Patrick S., *The Use of Methane Gas from Landfills as an Alternative Fuel Source*, Presentation at the U.S. Conference of Mayors/Municipal Solid Waste Management Association Fall Summit, San Jose, California, November 1999.

Sullivan, Patrick S. (lead author: Risk Assessment section), *Environmental Site Characterization and Remediation Design Guidance*, American Society of Civil Engineers (ASCE) Manuals and Reports on Engineering Practice No. 99, ASCE, Reston, Virginia, 1999.

Michels, Mike, and Sullivan, Patrick S., *Actual LFG Emissions Lower than EPA Estimates*, Conference Proceedings, National Solid Waste Management Association (NSWMA)/

Environmental Industries Association (EIA) Waste Tech 2000 Conference, Orlando, Florida, March 2000.

Sullivan, Patrick S., and Michels, Mike, *The Time Is Now for Changes to the AP-42 Section on Landfills*, Conference Proceedings, 23rd Annual SWANA Landfill Gas Symposium in La Jolla, California, March 2000.

Sullivan, Patrick S., *U.S. EPA's Urban Air Toxics Strategy*, Conference Proceedings, Conference Proceedings, 10th Annual Technical Conference, Air and Waste Management Association (AWMA) Golden Empire Chapter, Golden West Section, Bakersfield, California, March 2000.

Mezzacappa, David, and Sullivan, Patrick S., *Air Quality Pre-Construction Permits for Municipal Solid Waste Landfills*, Conference Proceedings, 9th Annual SWANA Landfill Symposium in Austin, Texas, June 2000.

Sullivan, Patrick S., *Risk Characterization in Site Characterization and Remediation Design*, Conference Proceedings, Convergence 2000 Environmental Engineering and Pipeline Engineering Conference, American Society of Civil Engineers (ASCE), Kansas City, Missouri, July 2000.

Nuno, Julio A., and Sullivan, Patrick S., *Site Characterization*, Presentation at Convergence 2000 Environmental Engineering and Pipeline Engineering Conference, ASCE, Kansas City, Missouri, July 2000.

Sullivan, Patrick S., *Getting Down to Cases: Just What Is a Bioreactor Landfill*, MSW Management, July/August 2000.

Sullivan, Patrick S., and Stege, G. Alexander, *An Evaluation of Air and Greenhouse Gas Emissions and Methane Recovery from Bioreactor Landfills*, MSW Management, September/October 2000.

Green, Roger B., Vogt, W. Gregory, and Sullivan, Patrick S., *Comparison of Emissions from Bioreactor and Conventional Landfills*, Conference Proceedings, Annual SWANA WASTECON Conference, Cincinnati, Ohio, October 2000.

Vogt, W. Gregory, and Sullivan, Patrick S., *Literature Review and Research Needs for Bioreactor Landfills*, Conference Proceedings, NSWMA/ EIA Waste Tech 2001 Conference in San Diego, California, February 2001.

Sullivan, Patrick S., and Caponi, Frank R., *The Potential Impacts of the MACT Standard and Urban Air Toxics Strategy on MSW Landfills*, Conference Proceedings, 24th Annual SWANA 24th Annual Landfill Gas Symposium in Dallas, Texas, March 2001.

Sullivan, Patrick S., *Bioreactor Landfill Energy Recovery*, Proceedings of the U.S. EPA's and Water Environment Federation's Innovative Processes to Produce Useful Materials from Biosolids and Animal Manures—A Symposium, Chicago, Illinois, June 2001.

McCready, Ambrose A., Nordell, David, and Sullivan, Patrick S., *Bioreactor Operation Feasibility Study for Fink Road Landfill*, Conference Proceedings, 10th Annual SWANA Landfill Symposium, San Diego, California, June 2001.

Sullivan, Patrick S., *Landfill Gas Modeling and Emission Estimates for a Large Bioreactor Landfill in California*, Presentation at the 10th Annual SWANA Landfill Symposium, San Diego, California, June 2001.

Sullivan, Patrick S., and Green, Roger, *Air Emissions, Methane Generation and Recovery, and Energy Potential for Bioreactor Landfills: Comparing the Theoretical to the Actual*, Proceedings of the Annual SWANA WASTECON Conference, Baltimore, Maryland, October 2001.

Pierce, Jeffrey L., and Sullivan, Patrick S., *Economic and Financial Aspects of LFGTE Project Development in California*, California Energy Commission/U.S. EPA Landfill Methane Outreach Program (LMOP), California Landfill Gas to Energy Workshop, California Landfill Gas Primer, Sacramento, California, October 2001.

Sullivan, Patrick S., *Enhancing Energy Recovery from Landfills Using the Bioreactor Technology*, Presentation at the 5th Annual U.S. EPA LMOP Conference and Project Expo, Washington, D.C., December 2001.

Sullivan, Patrick S., and Caponi, Frank R., Air Quality Compliance for Landfill Gas to Energy Projects, Conference Proceedings, 25th Annual SWANA, 25th Annual Landfill Gas Symposium, Monterey, California, March 2002.

Sullivan, Patrick S., Huff, Raymond, and Tinker, Amy, *Human Health Risk Assessment Issues for Landfills*, Conference Proceedings, 25th Annual SWANA Landfill Gas Symposium in Monterrey, California, March 2002.

Sullivan, Patrick S., *Update on Air Quality Permitting and Compliance Issues for MSW Landfills*, Presentation at the 31st Annual SWANA Western Regional Symposium, South Lake Tahoe, Nevada, May 2002.

Walsh, James, and Sullivan, Patrick S., *NSPS and Other Clean Air Act Issues—Recent Development and Workarounds*, Proceedings of the SWANA WASTECON Conference, Long Beach, California, October 2002.

Sullivan, Patrick S., and Bins, John, *Measurement of Toxic Emissions from Landfills: History and Current Developments*, Conference Proceedings, Symposium on Air Quality

Measurement Methods and Technology—2002, AWMA, San Francisco, California, November 2002.

Sullivan, Patrick S., and Bins, John, *Toxic Emissions from Landfills: History and Current Developments*, Conference Proceedings, NSWMA Waste Tech 2003 Conference, New Orleans, Louisiana, February 2003.

Morris, Jeremy, Sullivan, Patrick S., et al., *Performance-Based System for Post-Closure Care at MSW Landfill—A New Approach to the Current 30-Year Time-Based System of Subtitle D*, Conference Proceedings, NSWMA Waste Tech 2003 Conference, New Orleans, Louisiana, February 2003.

Sullivan, Patrick S., et al., *Landfill Gas Module, Performance-Based System for Post-Closure Care at MSW Landfill*, Conference Proceedings, Conference Proceedings, 26th Annual SWANA Landfill Gas Symposium in Tampa, Florida, March 2003.

Sullivan, Patrick S., *Landfill Gas Aspects of Bioreactor Landfills*, Presentation at Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Annual State Solid Waste Managers' Conference, Salt Lake City, Utah, July 2003.

Huff, Raymond H., Leonard, Michelle P., and Sullivan, Patrick S., *Composting Emissions Update and New Southern California Regulations*, Presentation at SWANA WASTECON Conference, St. Louis, Missouri, October 2003.

Huff, Raymond H., and Sullivan, Patrick S., *Unique Landfill Gas Issues on Urban Inactive Landfills*, Conference Proceedings, 27th Annual SWANA Landfill Gas Symposium, San Antonio, Texas, March 2004.

Clarke, Steve, and Sullivan, Patrick S., *Estimating the Trend in NMOC Generation and Emissions After Closure of MSW Landfills*, Conference Proceedings, 27th Annual SWANA Landfill Gas Symposium, San Antonio, Texas, March 2004.

Huff, Raymond H., and Sullivan, Patrick S., *Air Quality and Odor Impacts from Landfill-Related Emissions*, Conference Proceedings, Water Environment (WEF) and AWMA Odor and Air Emissions 2004, Bellevue, Washington, April 2004.

Sullivan, Patrick S., *Air Quality and Odor Impacts from Landfill-Related Emissions*, Presentation at the 33rd Annual SWANA Western Regional Symposium, San Luis Obispo, California, May 2004.

Sullivan, Patrick S., *The Role of LFGTE in California's RPS and the California Biomass Collaborative*, Presentation at the 8th Annual U.S. EPA LMOP Conference and Project Expo, Baltimore, Maryland, January 2005.

Sullivan, Patrick S., *Where Should I Put My Organic Waste: Bioreactor Landfill or Composting Facility*, Conference Proceedings, NSWMA/EIA Waste Expo, Las Vegas, Nevada, May 2005.

Sullivan, Patrick S., *LFG and Development on and Adjacent to Landfills in California*, Presentation at the 34th Annual SWANA Western Regional Symposium, San Luis Obispo, California, May 2005.

Sullivan, Patrick S., *Comparison of Air, Health, and Odor Impacts from Landfills vs. Composting*, Presentation at the Annual SWANA WASTECON Conference, St. Louis, Missouri, September 2005.

Sullivan, Patrick S., *LFG and Air Quality Aspects of Bioreactor Landfills*, Presentation at the Annual Technical Meeting, SWANA Evergreen Chapter, Yakima, Washington, October 2005.

Sullivan, Patrick S., *LFG Issues During Post-Closure Development of Landfills*, Presentation at the California Integrated Waste Management Board's Post-Closure Land Use Symposium, Stockton and Ontario, California, February 2006.

Leonard, Michael L., Huff, Raymond H., and Sullivan, Patrick S., *Unique Solutions to Complex LFG Migration Problems*, Conference Proceedings, 29th Annual SWANA Landfill Gas Symposium, St. Petersburg, Florida, March 2006.

Sullivan, Patrick S., *Current Status of Air Quality Regulations in the Solid Waste Industry*, SWANA Arizona Landfill Seminar, Phoenix, Arizona, May 2006.

Sullivan, Patrick S., et al., *Fugitive Dust Modeling with AERMOD for PM10 Emissions from a Municipal Solid Waste Landfill*, Proceeding of Guidelines on Air Quality Models; an AWMA Specialty Conference, Denver, Colorado, September 2006.

Sullivan, Patrick S., *CNG, LNG, and Other Fuels from LFG*, Presentation at 4th Annual Forum CA Biomass Collaborative, Sacramento, California, March 2007.

Sullivan, Patrick S., et al., *Field Comparison of Landfill Gas Collection Efficiency Measurements*, Conference Proceedings, 30th Annual SWANA Landfill Gas Symposium, Monterey, California, March 2007.

Sullivan, Patrick S., *Update on Major Air Quality Regulations Affecting Landfills*, Conference Proceedings, 30th Annual SWANA Landfill Gas Symposium, Monterey, California, March 2007.

Sullivan, Patrick S., *Landfill Management Practices for Reducing GHG Emissions*, Presentation for the California Integrated Waste Management Board (CIWMB) Strategic Policy Development Committee Public Workshop, Sacramento, California, May 2007.

Sullivan, Patrick S., *Mitigation of Unique LFG Migration Issues*, Conference Proceedings, SWANA WASTECON Conference, Reno, Nevada, October 2007.

Sullivan, Patrick S., *SWICS Landfill GHG Inventory Methodology*, Presentation for SWANA WASTECON Conference Landfill Gas Division Meeting, Reno, Nevada, October 2007.

Sullivan, Patrick S., *Air Quality Issues Affecting Landfills in California*, Presentation at SWANA Sierra Chapter Board Meeting, Fresno, California, January 2008.

Sullivan, Patrick S., *GHG Programs in California and their Impacts on MSW Landfills*, Conference Proceedings, 31st Annual SWANA Landfill Gas Symposium, Houston, Texas, March 2008.

Sullivan, Patrick S., *Air Quality Issues Affecting Landfills in California*, Presentation SWANA Gold Rush Chapter Board Meeting, Monterey, California, April 2008.

Sullivan, Patrick S., *Practicalities of Implementing and Permitting a Landfill Methane Project*, Presentation for the California Climate Action Registry (CCAR) Climate Action Reserve Workshop on California Landfill Methane Projects, Los Angeles, California, April 2008.

Sullivan, Patrick S., *Air Quality Issues for Composting Facilities*, Presentation at the 38th Annual SWANA Western Regional Symposium, Seaside, California, May 2009.

Huff, Raymond H., and Sullivan, Patrick S., *Carbon Footprint and Impact of Biosolids*, Presentation at CWEA's "Government Affairs: Global Climate Issues" Specialty Conference for the Cities of Whittier and Roseville, California, June 2008.

Huff, Raymond H., and Sullivan, Patrick S., *GHG Credit Trading*, Presentation at CWEA's "Government Affairs: Global Climate Issues" Specialty Conference for the Cities of Whittier and Roseville, California, June 2008.

Sullivan, Patrick S., *The New World of GHG Emissions for Landfills*, Presentation for SWANA Landfill Symposium, Palm Springs, California, June 2008.

Sullivan, Patrick S., *Quantification Methods for GHG Emissions from Landfills,* SWANA E-Session, October 2008.

Sullivan, Patrick S., *AB 32 Climate Change Issues Impacting Landfills in California,* Presentation at Rural Counties' Environmental Services Joint Power Authority Board and Technical Advisory Meeting, Sacramento, California, December 2008.

Sullivan, Patrick S., *Greenhouse Gas Regulations, Programs, and Reporting,* Presentation to Clark County Department of Air Quality and Environmental Management, Las Vegas, Nevada, January 27, 2009.

Sullivan, et al., *New LFG Monitoring Requirements in California: More Stringent and Expensive,* Conference Proceedings, 32nd Annual SWANA Landfill Gas Symposium, Atlanta, Georgia, March 2009

Sullivan, Patrick S., *Operational and Financial Impacts of CARB's New Early Action Rule for Landfills,* Presentation at the 38th Annual SWANA, Western Regional Symposium, Palm Springs, California, April 2009.

Sullivan, Patrick S., *Estimating Your Landfill's Carbon Footprint*, Presentation at the NSWMA/ EIA Waste Expo in Las Vegas, Nevada, June 2009.

Sullivan, Patrick S., *CARB's New Early Action Rule for Landfills: Beyond NSPS and into the Climate Change World*, Presentation for SWANA WASTECON Conference, Long Beach, California, September 2009.

Sullivan, Patrick S., *Global Setting: Waste Management's Response to Climate Change,* Presentation for SWANA WASTECON Conference, Long Beach, California, September 2009.

Sullivan, Patrick S., *AB 32/Scoping Plan Impact on Solid Waste Industries and Local Governments,* Presentation at the Southern California Waste Management Forum Annual Conference, Ontario, California, November 2009.

Sullivan, Patrick S., *Meeting EPA's Mandatory GHG Reporting Requirements,* NSWMA Webinar, December 2009.

Sullivan, Patrick S., *General Overview of EPA's Mandatory GHG Reporting Rule for Landfills,* Presentation at the SWANA Oregon Chapter, Winter Forum, January 2010.

Sullivan, et al., *The Impact of Federal Climate Change Legislation and Regulation on The Solid Waste Industry*, Conference Proceedings, 33rd Annual SWANA Landfill Gas Symposium, San Diego, California, March 2010.

Sullivan, Patrick S., *Comparison of Landfilling and Organic Waste Diversion in Terms of Air Quality and GHG Impacts,* Presentation at the 39th Annual SWANA Western Regional Symposium, San Luis Obispo, California, April 2010.

Sullivan, Patrick S., *The Importance of Landfill Gas Capture and Utilization in the U.S.*, Columbia University, Earth and Engineering Center, Council for the Sustainable Use of Resources (SUR), April 2010.

Sullivan, Patrick S., *Federal Mandatory Reporting Rule (MRR) and Tailoring Rule for Greenhouse Gas (GHG)*, Presentation at Waste Connections, Inc., Meeting, Copper Mountain, Colorado, August 2010.

Sullivan, Patrick S., *The Confusing Maze of State and Federal Greenhouse Gas (GHG) Reporting Programs,* Presentation for SWANA WASTECON Conference, Boston, Massachusetts, August 2010.

Van Kolken Banister, Amy, and Sullivan, Patrick S., *LFG Collection Efficiency: Debunking the Rhetoric,* MSW Magazine, Elements 2011 Issue, September 2010.

Sullivan, Patrick S., *Tailoring Talk,* Waste Age, February 2011.

Sullivan, Patrick S., *Not Another GHG Regulation—The Impact of the Tailoring Rule on Landfills,* Presentation for 34th Annual SWANA Landfill Gas Symposium, Dallas, Texas, March 2011.

Sullivan, Patrick S., *When Can Co-Located Facilities be Considered Separate Sources for Air Compliance Purposes the Concept of Common Control,* Presentation for 34th Annual SWANA Landfill Gas Symposium, Dallas, Texas, March 2011.

Sullivan, Patrick S., *GHG Regulatory Overload,* Presentation for 40th Annual SWANA Western Regional Symposium, Seaside, California, May 2011.

Sullivan, Patrick S., *Comparison of Air Quality and GHG Impacts from Organic Waste Disposal,* Presentation for AWMA Golden West Chapter Annual Technical Conference, Bakersfield, California, May 2011.

Sullivan, Patrick S., *Comparison of GHG Emissions Methodologies for Landfills,* Presentation for AWMA Annual Conference, Orlando, Florida, June 2011.

Sullivan, Patrick S., *Air Modeling for LFG Projects,* Presentation for SWANA WASTECON Conference, Nashville, Tennessee, August 2011.

Sullivan, Patrick S., *Impacts from Organic Waste Management,* AWMA Mother Lode Chapter Meeting, Sacramento, California, September 2011.

Sullivan, Patrick S., *The Effects of New Air Modeling Standards on Landfill Gas Projects,* Presentation for 35th Annual SWANA Landfill Gas Symposium, Orlando, Florida, March 2012.

Sullivan, Patrick S., *The Impact of the GHG Tailoring Rule on Title V and PSD Permitting for Landfills,* Regulation Week e-Seminar, April 2012.

Sullivan, Patrick S., *Clean Air Act Update,* Conference Proceedings, Waste Expo, Las Vegas, Nevada, April 2012.

Sullivan, Patrick S., *Air Quality Requirements for Composting Facilities are Changing—Are You Ready?,* 41st Annual SWANA Western Regional Symposium, April 2012.

Sullivan, Patrick S., *The Effects of New Air Modeling Standards on Landfill Gas Projects,* SWANA E-Session, May 2012.

Sullivan, Patrick S., et al., *Defending Landfills Accused of Landfill Gas Impacts on Neighboring Properties,* Paper and Presentation for SWANA WASTECON Conference, Washington, D.C., August 2012.

Sullivan, Patrick S., et al., *Lessons Learned from the First Two Years of Compliance with the Federal GHG* Mandatory *Reporting Rule*, Paper and Presentation for 36th Annual SWANA Landfill Gas Symposium, Las Vegas, Nevada, March 2013.

Sullivan, Patrick S., *Why Won't They Just Stop? More Changes to the Air and GHG Regulations for Landfills,* 42nd Annual SWANA Western Regional Symposium, San Luis Obispo, California, April 2013.

Sullivan, Patrick S., et. al., *LFG Rules and Regulations Committee Update,* Panel Presentation at SWANA WASTECON Conference, Long Beach, California, September 2013.

Sullivan, Patrick S., *The Implications of California Air Regulations on Composting Facilities, P*resentation at the U.S. Composting Council Annual Conference, Oakland, California, January 2014.

Sullivan, Patrick S., et al., *Lessons Learned from California Landfill Methane Rule Reporting*, Presentation at the 37th Annual SWANA Landfill Gas Symposium, Monterey, California, March 2014.

Sullivan, Patrick S., et al., *Update on Federal Air and GHG Regulations Affecting Landfills*, Published in *Waste Advantage* magazine, Volume 5, Number 3, March 2014.

JOHN HENKELMAN

Education

B.S., Chemical Engineering, University of Nevada, June 2002

Professional Licenses and Registrations

Engineer-in-Training (EIT)

Professional Affiliations

Air and Waste Management Association (AWMA)

Certifications

OSHA 40-Hour Hazardous Waste Operator

Professional Experience

Mr. Henkelman has 12 years of experience as a chemist and engineer. His duties have included air dispersion modeling using several regulatory models, including AMS/EPA Regulatory Model (AERMOD), Industrial Source Complex Short Term 3 (ISCST3), Screen 3, AERSCREEN, and Areal Locations of Hazardous Atmospheres (ALOHA). He has used modeling results in risk assessments, accidental release planning, permit applications, and environmental impact assessments. He has written workplans for and performed sampling of soil vapor, landfill gas, soil, and water. He has assisted with compliance and permitting under the Clean Air Act. He has assisted in greenhouse gas reporting and verification under the California Climate Action Registry, The Climate Registry, and California's Mandatory greenhouse gas reporting regulation. He also has experience in manufacturing that includes production scheduling, quality assurance, quality control, product development, and health and safety.

Select project experience includes the following:

Modeling for Permitting of Newby Island Sanitary Landfill, Milpitas, CA: Support included dispersion modeling using a screening model (SCREEN3) used in support of an Environmental Impact Report (EIR) and California Environmental Quality Act (CEQA) report. Modeling included all major emission sources at the site. Model results were used to evaluate human health risk and National Ambient Air Quality Standards (NAAQS) compliance.

Modeling for Permitting of Forward Landfill, Manteca, CA: Modeling included dispersion modeling using a complex model (AERMOD) used in support of an EIR and CEQA report. Modeling included all major emission sources at the site. Model results were used to evaluate human health risk and NAAQS compliance.

Modeling for Permitting of Fairmead Landfill, Madera, CA: Modeling included dispersion modeling using a complex model (AERMOD) used in support of an EIR and CEQA report.

Modeling included all major emission sources at the site. Model results were used to evaluate human health risk and NAAQS compliance.

Modeling Evaluation for Avenal Landfill, Avenal, CA: Evaluation included dispersion modeling used in an EIR and CEQA evaluation. Modeling was completed using ISCST3. Model results were used to evaluate human health risk.

Modeling Evaluation for Central County Landfill, Petaluma, CA: Evaluation included dispersion modeling used in an EIR and CEQA evaluation. Modeling was completed using CAL3QHCR. Model results were used to evaluate human health risk.

Modeling Evaluation for East Los Angeles Transfer Station, East Los Angeles, CA: Evaluation included dispersion modeling used in an EIR and CEQA evaluation. Modeling was completed using SCREEN3. Model results were used to evaluate human health risk and NAAQS compliance.

Modeling Evaluation for West Artesia Material Recovery Facility, Compton, CA: Evaluation included dispersion modeling used in an EIR and CEQA evaluation. Modeling was completed using SCREEN3. Model results were used to evaluate human health risk and NAAQS compliance.

Assisted in Health Risk Assessment for a Former Plastic Bottle Manufacturing Facility, Toluca, Mexico: The assessment included developing a soil vapor sampling plan, collecting soil vapor samples, developing exposure scenarios for soils and soil vapor, developing toxicity criteria, and developing exposure parameters.

Assisted in a Focused Health Risk Assessment for a Former Aerospace Research Facility, Los Angeles, CA: The assessment included developing exposure scenarios for groundwater and indoor air, developing toxicity criteria, and developing exposure parameters.

Assisted in a Health Risk Assessment for Former Industrial Sites in Southern California: The sites were being developed for residential use. The assessment included developing exposure scenarios for soil vapor and modeling risk using the Johnson Ettinger model.

Assisted in the Development of Copper and Cyanide Cleanup Levels for Surface and Air, San Marcos, CA. Development included focus on exposure scenarios, toxicity criteria, and exposure parameters. Chronic health hazard-based cleanup levels for both contaminants were developed for future residential and commercial use of the facility.

Assisted in the Development of Health Based Beryllium Cleanup Levels for Surfaces, Kansas City, MO: Development included defining exposure scenarios, toxicity criteria, and exposure parameters. Cleanup levels were based on increased cancer risk for commercial workers.

Assisted in the Development of Contaminant Cleanup Levels for Soil Gas throughout California: Development included defining exposure scenarios, toxicity criteria, and exposure parameters. Cleanup levels were based on both increased cancer risk and chronic health effects.

Assisted in a Health Risk Assessment for an Asbestos Landfill, Copperopolis, CA: Assessment included developing emission rates of asbestos, modeling dispersion of asbestos emissions using the Industrial Source Complex Short Term 3 (ISCST3) model to determine downwind concentrations, developing exposure scenarios for outdoor air, developing toxicity criteria, developing meteorological data, and developing exposure parameters.

Performed Soil Vapor Surveys, including Sample Location Selection, Sample Collection, and Sample Analysis throughout California and Oregon: Surveys were performed in support of vapor intrusion risk assessments.

Modeling for Permitting of Kirby Canyon Landfill, Morgan Hill, CA: Support included dispersion modeling using screening and complex models (ISCST3, AERMOD, and SCREEN3) for permitting of flares and potential engines. Modeling results were used to determine human health risk.

Modeling for Permitting of Tri-Cities Landfill, Fremont, CA: Support included dispersion modeling using screening and complex models (ISCST3 and SCREEN3) for permitting of flares and potential engines. Modeling results were used to determine human health risk.

Modeling for Permitting of McCommas Landfill, Dallas, TX: Support included dispersion modeling using a screening model (SCREEN3) in support of a permit application for flares. Modeling results were used to determine NAAQS compliance.

Modeling for Permitting of Hay Road Landfill, Vacaville, CA: Modeling included dispersion modeling using a complex model (AERMOD) used in support of an EIR and CEQA report. Modeling included all major emission sources at the site. Model results were used to evaluate human health risk and NAAQS compliance.

Review of Modeling for Redwood Landfill, Novato, CA: Review included dispersion modeling completed for Prevention of Serious Deterioration (PSD) evaluation of flares and engines for a landfill gas to energy (LFGTE) project using AERMOD. Model results were used to determine human health risk.

Reviewed Air Toxics Health Risk Assessments for Los Angeles Unified School District (LAUSD), los Angeles, CA: Review included emission calculations, air dispersion modeling using ISCST3, risk and exposure criteria selection, and risk calculation. Also reviewed hazardous material accidental release scenarios.

Reviewed Air Toxics Risk Assessment of a Quarry, Novato, CA: Review of the assessment performed by another firm included emissions calculations, modeling, and risk evaluation.

Review concluded that the emission calculations were fundamentally flawed and that the quarry may pose a significant health risk to nearby residential areas.

Evaluated Emissions from Vehicles using Emfac2007 for Various Sites in California: Emissions calculations have been used in fleet emission calculations and health risk assessments.

Assisted in the Permitting of Industrial Facilities Throughout California: Permitting included developing appropriate emission factors, calculating emissions, and preparation of permit application materials. Permitted facilities have included several landfills, transfer stations, and a lumber factory.

Prepared New Source Performance Compliance Standards (NSPS) Tier 2 Reports for 10 Landfills, CA: Preparation included creating a workplan for the sample collection, collecting samples at the landfills, calculating emissions, and writing the report which was submitted to regulators.

Evaluated Greenhouse Gas Regulations for Landfills and the Steel Industry, Pittsburg, CA: Evaluation included investigation of current and future legislation and regulations regarding greenhouse gasses.

Performed Analysis for Best Attainable Control Technology (BACT) for composting operations, Novato, CA: Analysis included evaluating the effectiveness and cost of several control technologies.

Specialized Training

Completed 2-Day Training Course for ISCST3 and AERMOD: Course included model selection, meteorological data processing, source and receptor parameters selection, and terrain processing.

EXHIBIT B

BSK Associates Engineers & Laboratories
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Rancho Cordova, CA 95670
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Via U.S. Mail and Email (Osha Meserve osha@semlawyers.com)

July 22, 2015 BSK Project Number E0906601S

Soluri Meserve
1010 F Street, Suite 100
Sacramento, CA 95814

Subject: Draft Review
Hazardous Materials
Mission Bay Project
San Francisco, California

Dear Ms. Meserve:

At the request of Soluri Meserve, BSK Associates (BSK) reviewed the following documents:

A. **Mission Bay Subsequent Environmental Impact Report, Dated September 17, 1998, Sections:**
   - Chapter V.J.1 to V.J.109, Environmental Setting and Impacts, Contaminated Soils and Groundwater
B. **Risk Management Plan (RMP), Mission Bay Area San Francisco, California, Dated May 11, 1999, Prepared by Environ Corporation and Revised Risk Management Plan, August 2006 Prepared by BBL Environmental Services, Inc.**
C. **Notice of Preparation of an Environmental Impact Report, Event Center and Mixed-Use Development at Mission Bay Blocks 29-32, Dated November 19, 2014**
   - Pages 106 to 122
D. **Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015**
   - Pages 1-60 to 1-62, Summary of Impacts and Mitigation Measures, Hazards and Hazardous Materials
   - Page 5-1
   - Page 6-5

The following section (A1 to A4) presents our comments based on a review of the Mission Bay Subsequent Environmental Impact Report, Dated September 17, 1998

A1. Section V.J.42, Under Existing Human Health Risks, states " ENVIRON compared the maximum concentration of chemicals detected in the soil anywhere in the Project Area to the risk-based preliminary remediation goals (PRGs) developed by U.S. EPA Region IX for the protection of industrial land uses (Region IX Industrial PRGs)." EPA PRGs are currently not considered appropriate for use in the San Francisco Bay Area as site screening levels. PRGs have been replaced by Environmental Screening Levels (ESLs) developed by the San Francisco Bay Regional Water Quality Control Board in 2013 (SFBRWQCB, 2013). The ESL user guide (SFBRWQCB, 2013) identified significant differences between EPA PRGs and SFBRWQCB ESLs, listed below:

"The U.S. EPA Regional Screening Levels or RSLs (formerly PRGs; U.S. EPA, 2013d) address human health concerns associated with direct exposure to chemicals in soil, but do not address ecological concerns. Exposure routes and receptors not addressed by the RSLs, but included in the ESLs are listed below:

- direct-exposure screening levels for construction and trench workers' exposure to subsurface soils;
- groundwater screening levels for vapor intrusion;
- groundwater screening levels for the protection of aquatic habitats/surface water quality
- soil screening levels for urban area ecological concerns;
- soil and groundwater ceiling levels to address potential presence of Non-Aqueous Phase Liquids (NAPL) and nuisance odor concerns
- soil and groundwater screening levels for Total Petroleum Hydrocarbons (TPH)."

Using PRGs would lead to significant gaps in determining the risks from impacts with respect to vapor intrusion, of aquatic habitats/surface water quality and urban area ecological concerns.

A2. Section V.J.43 first paragraph states: "The upper numerical limit of a calculated statistical average of the concentration of each COPIC in the exposed soils was compared with Region IX Industrial PRGs to determine if any PRGs were exceeded." The appropriate use of an averaged concentration typically involves a robust statistical analysis based on a statistically sufficient number of samples with respect to the area size and requires normally distributed values. The number of samples utilized in the analysis appears to be insufficient considering the large area of the project.

A3. Section V.J.53 last paragraphs states: As discussed in more detail in "General Soil Movement and Transport During Construction," below, DTSC has determined that soils excavated during construction in the Mission Bay Project Area can be moved around and reused in the Project Area without triggering hazardous waste management requirements, provided the soils are managed in accordance with RMP measures. However, DTSC's determination does not apply to building demolition debris or waste soils or other waste materials from any necessary remediation activities. In the event these wastes contain levels of constituents that would result

in their classification as hazardous waste, the hazardous waste regulations described above would apply to those materials."

Based on our review of the boring logs recent Phase II Environmental Site Assessment (Langan, 2015), it appears that soil with construction debris was used as fill during the 2005 remediation effort for the Pier 64 clean-up. Our review of the Langan 2015 report boring log soil descriptions indicates that near surface soils at boring locations LB-8, LB-12, LB-26 and LB-29 contain brick fragments. These borings were completed in the area of the Pier 64 clean-up that reportedly removed petroleum impacted soil to a depth of 9 feet and filled in the area (Langan 2015). Furthermore, as stated in B7 below, the area of fill from the Pier 64 clean-up may contain soil impacted with soluble lead that would classify it as a California Hazardous Waste.

The presence of brick, that is probably demotion debris, and soluble lead in the fill material placed during the Pier 64 clean-up effort, indicates that the Risk Management Plan (RMP) or implementation of the RMP, was ineffective and did not comply with the DTSC determination listed above.

A4. Section V.J.83 under Human Health Risk Assessment states: "The SSTLs were developed using methods consistent with the Risk-Based Corrective Action (RBCA) methodology, as developed by the American Society for Testing and Materials (ASTM) and described in ASTM E-1739, 'Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, 1995'."

Use of the RBCA methodology may be valid for areas impacted with petroleum hydrocarbon related releases. In other non-petroleum release areas, chemicals-of-concern, such as metals and PAHs not related to petroleum hydrocarbons were detected in soil or groundwater. Use of SSTLs developed for petroleum site based RBCA for non-petroleum related constituents may not be a valid approach. Furthermore, 1995 ASTM E 1739-95 standard under Section 1.1 Scope states: "Ecological risk assessment, as discussed in this guide, is a qualitative evaluation of the actual or potential impacts to environmental (nonhuman) receptors."

Summary of Review 1998 - Mission Bay Subsequent Environmental Impact Report

The Mission Bay Subsequent Environmental Impact Report (SEIR), dated September 17, 1998 utilized screening level methods (EPA PRGs) that would not be adequate for current site clean-up standards and would not be appropriate for use on non-petroleum related constituents. The number of samples utilized in the analysis appears to be insufficient considering the large area of the project. Risk Management Plan (RMP) or implementation of the RMP, was ineffective and did not comply with the DTSC determination. Furthermore, the methodology used to develop site risk screening values did not properly incorporate ecological receptors. Given these changes and deficiencies, with consideration of current site conditions, a re-evaluation using current methods and standards of the environmental impacts and risks is required.

The following section (B1 to B7) presents our comments based on a review of the Risk Management Plan (RMP), Dated May 11, 1999 and Revised RMP dated August 2006.

B1. Page 2-1, there was no discussion of the semivolatile organic chemicals that were detected in soil and groundwater at the site. Summary tables presented in Appendix A of the RMP indicate that polycyclic aromatic hydrocarbons (PAHs) were detected in the soil at various locations and in groundwater collected from MW-11. A possible source and significance of the PAHs was not presented in the RMP.

B2. Page 2-2, the RMP states "No chemicals were detected at concentrations that would pose a threat to human health or the aquatic ecosystem following the completion of the planned development, with the potential exception of the Free Product Area." Based on our review of the receptors presented in Appendix E, Tables E-1, E-2. E-3 and E-4, it appears that ecologic receptors were not included in the risk assessment.

B3. Page 3-2, Section 3.2 states: "In addition, mean chemical concentrations in surface soil (estimated by calculating the 95 percent upper confidence limit (UCL) of the arithmetic mean) were below the ITLs developed under assumptions of long-term (i.e., 25 to 30 years) direct contact pathways (i.e., soil ingestion and dermal contact)." The use of mean concentrations typically involves a robust statistical analysis based on a statistically sufficient number of samples with respect to the area size. The number of samples utilized in the analysis appears to be insufficient considering the large area of the project. Furthermore, the depth of soil sampling was limited to samples collected at less than five feet below the ground surface (bgs). Proposed developments may require excavating soil to depths significantly deeper than 5 feet bgs. This may expose receptors to soils that have not been adequately characterized. The recent Phase II Environmental Site Assessment (Langan, 2015) performed additional soil sampling at Blocks 29 to 32 and found "The fill unit was characterized as either a State of California Class I hazardous material based on soluble chromium, lead, and nickel concentrations or a Class II non-hazardous material, likely related to debris from the 1906 earthquake and resulting fire." Designation of the site soils as California Class I hazardous waste is a significant change from what was presented in the 1998 RMP. Additional impacts that would result from excavating and transportation of a large volume of soil for off-site disposal at a Class I disposal site were not evaluated in the 1998 Subsequent Environmental Impact Report (SEIR).

B4. Page 4-1, Section 4.1 states: "As described below in Section 4.3.11, additional sampling may be required on individual development parcels in order to comply with the Ordinance Requirements for Analyzing the Soil for Hazardous Wastes in Appendix F. Depending on the results obtained during any additional sampling, supplemental management measures, in addition to the management measures identified below, may be required on a parcel-by-parcel basis." The RMP specified a deferred sample and analysis protocol to a later date and as stated in section A4 above, deferred analysis may produce dramatically different results. Significant volumes of soil classified as hazardous waste will need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase.

B5. Section 4.3.5.3 indicates that excavated soil may be re-used as fill on-site. There is no contingency for the handling of excavated wooden piles or railroad ties that may be treated with wood preservatives (creosote) that may be classified as a RCRA hazardous waste. Creosote often contains polycyclic aromatic hydrocarbons (PAHs), some of which are listed RCRA hazardous waste constituents.

B6. Section 4.3.5.3 allows for re-use of soils that may potentially be hazardous waste as fill inside the RMP. Based on our review of the recent Phase II Environmental Site Assessment (Langan, 2015), it appears that soil with elevated lead levels were used as fill during the 2005 remediation effort for the Pier 64 clean-up. Shallow soil samples collected from Langan Treadwell Rollo borings LB-12, LB-13, LB-26, LB-27, LB-28, LB-29 and LB-30 had results of soluble lead (California Waste Extraction Test) above the California Soluble Threshold Limit Concentration (STLC) that would classify the soil as hazardous waste. These soil samples were collected in the Pier 64 clean-up fill area (See Figure 2 of Langan 2015 report) at depths of less than 9 feet below the ground surface (bgs). The Pier 64 clean-up reportedly removed petroleum impacted soil to a depth of 9 feet and filled in the area (Langan 2015). The re-use of soil that is classified as hazard waste resulted in a significant volume of soil that, if excavated and removed from the RMP area will need to be transported off-site and disposed at an appropriate facility. These are new and additional impacts not previously incorporated into the impact analysis. These additional impacts must be incorporated into additional risks to receptors outside the RMP as well as additional traffic, noise, and air contaminants.

B7. Page 4-22 states "If the levels are below the relevant health-based Site Specific Target Levels (SSTLs), and the RWQCB concludes that the potential for ecological impacts is insignificant and does not require mitigation, then soil removal activities will not be required and the soil may be temporarily stored elsewhere pending reuse in the RMP Area." Based on our review of the receptors presented in Appendix E, Tables E-1, E-2. E-3 and E-4, it appears that ecologic receptors were not included in the risk assessment.

Summary of Review 1999 - Risk Management Plan

The Risk Management Plan (RMP), dated May 11, 1999 and Revised RMP dated August 2006 failed to properly identify possible sources and significance of the PAHs and did not have disposal protocols for PAH containing wastes. The site specific target levels developed for the site did not include ecological receptors. The RMP utilized an insufficient number of samples and questionable statistical analysis techniques considering the large area of the project. The RMP did not have developed protocols for addressing off-site disposal of large volumes of soil that is currently classified as California Class I Hazardous Waste.

The following section (C1 to C2) presents our comments based on a review of Notice of Preparation of an Environmental Impact Report/Initial Study (NOP/IS), Dated November 19, 2014.

C1. Page 106 under Topics: 16. Hazards and Hazardous Material – Would the project: a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? Is listed as "No New or More Severe Significant Effects." As stated in A4 above this is in direct conflict with the findings of the recent Phase II Environmental Site Assessment (Langan 2015). Significant volumes of soil classified as hazardous waste will need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase. The transportation of hazardous waste off-site will increase the potential for items b) and c) on page 106. Excavation and transportation of soil to a Class I hazardous waste disposal site would significantly increase the potential for release of hazardous materials during the loading, excavation and transportation process. The additional trucking will cause additional exposures to exhaust fumes, traffic and noise. The additional impacts related to off-site transportation of hazardous waste will require further evaluation.

C2. Page 114 introduces Mitigation Measure M-HZ-1b: "Geologic Investigation and Dust Mitigation Plan for Naturally Occurring Asbestos." M-HZ-1b is a new mitigation measure for an impact that was not addressed in the 1998 SEIR. The new hazards associated with Naturally Occurring Asbestos (NOA) conflicts with the designation of "No New or More Severe Significant Effects" on items 16 a), 16 b) and 16 c) listed on page 106 of the NOP.

Summary of Review 2014 Notice of Preparation of an Environmental Impact Report (NOP)
The Notice of Preparation (NOP), dated Novemeber 19, 2014 failed to identify new or more severe significant effects with respect to the large volume of soil classified as Class I hazardous waste that will require off-site disposal at a Class I Hazardous Waste Disposal Facility. New mitigation measures for naturally occurring asbestos were not properly identified as new or more severe significant effects.

The following section (D1 to C4) presents our comments based on a review of the Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015.

D1. Page 1-61 under Hazards and Hazardous Materials, Initial Study Section E16, does not include the findings in the recent Phase II Environmental Site Assessment (Langan, 2015) with respect to significant volumes of soil classified as hazardous waste that will need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase. These additional impacts were not previously included in the impact analysis.

D2. Page 1-61 Impact HZ-2, under Mission Bay FSEIR Mitigation Measure J.2, the RWQCB is listed as the agency responsible for reviewing risk evaluations for a public school or child care facility. The Department of Toxics Substances Control (DTSC) School Property Evaluation and Cleanup Division is the responsible agency for assessing, investigating and cleaning up proposed school sites (DTSC, 2015).

D3. Page 5.1-1 under 5.1.1 Scope of Analysis, Issues Scoped Out in the Initial Study, states "The Initial Study determined that the following topics were adequately analyzed in the Mission Bay FSEIR such that the proposed project would have no new significant impacts or no substantially more severe significant impacts than those previously found significant on these resources:… Hazards and Hazardous Materials;…" As stated in C1 above significant volumes of soil classified as hazardous waste will need to be transported off-site and disposed at an appropriate facility

causing significant additional impacts during the construction phase. These additional impacts were not previously included in the impact analysis.

D4. Page 6-5 under Section 6.3 Effects Found Not to be Significant under Hazards and Hazardous Materials states "The project would not cause risk of upset and accident conditions involving release of hazardous materials; emit hazardous materials within 0.25 mile of a school; be located on a site listed on a hazardous materials database; be located on airport or air strip land use areas; impair implementation of emergency response or evacuation plan; expose people or structures to fire risk; or create construction related hazards and hazardous materials impacts. As stated in C1 above significant volumes of soil classified as hazardous waste will need to be transported off-site and disposed at an appropriate facility causing significant additional impacts during the construction phase. These additional impacts were not previously included in the impact analysis.

Summary of Review 2015 – Draft Subsequent Environmental Impact Report
The Draft Subsequent Environmental Impact Report (DSEIR), dated June 5, 2015 failed to identify new or more severe significant effects with respect to the large volume of soil classified as Class I hazardous waste that will require off-site disposal at a Class I Hazardous Waste Disposal Facility. The DEIR is inadequate by not accounting for additional impacts that from additional transportation of soil off-site that will cause additional exposures to exhaust fumes, traffic and noise.

We appreciate the opportunity to be of service to Soluri Meserve and trust that this correspondence provides you with the information necessary at this time. Please contact us with questions regarding the review comments presented this letter.

Respectfully submitted,
BSK Associates

Martin B. Cline, CEG
Senior Engineering Geologist

Kurt Balasek, PG, CHg, QSD
Senior Hydrogeologist

References:

BBL Environmental Services, June 2006, Pier 64 Phase II Completion Report Former Petroleum Terminals and Related Pipelines Located at Pier 64 and the Vicinity City and County of San Francisco, California

Langan Treadwell Rollo, June 2015, Phase II Environmental Site Assessment Golden State Warriors Arena, Blocks 29-32, Mission Bay, San Francisco, California

DTSC Evaluating & Cleaning-Up School Sites, https://www.dtsc.ca.gov/Schools/ accessed July 2015

SFBRWQCB, 2013, User's Guide: Derivation and Application of Environmental Screening Levels

Martin B. Cline, CEG – Project Geologist

Professional Background:

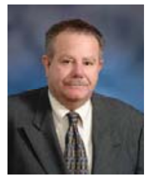
Mr. Cline has more than 28 years of experience in geology, engineering geology, petroleum geology and environmental field studies, including assessments for hillside grading, subsurface drainage design, and landslide repair and mitigation. As Project Geologist, his responsibilities include performing field investigations for geotechnical, geologic, and environmental studies. He has experience in planning and implementing geologic and geomorphic mapping and analyses of soil, bedrock and groundwater conditions as they pertain to engineering works. Mr. Cline's experience also includes construction observation and testing, and geotechnical laboratory testing. He has extensive project experience including Phase I and II environmental assessments for a wide variety of commercial and industrial properties, including wholesale/retail petroleum product outlets and heavy industrial sites. He also has extensive experience in the completion of CEQA Special Studies, as well as section preparation, for Environmental Impact Reports.

Relevant Project Experience:

Engineering Geology – Seismic Hazards Investigation Projects

Mr. Cline has expertise in the planning and implementation of geologic/seismic hazard investigations and development of seismic design criteria as they pertain to engineering works. Experience includes surface fault rupture investigations, deterministic/probabilistic site specific ground motion evaluations, site condition modeling, response spectra using time histories development, liquefaction, lateral spreading and seismic settlement analysis. Additionally, Mr. Cline has expertise in seismic hazards evaluations for Hospital and Schools according to OSHPD and DSA Title 24 specifications. Representative projects include:

- Geologic/Seismic Hazard Evaluation and time-history analysis, AT&T Central Office Seismic Upgrade, San Francisco, California
- Geotechnical Investigation/Liquefaction Analysis, AT&T Building Seismic Upgrade, San Francisco, California
- Geologic/Seismic Hazards Evaluation, Proposed Multi-Use Sports Complex, West Hills College, Lemoore, California
- Geologic/Seismic Hazards Evaluation, Proposed Wellness Center, West Hills College, Coalinga, California
- Geologic/Seismic Hazard Evaluation, College of the Sequoias, Tulare, California
- Geologic/Seismic Hazard Evaluation, Clovis Community Medical Center



Qualifications

Registration:

Professional Geologist, California, 6248
Certified Engineering Geologist California, 2084

Education:

BA, Geology, California State University, Chico, 1982

Experience:

BSK Associates 1988

1983 – 1988, SOHIO Petroleum Geologist

1980 – 1983, Exploration Logging Geologist

1982, ANATEC Laboratories

1977 – 1981, Graham Gas Geologist

Clovis, California

- Seismic Hazards Update HAZUS Reclassification, Kern Medical Center, Bakersfield, California
- Geologic/Seismic Hazard Investigation, Woman's Health - Adventist Hospital, Hanford, California
- Geologic/Seismic Hazard Investigation, State Courthouse, Madera, California
- Surface Fault Rupture Hazard, Commercial Development, Fremont, California
- Surface Fault Rupture Hazard, Service Station, San Leandro, California
- Surface Fault Rupture Hazard, Public Library, Frazier Park, California
- Surface Fault Rupture Hazard, USFS Visitors Center, Lone Pine, California
- Surface Fault Rupture Hazard, New Fire Station, Pine Mountain, California
- Surface Fault Rupture Hazard, New Hospital Site, Tehachapi, California
- CEQA Level Geohazards Investigation, Solar Farm, Mohave, California
- Fault Evaluation Report Peer Review, Kern County, California
- Fault Evaluation Report Peer Review, City of Bakersfield, California
- Fault Evaluation Report Peer Review, Inyo County, California
- CEQA Level Geohazards Investigation Peer Review, Kern County, California
- Slope Stability and Erosion Evaluation, Petroleum Pipeline Crossing, Kern County, California

Environmental Engineering Projects

Soil and Groundwater Remediation - Projects have included feasibility studies, system design, application for permits, remedial action oversight for clean-up of petroleum and heavy metals using in-situ treatment and excavation and disposal, and post closure monitoring. Projects of this nature include:

- Remedial Investigation/Feasibility Study-UST Site, Stockton, California
- Remedial Investigation for Seepage Pits - Visalia, California
- Well Design and Installation of a 3-Stage Monitoring Well - NASA Ames Research Center, Moffett Field, California
- Feasibility Study for former Service Station - Castro Valley, California
- Remedial Investigation for Foundry Site - Union City, California
- Feasibility Study for Pump and Treat Design, Tracy Army Depot, Tracy, California
- Operation and Maintenance, Dual Phase Vapor Extraction, Truck Stop, Dunnigan, California
- Remedial Investigation for Former Trucking Facility, Carson, California

Environmental Assessment Studies - Mr. Cline has expertise in the planning of field operations, sampling and analysis plans, workplan preparation, monitoring well design and construction, site assessment (Phase I and II), regulatory compliance, contaminant mobility and plume characteristics determinations, data acquisition and interpretation, and development of remedial action plans.

He has worked on sites impacted with petroleum, solvent and/or heavy metal contamination. Projects of this nature include:

- UST Assessment Service Station in Castro Valley, California
- UST Assessment for the City of Livermore, Livermore, California
- UST Assessment Trucking Facility in Sunnyvale, California
- UST Assessment Food Processing Plant in Stockton, California
- UST Assessment Trucking Facility in Sacramento, California
- UST Assessment Moving and Storage Facility in Fairfield, California
- UST Assessments Numerous Service Stations in Sacramento, California
- Jet Fuel Release Assessment, NASA-Ames Research Center, Moffett Field, California
- Phase I ESA, City of Pittsburg Redevelopment Agency, Pittsburg, California
- Phase I ESA, California Department of Water Resources - 60 acre site, Hood, California.
- Phase I ESA, Multi-unit Retirement Community in Fairfield, California
- Phase II ESA, Chrome Plating Facility, Oakland, California
- Phase II ESA, Future Elementary School Site, Dublin, California
- Phase I/II ESA, Future Elementary School Site, Empire, California
- Phase II ESA, Foundry Sand Deposition Site, Newark, California
- Phase I ESA, Fertilizer Distribution Facility, Lathrop, California
- Phase I ESA, Fertilizer Distribution Facility, Maxwell, California

Geographic Information Systems (GIS) Experience

Mr. Cline has expertise using GIS to evaluate and process data from numerous sources including AutoCAD, GPS and LiDAR data. Experienced with ESRI ArcMap, ACOE's HEC-RAS, HEC-GeoRAS, LASTools and ArcHydro.

GIS Project Experience:

500 Acre Solar Farm, Mohave, CA - CEQA Level Preliminary Geohazards Investigation for proposed construction of future photovoltaic systems in Mohave, California.

Solar Farm and Aquifer Restoration, Fremont Valley, CA - CEQA Level Preliminary Geohazards Investigation for proposed construction of a 4,800 acre photovoltaic system, included analysis of 37 miles of water lines and 98 miles of transmission lines in Fremont Valley, California.

Putah Creek Restoration Plan, Yolo County, CA: Developed supporting documents using GIS for permitting and design of a 2 mile-long watershed restoration project on Putah Creek for the City of Winters and the Putah Streamkeeper.

Lower Putah Creek Restoration Project, Solano and Yolo Counties, CA – BSK provided support activities related to the determination of ordinary high water mark and wetland delineation. Mr. Cline utilized

LiDAR to develop a Digital Elevation Model (DEM) for 21 linear miles of Putah Creek for USACE NWP-27 and for a Regional General Permit.

Cache Creek Plans, Yolo County, CA – Provided GIS support. LiDAR vegetation analysis for patch and trajectory modeling, as well as channel migration studies, to technical advisors for approximately 19.5 miles of restoration planning for the Cache Creek Yolo County Resource Management Planning Area.

Professional Organizations

American Society of Civil Engineers

Association of Environmental and Engineering Geologists

ASFE - Professional Firms Practicing in the Geosciences

URISA-Northern California Urban and Regional Information Systems Association

Kurt Balasek, PG, CHG, QSD – Senior Hydrogeologist

BSK Associates Engineers & Laboratories

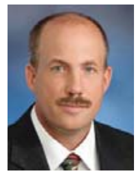
Professional Background:

Mr. Balasek is the Sacramento Senior Hydrogeologist for BSK. He has more than 25 years experience providing geologic, hydrogeologic and environmental consulting to western U.S. businesses and government agencies. His experience includes managing teams of scientists and engineers on projects ranging from large-scale brownfield developments, CEQA compliance and groundwater studies. He has provided project management of water resource evaluations and conjunctive use studies, as well as numerous petroleum hydrocarbon-related groundwater contamination investigations and remedial designs. Mr. Balasek has completed geologic hazard studies for proposed school sites in accordance with the Office of State Architect requirements and has completed detailed geologic surface mapping assignments in the foothills of the Sierra Nevada.

Mr. Balasek has spent his career working to evaluate hundreds of properties for the purposes of development, redevelopment and preservation as conservation easements. Conducting or leading these evaluations has given Mr. Balasek vast experience preparing site investigation strategies with an emphasis toward negotiating with regulatory agencies regarding future land use. Mr. Balasek has worked with redevelopment teams in numerous northern California cities and extensively under EPA community-wide assessment grants in the Cities of West Sacramento, Esparto, and Rancho Cordova. He has worked with local, State, and Federal agencies in evaluating a wide range of environmental contaminated and lighted, assessing community needs, and using tools to develop site cleanup goals. His skills of using land use covenants and maintenance tools provides for blighted property that have led to showcases community revitalization efforts. Mr. Balasek has completed numerous landfill characterization studies and provided detailed analysis to assist in consolidation and clean closure decision making.

Representative Project Experience:

City of Rancho Cordova, California, Community Redevelopment Agency, Brownfield Assessments-Mr. Balasek provided senior management oversight on a community-wide assessment of over 460 properties in Rancho Cordova, California. Approximately 30 parcels warranting Phase I and/or Phase II Environmental Site Assessments (ESAs) were identified. To date, a Phase I and II ESA were conducted on two parcels of a planned community college campus.



Qualifications

Registrations:

Professional Geologist,
California, No. 6162

Certified Hydrogeologist,
California, No. 299

Education:

MS, Hydrogeology,
California State University, Chico
1989

BA, Geology. University of
California, Santa Barbara, 1985

Experience:

BSK Associates 2009

1991-2009, Wallace-Kuhl
Director of Environmental
Services

1989 – 1991 Terrestrial Tech.
Senior Staff Hydrogeologist

Putah Creek Park North Bank Improvement Project, California-The North Bank Improvement Project stemmed from a federal appropriation of 2 million dollars to enhance the Solano County Transportation Department's automobile bridge replacement at the City of Winters. The project funds are administered by **CalTrans** so extensive coordination with this agency regarding project description and permitting has been a substantial portion of this project. The project was developed by the City of Winters. Mr. Balasek and his team were initially tasked with obtaining the biological opinion for mitigation as it related to disturbance of Valley Elderberry shrubs. Instead of purchasing mitigation credits from a Service-approved mitigation bank, Mr. Balasek and his staff devises a unique plan to develop a small on-site mitigation area within the Winters Putah Creek Nature Park. If approved, the mitigation area will provide enough mitigation credits to offset the Solano County Bridge project, the north bank improvement project and a proposed pedestrian bridge. Money will be set aside for maintenance of the mitigation area in perpetuity but will enable the project proponents to mitigate habitat damage locally and keep local control of the money. To develop this plan, Mr. Balasek and his team developed the financial model to predict the amount of money required to establish a non-wasting endowment. This model was submitted to USFWS and is undergoing review. U.S. Representative Mike Thompson and his staff are involved in the project and are assisting with negotiations with USFWS.

Winters Putah Creek Park Revised Master Plan CEQA Support- Winters, California-Mr. Balasek and his team prepared the Initial Study/Mitigated Negative Declaration (IS/MND) based on the revised master plan for Winters Putah Creek Park. This document was compiled in advance of implementing several projects outlined in the park master plan. The document was reviewed by the Winters City Council and adopted by the Winters planning commission without comment by the trustee agencies and with only one comment from the public. The document framed the foundation for environmental permitting for all of the following restoration-related projects.

City of West Sacramento, Housing and Community Investment Division, West Sacramento, California- Mr. Balasek has managed several Environmental Projects for the City of West Sacramento, including: West Capitol Corridor Study, 427 "C" Street, Tower Court, Sacramento Generator, and Vlad's Toyota.

City of Winters PG&E Training Center, Winters California-During critical property negotiations, due diligence studies revealed the historic presence of an underground fuel storage tank. Me. Balasek we retained by the City on an emergency basis to advise City Council and staff. Mr. Balasek mobilized BSK resources and conducted a comprehensive, soil, groundwater and soil vapor investigation on the site. Mr. Balasek also advised the City throughout the project and represented the City in numerous negotiations with PG&E. As a result of a well planned and executed investigation, a $70 million state-of-the-art training facility project is moving through the CEQA process and is scheduled to break ground late in 2015. This project is a huge success for the small City of Winters and will act as a catalyst for a downtown hotel project. Mr. Balasek's work in the field and at the negotiating table were a key part of the success of this project.

Stockton Worknet Center, Stockton, California-Provided project management for a contaminated site. The site characterization and remediation was funded by a State of California Brownfield Grant. The source of contamination was determined to have come from a pipeline located under railroad tracks. Removal and backfill of soil from an excavation that was 35 feet wide by 400 feet long was completed prior to construction of the new center.

River City Baseball – River Cats Stadium, West Sacramento, California-The site was located adjacent to a chemical mixing plant and as part of the owner's due diligence an environmental assessment was conducted. Contamination of volatile organics was determined and remediation followed. Based on these findings the foundation design was also adjusted to accommodate shallow groundwater. Based on Mr. Balasek's recommendation, Gorsorb™, a passive form of soil vapor testing, was used to delineate the contamination. A Risk Assessment report was provided to determine if the level of contamination exposure based on the properties intended use. All this work was completed at an accelerated pace to facilitate construction.

Colusa County, Three UST Sites, Colusa, California-Underground storage tanks at the County Sheriff's Department, Central Services, and County Jail were removed soil and water samples were tested for contamination. As project manager, Mr. Balasek managed the team who provided soil excavation and shallow groundwater monitoring for petroleum hydrocarbons. The three projects took place concurrently resulting in a cost savings to the county.

Sacramento International Airport Terminal Construction, Sacramento, California-Mr. Balasek and his team installed monitoring wells and conducted aquifer performance tests in advance of massive dewatering efforts to facilitated construction at the new Sacramento International Airport Terminal project. Data developed from this study was used to quantify discharge volumes and evaluate water quality. The data was subsequently used as the basis for dewatering design related to a large basement structure extending approximately 17 feet below grade for the entire terminal building as well as subterranean tunnel structures. The new Sacramento Terminal opened in the fall of 2011.

Yolo Ranch Agricultural Landfill Remediation, Yolo County, California-Provided project management and oversight during landfill excavation and remediation. This project involved careful coordination with regulatory personnel from the Illegal Abandoned Landfill Group at the former California Integrated Waste Management Board to remove and/or encapsulate a wide range of ag-related waste in the Yolo ByPass. The work involved remediation and subsequent site closure of an agricultural landfill adjacent to sensitive natural habitats. This work was done as part of a property transaction and demonstrated creative problem solving that included an on-site solution which saved the client tens of thousands of dollars.

Kurt M. Balasek, PG, CHG, QSD– Senior Hydrogeologist

Butte County, California-Mr. Balasek and his team conducted the base-line hydrogeologic analysis of the site vicinity in support of the gravel mining permit application submitted to Butte County. Mr. Balasek's team also conducted the slope stability evaluations for the propose mine. Both technical documents were used to support an EIR commissioned by Butte County on behalf of the project proponent. In addition, Mr. Balasek's team provided consultation on pit capture and anadromous fish entrapment if high water resulted in overtopping of the pit. The work also involved analyzing resource data to identify the bottom of economically recoverable resource.

Cold Spring Rancheria, Tollhouse, California-Mr. Balasek oversaw the preparation of a comprehensive long range water development program for the Cold Springs Rancheria. This program examined available surface and groundwater resources, outlined potential problems with existing infrastructure and water rights and prioritize projects for improvement. Mr. Balasek and his staff also prepared a revised Quality Assurance Assessment Plan (QAAP) for the Rancheria that outlined procedures for all field sampling activities. These plans were funded by the Bureau of Indian Affairs and are required planning documents in advance of project implementation funding.

Professional Organizations

American Society of Civil Engineers
Association of Environmental and Engineering Geologists
ASFE - Professional Firms Practicing in the Geosciences
Water Resource Association of Yolo County
Winters Education Foundation
City of Winters, Putah Creek Park Committee
Solano Resource Conservation District
Groundwater Resources Association of California

BSK

EXHIBIT C

LAWRENCE B. KARP
CONSULTING GEOTECHNICAL ENGINEER

FOUNDATIONS, WALLS, PILES
UNDERPINNING, TIEBACKS
DEEP RETAINED EXCAVATIONS
SHORING & BULKHEADS
EARTHWORK, & SLOPES
CAISSONS, COFFERDAMS
COASTAL & MARINE STRUCTURES

SOIL MECHANICS, GEOLOGY
GROUNDWATER HYDROLOGY
CONCRETE TECHNOLOGY

July 21, 2015

Osha Meserve
Soluri Meserve, A Law Corp.
1010 F Street, Suite 100
Sacramento, CA 95814

Subject: Proposed Golden State Warriors Arena
Mission Bay, Blocks 29-32, San Francisco
Geotechnical Engineering Review

Dear Ms. Meserve:

As authorized, this review is based on information necessary to update a 1998 EIR for a current project proposed within an area bordered by 3rd, South, and 16th Streets, and Terry Francois Boulevard located on Mission Bay fills over Bay Mud. The four blocks are mapped within a seismic hazard area (CDM&G 2000*a*) requiring investigation (CDM&G 2000*b*) and mitigation of potential liquefaction hazards (CGS 2008). The site is also subject to amplification of strong motion due to soft ground (2013 SFBC, ASCE 2013). None of the geotechnical engineering reports for the property classify the site as required by current codes and standards. The data in the existing geotechnical reports underestimates site response to strong motion required for risk to a structure whose primary occupancy will be public assembly with an occupant load greater than 300.

Proposed Project

The project considered, on Blocks 29, 30, 31 and 32, is an event center and parking for the Golden State Warriors basketball team. The project includes two 160 foot office towers, gatehouse, food hall, and retail spaces. 17 years ago an EIR for another project was prepared (C&CSF 1998) based on information for an unspecified location in Mission Bay as no subsurface investigation for the proposed arena site had been undertaken. Later, the four blocks were investigated and reported (Treadwell & Rollo 2007, 2008*a*, 2008*b*) for other projects. Composite reports for four commercial buildings for the four blocks was produced for Alexandraa (Treadwell & Rollo 2008*a*) and salesforce.com (Langan Treadwell Rollo 2011). Subsequent evaluation reports for the arena (LTR 2014*a*, 2014*b*), marked "...privileged...confidential...", have been issued but they do not classify the site nor do they address the Risk III Importance (ASCE 2013, 2013 SFBC) for a known project primarily intended for public assembly. The recent draft EIR (C&CSF 2015) does not address these issues and the current California requirements for mitigation of seismic hazards have not been followed.

Ground Conditions

Several years after the 1998 EIR was prepared, California's seismic hazard mapping program delineated the area of the proposed project (CMD&G 2000*a*) as being subject to liquefaction-induced ground displacement resulting from the shaking of saturated granular sediments that comprise the sands and other artificial fills placed in Mission Bay 100 to 150 years ago.

The property, which was not the subject of a subsurface exploration program when the 1998 EIR was prepared, also includes deposits of Bay Mud of varying thicknesses under the fills that will produce ground amplification from strong motion generated by earthquakes. These hazards are different but related; liquefaction potential (sand) can be mitigated but the structure must be designed to resist soft ground (clay) amplification from strong motion. The data (exploratory boring logs showing materials, sampling, and testing) in the composite reports for the four block area (Treadwell & Rollo 2008a, Langan Treadwell Rollo 2011) verify that both potential hazards exist at the proposed project site.

Seismic Environment

The site is located in the earthquake active San Francisco Bay Area which is seismically dominated by the presence of the San Andreas Fault System. In the theory of plate tectonics, the San Andreas is the boundary between the northward moving Pacific Plate (west of the fault) and North American Plate (east of the fault) which is manifested by the San Andreas system. The faults in the system produce dextral horizontal shear movements resulting from the relative motion of the Pacific and North American plates. Based on history and theory, the land of the proposed project site (sand and rubble fill over Bay Mud)[1] will be subjected to strong shaking from earthquakes generated along both the active San Andreas (8 miles to the west) and Hayward (10 miles to the east) faults.

The northwestward movement of the Pacific Plate relative to the North American Plate persistently causes right-lateral slip across the major faults and deformation between the faults. In the Bay Area, this movement is distributed across a complex system of strike-slip, right lateral parallel and subparallel faults. The San Andreas fault ruptured on 4/18/1906 (estimated M = 8.0) and last severely shook the area on 10/17/89; other earthquakes that epicentered relatively recently along the San Andreas fault occurred on 10/1/69 (Santa Rosa, M = 5.7) and 3/22/57 (Daly City, M = 5.3). Maximum moment magnitudes (scaled size of earthquakes in terms of energy released)[2] are San Andreas $M_W = 7.9$, and Hayward $M_W = 6.9$.

The U. S. Geological Survey forecasted a 67% probability that one or more earthquakes of M = 7.0 (0.20 to 0.45g) or greater will occur on the San Andreas or Hayward faults by the year 2020 (Peterson 1996). Shortly afterwards, the Working Group on California Earthquake Probabilities concluded that the Hayward - Rogers Creek fault system has a 32% probability of generating a large earthquake (M = 6.7 to 7.4) by the year 2030. The average earthquake recurrence interval for the East Bay is roughly 220 years, give or take 100 years As for ground rupturing, there has been a quiescent period of seismic activity after the great 1906 earthquake on the San Andreas fault and there has been no rupturing along the Hayward fault for more than 100 years. The 1998 EIR does not cogently explain the seismic environment of the site.

[1] A layered sequence of soft, plastic, expansive sediments forming the bottom of San Francisco Bay (often referred to as "Younger Bay Mud"). Bay mud is a very weak, compressible soil, consisting of clay-sized and silt-sized particles interspersed with stringers and pockets of peat, fine sand, and minor amounts of gravel, and having a water content ranging from 30 to 92% (commonly 50 to 60% in the uppermost 50 to 100 feet of the deposit).

[2] The moment magnitude scale is used to measure earthquake magnitude M_W taking into account the size of the fault rupture, the stiffness of rock, and the amount of the movement of the fault using values that can be estimated from the size of several types of seismic waves; while the older Richter scale is a numerical scale used to measure the magnitude M of an earthquake using values based on the size of the earthquake's largest seismic waves.

Research, including trenching by the USGS at the Mira Vista Country Club in the Berkeley Hills, indicates that the northern segment of the Hayward fault is overdue for a characteristic major earthquake (Schwartz & Lettis 1998). On 8/24/14, in not unusual ground conditions, a damaging M = 6.0 earthquake occurred off the northern segment in Napa.

Liquefaction (cyclic mobility, which occurs when loose granular soils that are saturated undergo a rapid loss in shear strength as a consequence of ground shaking, and movement amplification of the Bay Mud due to strong motion, will occur at the proposed project site (and nearby sites) during significant earthquakes. This is the reason why California mapped the seismic hazard zones in the state in 2000 and requires mitigation of the seismic hazards.

Ground Motion Parameters

The National Earthquake Hazards Reduction Program ("2009 NEHRP") document "Recommended Provisions for Seismic Regulations for New Buildings and Other Structures" (FEMA 450-1) feeds into the ASCE (American Society of Civil Engineers) 7-10 "Minimum Design Loads for Buildings & Other Structures" (ASCE 2013) development process, and ASCE 7 in turn serves as the primary referenced standard in the 2012 International Building Code (2012 IBC). The 2013 San Francisco Building Code (2013 SFBC) is the City's iteration and adoption of the 2013 California Building Code, which is the State's iteration and adoption of the 2012 IBC. At the time the 1998 EIR was written the San Francisco Building Code was based on superficial maps in the Uniform Building Code (ICBO 1998) when seismic design standards were much less stringent than those of today.

Ground motion parameters, for this review of data in reports of subsurface investigation for the project site, all of which were gathered and presented after the 1998 EIR, were determined for the site using USGS ASCE 7 (2013) based calculation tools derived from published ground motion maps. Seismic ground motion values for use in characterizing and classifying the site for the current project are as follows:

General:

Site Location (USGS):	Latitude 37.7678°N Longitude -122.3875°W
Risk Category (2013 SFBC Table 1604.5)[3]:	III
Seismic Importance Factor I_e (ASCE 7 Table 1.5-2):	1.25

Mapped Acceleration Parameters (2013 CBC §1613.3.1):

Determination of Maximum Considered Earthquake (MCE) spectral response accelerations, mapped at short (0.2 second) period S_s and at a full second (1.0 second) period S_1, for the site:

Determined Site Classification (input Latitude/Longitude):	E
Short period (0.20 second) mapped spectral acceleration S_s:	1.500g
Site Coefficient F_a (2013 SFBC Table 1613.3.3(1); function/Site Class E & S_s):	0.900
Adjusted MCE 0.20 second period spectral response acceleration $S_{MS\text{-}B} = F_a S_s$:	1.350g

[3] "Buildings and other structures that represent a substantial hazard to human life in the event of failure."

One second period mapped spectral acceleration S_1:	0.600g
Site Coefficient F_v (2013 SFBC Table 1613.3.3(2); function/Site Class E & S_1):	2.400
Adjusted MCE one second period spectral response acceleration $S_{M1-B} = F_v S_1$:	1.440g

Design Spectral Response Acceleration Parameters (2013 SFBC §1613.3.3):

Site Classification definitions are dependent on geotechnical data (2013 SFBC §1613.2.1; ASCE 7 §§20.3.2, 20.3.3(3) [softer soil category to be used due to differing criteria][4]).

Defined Site Classification (2013 SFBC §1613.3.2 & ASCE 7 Table 20.3-1):	E
Site Coefficient F_a (2013 SFBC Table 1613.3.3(1); function/Site Class E & S_s):	0.900
Adjusted MCE 0.20 second period spectral response acceleration $S_{MS-D} = F_a S_s$:	1.350g
5% damped short period design spectral acceleration $S_{DS} = 0.67 S_{MS-D} = 0.67(1.350)$:	0.905g
Site Coefficient F_v (2013 SFBC Table 1613.3.3(2); function/Site Class E & S_1):	2.400
Adjusted MCE one second period spectral response acceleration $S_{M1-D} = F_v S_1$:	1.440g
5% damped one sec. period design spectral acceleration $S_{D1} = 0.67 S_{M1-D} = 0.67(1.440)$:	0.965g

Seismic Design Categories (SDC); Risk Category III, $S_1 \geq 0.75$ (2013 SFBC §1613.3.5, ASCE 7 §11.6):

Determination of Seismic Design Category (SDC) is based on occupancy or use and level of expected soil/rock-modified seismic ground motion at the site (adjusted per ASCE 7 §11.6).

Short period response acceleration SDC_{DS} (2013 SFBC Table 1613.3.5(1) adjusted):	E
One second period response accel. SDC_{D1} (2013 SFBC Table 1613.3.5(2) adjusted):	E

Mapped MCE Geometric Mean Peak Ground Acceleration PGA (ASCE 7 §11.8.3, 2013 SFBC §1805.5.12(2)):

PGA (USGS output):	0.523
Site Coefficient F_{PGA} (Site Class E, ASCE Table 11.8-1, PGA ≥ 0.50):	0.900
Peak Ground Acceleration adjusted for site class effects $PGA_M = F_{PGA} PGA$:	0.471g

The above ground motion parameters, reporting just recently required per ASCE 7 (ASCE 2013) where applicable under 2013 SFBC §1805.5.12, and calculated for a structure having an occupant load greater than 300, must be used for analysis in a new EIR. Lateral force resisting systems must meet seismic detailing requirements and limitations set forth in ASCE 7 (2013 SFBC §1604.10).

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[4] Langan Treadwell Rollo 2011 (ASCE 7 Table 20.3-1):
B 29-8 8/31/11 Bay Mud, soft-wet 12-35' (21'>10')
B 32-1 5/1/07 Bay Mud, soft-wet 11-42' (31'>10'), MC=57% (>40%)
B 30-4 5/5/07 Bay Mud, soft-wet 25-50' (25'>10'), MC=63-74% (>40%)
B 31-4 9/1/11 Bay Mud, soft-wet 12-35' (23'>10'), s_u=400 psf (<500 psf)
Treadwell & Rollo 2008*a* (ASCE 7 Table 20.3-1):
1030 (AGS) 3/1/00 Bay Mud, moist-soft 22-51' (29'>10'), PI=58% (>20%)
1031 (AGS) 2/29/00 Bay Mud, moist-soft 16-55' (39'>10'), PI=38-62% (>20%)

Mitigation of Seismic Hazards

California's Special Publication 117A (CDM&G 2008) mandates countermeasures to liquefaction because liquefaction has been a major source of damage during past earthquakes where deposits of saturated sands were present. The risk of liquefaction and associated ground deformation can be reduced by various ground-improvement techniques, but consideration of also lessening the effects of strong motion in the underlying Bay Mud (from transient porewater pressure increases) during earthquakes must also be part of mitigation. The EIR of 17 years ago (C&CSF 1998) contains no mitigation measures, and the newest draft EIR (C&CSF 2015) does not include sufficient countermeasures.

The latest composite report for the site (Langan Treadwell Rollo 2011) anticipated four buildings. Alternative mitigation measures were recommended in the report for those buildings including "rapid impact compaction" ("RIC") "stone columns" and "compaction grouting". A more appropriate countermeasure, deep soil mixing of slurry at depth, has been suggested (Langan Treadwell Rollo 2014*a*). Gravel drains in backfilled bored holes to dissipate pore pressures are an effective counter-measure to liquefaction (Seed & Booker 1977). However, the proposed arena would probably be supported by piles arranged in concentric circular or elliptical patterns, and those piles will be subject to not only liquefaction loads from saturated relatively loose granular materials in the sand and rubble fill but from strong motion amplification of the relatively soft cohesive materials of the Bay Mud.

By embedding the piles into a mat capping the piles, and strengthening the liquefiable sand in the fill (not by "compaction grouting" but by permeation grouting using microfine cement or Portland cement slurry mixed with the sand), and socketing the piles into the Colma (or bedrock near the south end of the site), the effective length of the prestressed concrete piles will be reduced considerably by fixing end conditions and shortening the effective lengths of piles within the Bay Mud. The undersigned believes a program of combination of techniques should be modeled and tested before project approval.

Arena Foundation System

The latest composite report for the site (Langan Treadwell Rollo 2011) was for four separate buildings, one on each of the four lots. The proposed arena (Langan Treadwell Rollo 2014*a*) will be the principal structure in a complex that includes other structures. The 2011 report provides foundation alternatives for each building mainly because the Colma formation (dense to very dense sand, silty sand, clayey sand) is thin at the southeastern part of the site. Structural steel piles should not be used as the Bay Mud is highly corrosive and cathodic protection systems are problematical (Karp 1977).

If the proposed arena project were to proceed, it is more than likely that the foundation system, arranged in a pattern of concentric circles or ellipses. would be comprised of either precast prestressed concrete piles or cast-in-place concrete piles that are drilled through casing that is part of the machinery with the piles concreted as the casing is withdrawn. Piles would derive their support from the Colma formation, except at the southern part of the site bedrock would be the supporting medium. For embedment in the Colma formation or very stiff to hard clay and bedrock where the Colma formation is not present, depth-limited augered piles could penetrate dense materials or precast prestressed concrete piles could be driven with steel stingers and where the Colma formation is not present, the piles could be piloted into the very stiff to hard clay or bedrock. Although various deep foundation alternatives are theoretically possible, the proposed current project, which is particularly sensitive due to its public assembly nature, should have a testing program instituted to test alternatives.

Vibrations During Construction

Driving displacement piles causes noise and vibrations from impact that are transferred though dense subgrade materials to nearby structures. As the configuration of the proposed arena will likely be circular or elliptical and vibrations, particularly driving those at the western side of the project, would likely affect the UCSF Medical Center building at 1650 3rd Street. Prior to project approval, an indicator pile test program must be implemented to monitor vibrations and verify the suitability of the intended foundation system for the area.

Drilling and casting-in-place reinforced concrete shafts, if feasible to required depths, may be an appropriate suitable alternative to driven piles. As noted below for shoring, shafts are augered and spoils removed through casing contained in the rig that is withdrawn as concrete is placed. Using tremie methods, concrete displaces water in the hole so it rises and is pumped out with low ground-water loss. Before the project is approved, a test program should be implemented to ascertain the feasibility of using cast-in-place piles or where appropriate, a combination of drilled and driven piles.

Shoring & Groundwater

As an underground parking garage would be part of the project, secant piles, drilled in a circular or elliptical pattern to form a tension ring, would likely be the shoring, but drilling/concreting operations will encounter and displace groundwater that would have to be continuously tested for contaminants and otherwise managed under an advance plan. A Memorandum (Langan Treadwell Rollo 2015) suggests "Construction Dewatering Discharge Options" which may be helpful for that problem but the actual engineering effects of dewatering (increase in effective stress that causes areal subsidence) was not addressed. The effects upon surface improvements from dewatering in the area of the project must be studied before project approval.

Shoring of the excavations for the intended subgrade portions of the proposed current project, the appropriate method would be, as noted above, secant piles. Secant piles are sequentially drilled shafts that intersect each other to form a solid wall. Primaries (soft piles) are drilled apart in rows (or curves) closer together than the pile diameter. Primary shafts are augered and spoils removed with low water loss. Secondary shafts (hard piles) are augered between and arched into both of adjacent primaries, and wet-set reinforced with steel. In the saturated sand, it would be at this stage (casing/augering, and reinforcing) and afterwards (tolerance deviation from verticality, joints between overlapping piles, and movement) when groundwater and sand will be lost.

Depending on depth below groundwater level, hydrostatic pressures (head) are about one-half psi which will allow water and sand to migrate into the excavation. Pressure is only reduced if groundwater level drops outside the wall. When water is lost, increases in effective stress with vibrations from hard pile installations will densify the sand with differential settlement of improvements. The only methods to minimize water and sand flowing into the excavation with simultaneous drawdown of the groundwater level is to recharge outside the wall or construct the shoring in a circular pattern with large overlaps acting in ring compression.

Under current codes and standards, below grade walls for the proposed underground structures will require dynamic analysis (2013 SFBC §1803.5.12(1)) as well as engineered design to protect surface improvements, wall backdrainage, groundwater collection, piping, and discharge facilities.

Contamination

Although it is understood that others will discuss contamination, the subject is a very important environmental and geotechnical engineering concern for reasons that include intended subgrade excavation and construction. Mission Bay was used for many years as a dump and then a railroad yard. Bayward of the site there were fuel terminals that included tanks and pipelines which are known contributors to contamination. The Pier 64 area has received past attention under the auspices of developers (Langan Treadwell Rollo 2014*b*) but the extent and sufficiency of actual clean-up is not really known from second hand information. The report of geotechnical investigation produced for salesforce.com (Langan Treadwell Rollo 2011), 327 pages, contains no contaminant sampling, testing, or even recognition of the potential problem.

Contamination seems to have been dismissed as a thing of the past, but contaminants in groundwater do not simply go away without complete ground remediation. The 1998 environmental document is vague so "change" from then to now cannot be quantified. For instance, the "2001 Phase I Remedial Excavation" resulted in a record that "Soil containing residual oil below the target zone was left in place." (Langan Treadwell Rollo 2014*b*, pg 9). The observance of living birds congregating where water has ponded is not a reliable yardstick for declaring a site free of contamination. Hands-on testing by an independent laboratory would be appropriate measures that should be undertaken before a public assembly project at this site is approved.

Yours truly,

Lawrence B. Karp

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EXHIBIT D

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Subject: Review
Mission Bay Subsequent Environmental Impact Report (September 17, 1998)
Notice of Preparation of an Environmental Impact Report (November 19, 2014)
Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015
Mission Bay Project
San Francisco, California

Dear Ms. Meserve:

At the request of Soluri Meserve, BSK Associates (BSK) reviewed the following documents:

A. **Mission Bay Subsequent Environmental Impact Report (SEIR), Dated September 17, 1998, Sections:**
   - Chapter II.20 to II.21, Summary
   - Chapter V.H.1 to V.H.24, Seismicity
   - Chapter VI.37 to VI.39, Mitigation Measures, Seismicity
   - Chapter VI.87 to VI.93 Mitigation Measures, Geology
   - Chapter IX.2 to IX.3, Irreversible Environmental Changes
   - Chapter XII.187 to XII.188, Public Comments, Seismicity
   - Appendices A.49 to A.54, Initial Study, Geology
   - Appendices G.1 to G.4, Seismicity
B. **Notice of Preparation of an Environmental Impact Report/Initial Study, Event Center and Mixed-Use Development at Mission Bay Blocks 29-32, Dated November 19, 2014**
   - Pages 84 to 105
C. **Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015**
   - Pages 1-47 to 1-48, Summary of Impacts and Mitigation Measures, Hydrology and Water Quality
   - Pages 1-59 to 1-60, Summary of Impacts and Mitigation Measures, Geology and Soils
   - Pages 5.9-9 to 5.9-29, Flooding
   - Page 6-5, Effects Found Not to be Significant

Our review was limited to Geology, Engineering Geology and Seismic related aspects of the subject documents. The following section (A1 to A14) presents our comments based on a review of the Mission Bay Subsequent Environmental Impact Report (SEIR), Dated September 17, 1998.

A1. Section II.20 Summary-Seismicity, fourth paragraph indicates that structures would be supported on piles between 30 and 200 feet deep to reduce the effects of groundshaking and liquefaction. This type of structural support may provide mitigation of liquefaction hazard of the main building structure, however pile support systems do little to provide mitigation from liquefaction and settlement of surrounding utilities/roads and other support systems that may be damaged during a seismic event. Due to the shallow occurrence of the liquefiable layers, sand boils may develop during a seismic event. Ground settlements due to development of sand boils can be large and unpredictable. Design of these surrounding systems, not proposed to be supported on piles, cannot withstand the effects of sand boils and can lead to excessive and differential settlement without further technical analysis, and mitigation measures such as recompaction.

A2. Section II.20 states "the likelihood of tsunami inundation is very slight." The fact that portions of the proposed facility are located in a Tsunami Hazard Zone established by the State of California (California Emergency Management Agency, June 15, 2009 Map) indicates that the tsunami hazard is significant.

A3. Section V.H.12 states that "To reduce potential effects in the Liquefaction Hazard Zone, Catellus has committed to construction of major structures in the Project Area on foundations supported by piles driven into dense sands, stiff clays, or bedrock in areas where such materials are too deeply buried by unengineered fill and/or Bay mud to provide adequate support for foundations." The conditions that trigger use of piles and areas where they are needed were not delineated and the method for determining the requirement criteria was not provided. Futhermore, as stated in section A1 above, piles alone may not provide sufficient mitigation for areas surrounding the building structures.

A4. Section V.H.13 states that "If not mitigated as described in Chapter VI of this SEIR, the above-described risks to people posed by seismically induced groundshaking and liquefaction would be significant impacts of the project." Many risks described in Section V.H.13 are from structures/facilities located outside the project area. The mitigation measures presented in Chapter VI of the SEIR are for structures/facilities located in the project area. It is not possible to mitigate hazards to structures located outside the project area by mitigation measures that were developed for structures located inside the project area.

A5. Section V.H.16 states "Some grading of the Project Area, including the excavation of some potentially liquefiable materials and replacement with engineered fill, would occur prior to the construction of underground infrastructure to ensure that the systems could be designed to accommodate expected settlement along their specific routes, and to prevent liquefaction damage." This is vague with respect to which areas will require regrading and how deep the fill replacement extends. The technical criteria that is to be used to determine if an area requires replacement was not provided.

A6. Section V.H.17 first paragraph utilizes U.S. Army Corp of Engineers (ACOE) 1975 run-up model for 100-year and 500-year events to estimate potential tsunami hazards. The indented use for ACOE 1975 report was for determining 100-year and 500-year flood levels for the purpose of requiring flood insurance. The ACOE report considered the probabilities of tsunami sources from Alaska and the Aleutian trench alone, assuming that the 100-year and 500-year events are not strongly affected by events from other regions of the Pacific. They did not address the possibility of locally generated tsunamis (Borrero. et al, 2006). More recent studies used to develop the 2009 Tsunami Inundation Map uses multiple seismic sources including local faults (Point Reyes Thrust Fault, Rodgers Creek-Hayward Fault and San Gregorio Fault) and other distant sources such as the Cascadia Subduction Zone.

It should be noted that for designing structures against structural collapse the 2013 California Building Code uses a ground motion values from a Risk-Targeted Maximum Considered Earthquake (MCEr). The MCEr is defined as the ground motion from an earthquake at the 1% in 50 years (4975 year return interval) hazard level.

The most technically accurate method for assessing tsunami risk to a site is to perform a Probabilistic Tsunami Hazard Analysis (PTHA). The computational method in PTHA generally follows the Probabilistic Seismic Hazard Analysis (PSHA) method that is widely used in assessing seismic hazards (Geist, 2006). Given that the tsunamis are caused by earthquake events, the analysis should use the same standard hazard level as earthquakes (1% in 50 years), not the flood insurance risk return interval. Using an analysis based on 100-year or 500-year return intervals may not capture the controlling seismic event that may cause the maximum Tsunami run-up.

A7. Section V.H.17 first paragraph references an "extreme high tide crest condition" of an additional 2.95 feet above mean sea level. The reference source for the "extreme high tide crest condition" was not provided. Our review of the nearest tide station (Yerba Buena Island Tide Station 914782, NOAA Website) station information data sheet indicates that the Mean High Water (MHW [1]) level is 2.31 feet above mean sea level (msl) and the Mean Higher-High Water (MHHW[2]) is 2.91 feet above msl. The proponent assumes that the "extreme high tide" is a rare event with low probability of occurrence. The 2.95 feet above msl that is assigned to the assumed low probability event is not significantly different from the average event, Mean High Water of 2.31 feet above msl. The difference between what the proponent assumes is a low probability event value based on an "extreme high tide" and the Mean High Water value is probably less that the uncertainty in the model that was used. The analysis provided in the DSEIR attempts to minimize the apparent risk from a tsunami that occurs during a high tide through confusing and unsubstantiated statistical analysis.

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[1] MHW - Mean High Water: The average of all the high water heights observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.

[2] MHHW - Mean Higher High Water: The average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.

The tsunami run-up analysis presented in the SEIR also failed to account for future sea level rise due to climatic change. Estimate of future sea level rise in the San Francisco Bay Area range from 3.1 feet to 5.5 feet in next the 90 years (Nation Research Council, 2015). Tsunami run-up elevation analyses should incorporate future sea level rise.

A8. Section V.H.17 utilized the local San Francisco City Datum (SFCD) for the analysis. Page V.H.20 defines the SFCD as "For surveying purposes in San Francisco, a local datum was established, in the 19th century, at 8.66 above mean sea level, approximately higher high tide at the time." It is not clear what national datum the SFCD is related to since there is no citation. The proponent asserts the SCFD is the 8.66 above MSL in the 19th century, however, they fail to identify how this elevation relates to the current datum, used in other parts of their analysis. Current mean sea level data is referenced to the North American Vertical Datum of 1988 (NAVD88) that was established in 1991. NAVD88 replaced the National Geodetic Vertical Datum of 1929 (NGVD29). Tidal datums such as the Mean Sea Level (MSL), Mean High Water (MHW) and Mean Higher High Water (MHHW) are referenced to Geodetic Datums such as NAVD88 or prior to 1991, NAVD29 (NOAA 2015). To calculate flood levels, data that uses a consistent Geodetic Datum must be used (FEMA 2015). For example, MSL using NAVD88 is not the same as MSL using NAVD29. Using a local datum such as the SFCD, that uses an unknown Geodetic Datum and relating to tidal data that uses a known Geodetic Datum such as NAVD88 would produce erroneous results.

A9. Section V.H.17 last paragraph attempts to minimize the tsunami hazard. As shown on the attached Figure 1, portions of the site are located in a California State Designated Tsunami Hazard Zone. According to Appendix M, Section M101.4 of the 2013 California Building Code (CBC): "Construction within the Tsunami Hazard Zone - Construction of structures designated Risk Category III and IV as specified under 2013 CBC Section 1604.5 shall be prohibited within a Tsunami Hazard Zone."

Category III Risk Category includes: "Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:

- Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
- Buildings and other structures containing elementary school, secondary school or day care facilities with an occupant load greater than 250.
- Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500.
- Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities.
- Group I-3 occupancies.
- Any other occupancy with an occupant load greater than 5,000.
- Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV.
- Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area

as given in Table 307.1 (1) or 307.1 (2) or per outdoor control area in accordance with the California Fire Code; and Are sufficient to pose a threat to the public if released."

The proposed structures are probably located in an area that conflicts with the requirements specified in Appendix M, Section M101.4 of the 2013 California Building Code.

A10. Section VI.88, Table VI.8, K.2b refers to designing connections between pile-supported structures and unsupported sidewalks and driveways to reduce the likelihood of separation due to settlement. This analysis identifies unknown, but high settlements that may occur due to liquefaction and development of surface sand boils. Sand boils occur when liquefied units reach the ground surface and sand is ejected from the ground surface. Settlements due to sand boils can be large and unpredictable and greater than what was presented in the report. Without adequate mitigation for these high unknown settlements, the impacts would be significant.

A11. Section VI.89, Table VI.8, K.2c refers to using flexible connections for utilities serving pile-supported buildings to accommodate the settlement expected. This analysis identifies unknown, but high settlements that may occur due to liquefaction and development of surface sand boils. Without adequate mitigation, the impacts would be significant.

A12. Section VI.89, Table VI.8, K.4 indicates that leveling jacks should be used on buildings with shallow foundations. This measure would not be effective to mitigate differential settlements due to liquefaction or dry seismic shaking settlements. High differential seismic settlements may cause building collapse or the over-turning of structures rendering leveling jacks useless.

A13. Section VI.91, Table VI.8, K.15 states that "As deemed necessary by geotechnical studies, make sandy materials more dense to reduce the potential for liquefaction." This appears to conflict with the requirement of pile-supported foundations. The requirement is vague with respect to criteria to be used to determine how deep the densification should extend and is not adequate to mitigate a significant impact. Furthermore, the densification methods are not identified nor how this unknown process would work as mitigation.

A14. Appendices Section A.49 under Tsunami and Seiche states "Although the Project Area is relatively close to sea level, historical records indicate little likelihood of inundation by tsunami or seiche." In the next sentence it is stated that the portions of the project area would be below the level of inundation predicted by the U.S. Army Corps of Engineers computer models. It was also stated that techniques for reducing the inundation, tsunami and seiche hazards would be presented in the SEIR. The only mitigation measure against tsunami hazards presented was a vague reference to setbacks from the Bay and Channel made in Section V.H.17. As stated above in A9, the type of proposed structure would not be allowed according to Appendix M, Section M101.4 of the 2013 CBC.

Summary of Review 1998 - Mission Bay Subsequent Environmental Impact Report

The Mission Bay Subsequent Environmental Impact Report (SEIR), dated September 17, 1998 relied on an inadequate Tsunami hazard analysis, relied on out dated methodology and failed to provide adequate mitigation measures for Tsunami Hazard impacts. The SEIR failed to fully address high ground settlements and provide mitigation measures for impacts from sand boils. The SEIR failed to properly identify impacts and provide mitigation measures for areas of the project that may be impacted from liquefaction induced lateral spread hazards. The mitigation measures presented to address the impacts from high settlements due to liquefaction would not be effective in all areas of development, in particular with respect to impacted areas located outside building footprints.

The following section (B1 to B11) presents our comments based on a review of the Notice of Preparation of an Environmental Impact Report/Initial Study (IS), Event Center and Mixed-Use Development at Mission Bay Blocks 29-32, Dated November 19, 2014.

B1. Page 84 Topics: 14 Geology and Soils - lists the impacts for all subsections of the Geology and Soils Impacts as "No New or More Severe Significant Effects." Significant changes to the California Building Code and the standard of practice for analyzing ground motion and liquefaction evaluation have occurred since the 1998 SEIR was published. Geotechnical reports showing details of older analysis versus analysis based on newer ground motion criteria were not available for review. Without a comparison of the two analyses, it cannot be concluded that there are no new or more severe significant effects.

B2. Page 86 last paragraph: identifies the Langan Treadwell Rollo, Preliminary Geotechnical Evaluation Report, dated March 28, 2014 as the preliminary geotechnical evaluation for the project. Our review of that report indicates that the letter report carries the stamp "Privileged and Confidential – For Discussion Purposes Only" Furthermore, the geotechnical evaluation report states in the last paragraph "The conclusions and recommendations presented herein are preliminary and should not be relied upon for design." Other detailed geotechnical reports providing data and analysis were not referenced in the IS or available to review.

B3. Page 87 second paragraph states "On the basis of the preliminary geotechnical evaluation for the project, recommended measures for addressing these effects include improving the soil to resist liquefaction and lateral spreading as well as use of flexible utility connections, utility hangers, and hinged slabs to address differential settlement." As stated above in Section A10, high settlements may occur due to liquefaction and development of surface sand boils. Without adequate mitigation for these high unknown settlements, the impacts would be significant.

B4. Page 87 third paragraph states "As indicated by the project-specific geotechnical evaluation, no substantial changes have occurred nor has new information become available that would result in new or more severe project impacts related to seismic hazards including fault rupture, seismic groundshaking, seismically induced ground failures, or landslides." The referenced 2014 geotechnical report is insufficient in content and analysis to support this statement. A comparison of current and the 1998 derived ground motion design criteria, static and dynamic settlement values was not provided in the geotechnical report or the IS.

B5. The 2014 Langan Treadwell Rollo report also identified the potential hazard from lateral spread as high. The 1998 SEIR presented lateral spread as a hazard within several hundred feet of China Basin Channel. Due to the distance of the Site from from China Basin Channel (>2,000 feet), the lateral spread hazard identified in the 1998 SEIR would not have included blocks 29-32. This new hazard was not identified or acknowledged in the IS. A mitigation measure for the impact of lateral spread in the area between the proposed structure and San Francisco Bay was not presented in the IS or in the 2015 DSEIR.

B6. Page 88 under Settlement states "The Mission Bay FSEIR addressed settlement issues related to differential settlement of the underlying geologic materials that are relevant to the project site, but it did not address impacts related to settlement associated with excavation or dewatering.

However, these impacts would all be less than significant, as described below." As stated above in Section A10, high settlements may occur due to liquefaction and development of surface sand boils for which mitigation has not been provided.

B7. Page 90 third paragraph states: "In addition, noise and vibration concerns could limit the use of driven piles." The structure foundation mitigation measures specify the use of driven piles and no other foundation mitigation method alternative was provided.

B8. Page 98 under Mission Bay Plan Effects Related to Tsunami and Seiche. As stated in A6 above, the U.S. Army Corp of Engineers model is outdated and has been replaced with other modern methods of analysis.

B9. Page 103 under Inundation by Seiche or Tsunami. This section provides conflicting values. The older values from the FSEIR and newer values from the 2011 Tsunami Response Annex report by the City and County of San Francisco. It should be noted that on page 24 of the 2011 Tsunami Response Annex report states: "The map is intended for use as evacuation planning tools (Attachment B). The Tsunami run-up zone information are approximations due to limitations in modeling and baseline coastal data." The IS provides a tsunami and seiche run-up values of "approximately 6 feet" based on the 2011 Tsunami Response Annex report. Our review of the report indicates that that value is referenced to mean sea level. The 6 foot value does not account for diurnal high tides that may reach approximately 7 feet and sea level rise due to climatic change that may reach approximately 5 feet. To estimate Tsunami run-up elevations, the maximum run-up is calculated as a sum of the Tsunami run-up (6 feet), the tide level at the time of the Tsunami (may be as high as 7 feet) and sea level rise (may reach 5 feet). Not accounting for all the ocean level variables may cause a significant underestimation of Tsunami run-up.

B10. Page 104 under Inundation by Seiche or Tsunami. This section provides mitigation measures such as 1) Set Back, although no distance is given 2) Raise occupied portions, no elevation is given and 3) Tsunami Warning System, for hazards that were determined to be less than significant. If the hazard is less than significant, then mitigation measures would not be required. This presents an improper analysis by providing mitigation measures for an impact that was previously identified to be less than significant.

B11. Page 104 under Structures states: "Although some damage to the structures could occur, the improvements constructed under the proposed project would be resilient to tsunamis or seiches." A reference to the building code that provides design parameters for tsunamis resilient structure needs to be provided.

Summary of Review - 2014 the Notice of Preparation/Initial Study

The Notice of Preparation (NOP) of an Environmental Impact Report/Initial Study (IS), dated June 5, 2015 did not fully analyze the Tsunami hazard, relied on out dated methodology and failed to provide adequate mitigation measures for the area that is located in a State Tsunami Hazard Zone. The mitigation measures for Tsunami impacts provided in the IS were developed without performing a proper Tsunami hazard analysis. The IS failed to properly analyze, identify and address new or more severe significant effects. Recent Geotechnical reports (Langan 2014) identified new and significant impacts (lateral spread for example) that were not addressed in the IS.

The following section (C1 to C5) presents our comments based on a review of the Draft Subsequent Environmental Impact Report, Blocks 29-32, June 5, 2015.

C1. Pages 1-47, Table 1-2 Summary of Impacts and Mitigation Measures, Hydrology and Water Quality list Impact HY-5 "The project would not expose people or structures to a significant risk of loss, injury or death involving inundation by seiche or tsunami" as LS or Less-Than-Significant Impact (no mitigation required). Portions of the site are located in a State Identified Tsunami Hazard Zone, furthermore as stated in A6 and B9 above, the Tsunami hazard has not been adequately analyzed using current standards. The designation of LS or Less-Than-Significant Impact (no mitigation required) conflicts with the IS listing Tsunami mitigation measures, see B10 above.

C2. Pages 1-59 to 1-60, Table 1-2 Summary of Impacts and Mitigation Measures, Geology and Soils lists Impacts GE-1 through GE-5 and C-GE-1 with significance determinations of LS or Less-Than-Significant Impact (no mitigation required). This is contrary to the findings, conclusions and recommendations found in previous geotechnical evaluations (Langan 2014 and Langan 2011). The Langan geotechnical evaluations identified numerous conditions at the site requiring mitigation measures. The items included excessive static and dynamic settlements, liquefaction including sand boils, lateral spread, intense ground motion, shallow groundwater and corrosive soils. The Langan 2011 report presented numerous mitigation measures requiring extensive ground improvement modifications, specialized foundation design, dewatering and excavation shoring.

C3. Page 5.9-29 states " … and flooding as a result of failure of a levee or dam; and inundation by seiche, tsunami, or mudflow (Impact HY-5). Therefore, no further analysis of these subjects is presented in this section." As stated in A6 above, the Tsunami hazard methodology presented in the 1998 SEIR is dated and requires and updated analysis and evaluation.

C4. Page 6-5 under Section 6.3 Effects Found Not to be Significant in the Geology and Soils states "The project would not expose people or structures to geologic hazards; cause soil erosion or loss of topsoil; be affected by the presence of unstable soils or geologic units; be affected by the presence of expansive soils or soils incapable of adequately supporting wastewater disposal systems; or cause a substantial change of topography." This is in conflict with the newly identified hazards (Lateral Spread) and inadequately analyzed hazards (liquefaction induced sand boils).

C5. Page 6-5 under Section 6.3 Effects Found Not to be Significant in the Hydrology and Water Quality states: "The project would not deplete groundwater supplies; alter drainage patterns, resulting in erosion; place housing and/or structures within a 100- year flood zone; expose people and structures to hazards associated with flooding, failure of a levee or dam, seiche, tsunami, or mudflow; or cause construction-related water quality impacts." The portions of the site are located in a State-Identified Tsunami Hazard Zone and as stated above in Section A6 and B9, the Tsunami hazard was evaluated in the 1998 SEIR and 2014 IS using dated and/or inappropriate methodologies.

Summary of Review - 2015 Draft Subsequent Environmental Impact Report

The Draft Subsequent Environmental Impact Report (SDEIR), dated June 5, 2015 did not fully analyze the Tsunami hazard, relied on out-dated methodology and failed to provide adequate mitigation for portion of the site that are in a State Tsunami Hazard Zone. The SDEIR failed to address and provide mitigation for newly identified significant hazards such as lateral spread. Much of the SDEIR relies on analysis from the IS and 1998 SEIR without fully addressing newly identified hazards, data gaps and the need to apply current methodologies to analyze project impacts.

Our review was limited to the Geology, Engineering Geology and Seismic related aspects as they relate to the development as described in the reports made available for review.

We appreciate the opportunity to be of service to Soluri Meserve and trust that this correspondence provides you with the information necessary at this time. Please contact us with questions regarding the review comments presented this letter.

Respectfully submitted,
BSK Associates

PROFESSIONAL GEOLOGIST
MARTIN B. CLINE
No. 2084
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Martin B. Cline, CEG
Senior Engineering Geologist

Kurt Balasek
Senior Hydrogeolgist

Attachment: Figure 1, Tsunami Inundation Map

References:

Borrero, J., Dengler, L., Uslu, B., Synolakis, C., June 8, 2006, Numerical Modeling of Tsunami Effects at Marine Oil Terminals in San Francisco Bay, Report Prepared for: Marine Facilities Division of The California State Lands Commission

California Emergency Management Agency, California Geologic Survey and University of Southern California, (June 15, 2009) Tsunami Inundation Map for Emergency Planning, San Francisco North Quadrangle/San Francisco South Quadrangle

City & County of San Francisco, March 2011, Emergency Response Plan, Tsunami Response Annex

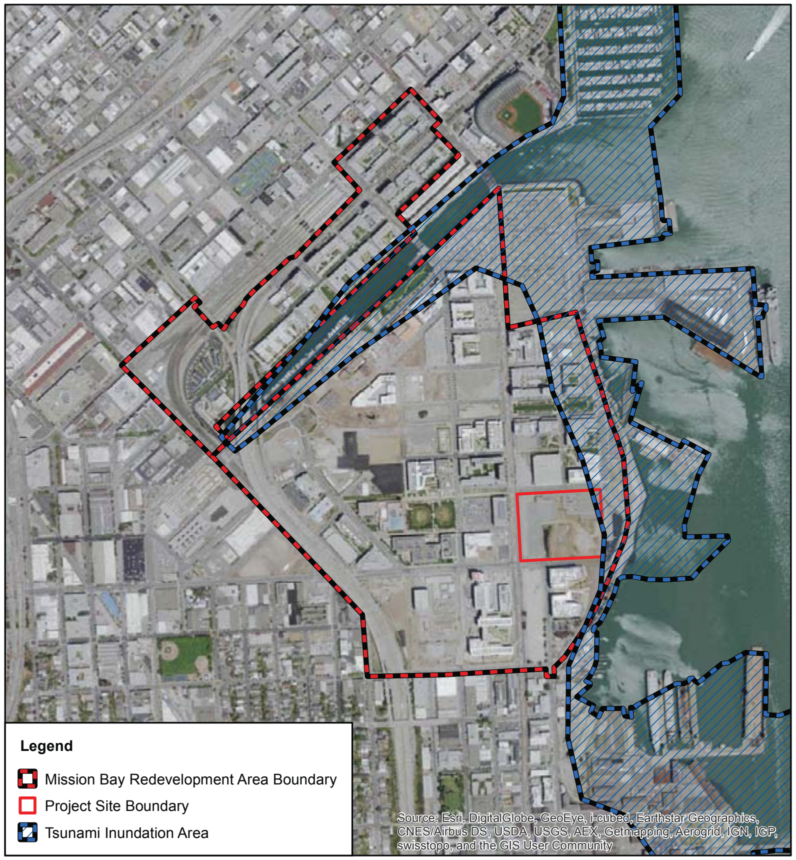
Geist, E.L., Parsons, T., 2006 Probabilistic Analysis of Tsunami Hazards, Natural Hazards (2006) 37: 277–314, DOI 10.1007/s11069-005-4646-z, March 14, 2005

Langan Treadwell Rollo, March 28, 2014, Preliminary Geotechnical Evaluation, Block 29-32 Mission Bay, San Francisco, California,

Langan Treadwell Rollo, December 21, 2011, Geotechnical Investigation, Salesforce Buildings, Block 29-32 Mission Bay, San Francisco, California,

National Research Council of the National Academies, 2012, Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future

NOAA Website, http://tidesandcurrents.noaa.gov/datums.html?id=9414782 accessed June 2015
NOAA Vertical Datums http://www.ngs.noaa.gov/datums/vertical/ accessed June 2015
FEMA Vertical Datum http://www.fema.gov/media-library-data/20130726-1615-20490-4828/vertical_datum_letter.pdf accessed June 2015



Document Path: T:\GIS-Files\Project-Files\E0906601S - Mission Bay\Tsunami_hazard.mxd

0 500 1,000 Feet

Source: State of California, Tsunami Inundation Map for Emergency Planning, San Francisco North Quad, June 15, 2009

BSK Associates Engineers & Laboratories

Review - Mission Bay Subsequent Environmental Impact Report San Francisco, California	Figure 1 Tsunami Inundation Map

Martin B. Cline, CEG – Project Geologist

BSK Associates Engineers & Laboratories

Professional Background:

Mr. Cline has more than 28 years of experience in geology, engineering geology, petroleum geology and environmental field studies, including assessments for hillside grading, subsurface drainage design, and landslide repair and mitigation. As Project Geologist, his responsibilities include performing field investigations for geotechnical, geologic, and environmental studies. He has experience in planning and implementing geologic and geomorphic mapping and analyses of soil, bedrock and groundwater conditions as they pertain to engineering works. Mr. Cline's experience also includes construction observation and testing, and geotechnical laboratory testing. He has extensive project experience including Phase I and II environmental assessments for a wide variety of commercial and industrial properties, including wholesale/retail petroleum product outlets and heavy industrial sites. He also has extensive experience in the completion of CEQA Special Studies, as well as section preparation, for Environmental Impact Reports.

Relevant Project Experience:

Engineering Geology – Seismic Hazards Investigation Projects

Mr. Cline has expertise in the planning and implementation of geologic/seismic hazard investigations and development of seismic design criteria as they pertain to engineering works. Experience includes surface fault rupture investigations, deterministic/probabilistic site specific ground motion evaluations, site condition modeling, response spectra using time histories development, liquefaction, lateral spreading and seismic settlement analysis. Additionally, Mr. Cline has expertise in seismic hazards evaluations for Hospital and Schools according to OSHPD and DSA Title 24 specifications. Representative projects include:

- Geologic/Seismic Hazard Evaluation and time-history analysis, AT&T Central Office Seismic Upgrade, San Francisco, California
- Geotechnical Investigation/Liquefaction Analysis, AT&T Building Seismic Upgrade, San Francisco, California
- Geologic/Seismic Hazards Evaluation, Proposed Multi-Use Sports Complex, West Hills College, Lemoore, California
- Geologic/Seismic Hazards Evaluation, Proposed Wellness Center, West Hills College, Coalinga, California
- Geologic/Seismic Hazard Evaluation, College of the Sequoias, Tulare, California
- Geologic/Seismic Hazard Evaluation, Clovis Community Medical Center

Qualifications

Registration:

Professional Geologist, California, 6248
Certified Engineering Geologist California, 2084

Education:

BA, Geology, California State University, Chico, 1982

Experience:

BSK Associates 1988

1983 – 1988, SOHIO Petroleum Geologist

1980 – 1983, Exploration Logging Geologist

1982, ANATEC Laboratories

1977 – 1981, Graham Gas Geologist

Clovis, California
- Seismic Hazards Update HAZUS Reclassification, Kern Medical Center, Bakersfield, California
- Geologic/Seismic Hazard Investigation, Woman's Health - Adventist Hospital, Hanford, California
- Geologic/Seismic Hazard Investigation, State Courthouse, Madera, California
- Surface Fault Rupture Hazard, Commercial Development, Fremont, California
- Surface Fault Rupture Hazard, Service Station, San Leandro, California
- Surface Fault Rupture Hazard, Public Library, Frazier Park, California
- Surface Fault Rupture Hazard, USFS Visitors Center, Lone Pine, California
- Surface Fault Rupture Hazard, New Fire Station, Pine Mountain, California
- Surface Fault Rupture Hazard, New Hospital Site, Tehachapi, California
- CEQA Level Geohazards Investigation, Solar Farm, Mohave, California
- Fault Evaluation Report Peer Review, Kern County, California
- Fault Evaluation Report Peer Review, City of Bakersfield, California
- Fault Evaluation Report Peer Review, Inyo County, California
- CEQA Level Geohazards Investigation Peer Review, Kern County, California
- Slope Stability and Erosion Evaluation, Petroleum Pipeline Crossing, Kern County, California

Environmental Engineering Projects

Soil and Groundwater Remediation **-** Projects have included feasibility studies, system design, application for permits, remedial action oversight for clean-up of petroleum and heavy metals using in-situ treatment and excavation and disposal, and post closure monitoring. Projects of this nature include:

- Remedial Investigation/Feasibility Study-UST Site, Stockton, California
- Remedial Investigation for Seepage Pits - Visalia, California
- Well Design and Installation of a 3-Stage Monitoring Well - NASA Ames Research Center, Moffett Field, California
- Feasibility Study for former Service Station - Castro Valley, California
- Remedial Investigation for Foundry Site - Union City, California
- Feasibility Study for Pump and Treat Design, Tracy Army Depot, Tracy, California
- Operation and Maintenance, Dual Phase Vapor Extraction, Truck Stop, Dunnigan, California
- Remedial Investigation for Former Trucking Facility, Carson, California

Environmental Assessment Studies - Mr. Cline has expertise in the planning of field operations, sampling and analysis plans, workplan preparation, monitoring well design and construction, site assessment (Phase I and II), regulatory compliance, contaminant mobility and plume characteristics determinations, data acquisition and interpretation, and development of remedial action plans.

He has worked on sites impacted with petroleum, solvent and/or heavy metal contamination. Projects of this nature include:

- UST Assessment Service Station in Castro Valley, California
- UST Assessment for the City of Livermore, Livermore, California
- UST Assessment Trucking Facility in Sunnyvale, California
- UST Assessment Food Processing Plant in Stockton, California
- UST Assessment Trucking Facility in Sacramento, California
- UST Assessment Moving and Storage Facility in Fairfield, California
- UST Assessments Numerous Service Stations in Sacramento, California
- Jet Fuel Release Assessment, NASA-Ames Research Center, Moffett Field, California
- Phase I ESA, City of Pittsburg Redevelopment Agency, Pittsburg, California
- Phase I ESA, California Department of Water Resources - 60 acre site, Hood, California.
- Phase I ESA, Multi-unit Retirement Community in Fairfield, California
- Phase II ESA, Chrome Plating Facility, Oakland, California
- Phase II ESA, Future Elementary School Site, Dublin, California
- Phase I/II ESA, Future Elementary School Site, Empire, California
- Phase II ESA, Foundry Sand Deposition Site, Newark, California
- Phase I ESA, Fertilizer Distribution Facility, Lathrop, California
- Phase I ESA, Fertilizer Distribution Facility, Maxwell, California

Geographic Information Systems (GIS) Experience

Mr. Cline has expertise using GIS to evaluate and process data from numerous sources including AutoCAD, GPS and LiDAR data. Experienced with ESRI ArcMap, ACOE's HEC-RAS, HEC-GeoRAS, LASTools and ArcHydro.

GIS Project Experience:

500 Acre Solar Farm, Mohave, CA - CEQA Level Preliminary Geohazards Investigation for proposed construction of future photovoltaic systems in Mohave, California.

Solar Farm and Aquifer Restoration, Fremont Valley, CA - CEQA Level Preliminary Geohazards Investigation for proposed construction of a 4,800 acre photovoltaic system, included analysis of 37 miles of water lines and 98 miles of transmission lines in Fremont Valley, California.

Putah Creek Restoration Plan, Yolo County, CA*:* Developed supporting documents using GIS for permitting and design of a 2 mile-long watershed restoration project on Putah Creek for the City of Winters and the Putah Streamkeeper.

Lower Putah Creek Restoration Project, Solano and Yolo Counties, CA – BSK provided support activities related to the determination of ordinary high water mark and wetland delineation. Mr. Cline utilized

Martin B. Cline, C.E.G. – Project Geologist

LiDAR to develop a Digital Elevation Model (DEM) for 21 linear miles of Putah Creek for USACE NWP-27 and for a Regional General Permit.

Cache Creek Plans, Yolo County, CA – Provided GIS support. LiDAR vegetation analysis for patch and trajectory modeling, as well as channel migration studies, to technical advisors for approximately 19.5 miles of restoration planning for the Cache Creek Yolo County Resource Management Planning Area.

Professional Organizations

American Society of Civil Engineers

Association of Environmental and Engineering Geologists

ASFE - Professional Firms Practicing in the Geosciences

URISA-Northern California Urban and Regional Information Systems Association

BSK

Kurt Balasek, PG, CHG, QSD – Senior Hydrogeologist

BSK Associates Engineers & Laboratories

Professional Background:

Mr. Balasek is the Sacramento Senior Hydrogeologist for BSK. He has more than 25 years experience providing geologic, hydrogeologic and environmental consulting to western U.S. businesses and government agencies. His experience includes managing teams of scientists and engineers on projects ranging from large-scale brownfield developments, CEQA compliance and groundwater studies. He has provided project management of water resource evaluations and conjunctive use studies, as well as numerous petroleum hydrocarbon-related groundwater contamination investigations and remedial designs. Mr. Balasek has completed geologic hazard studies for proposed school sites in accordance with the Office of State Architect requirements and has completed detailed geologic surface mapping assignments in the foothills of the Sierra Nevada.

Mr. Balasek has spent his career working to evaluate hundreds of properties for the purposes of development, redevelopment and preservation as conservation easements. Conducting or leading these evaluations has given Mr. Balasek vast experience preparing site investigation strategies with an emphasis toward negotiating with regulatory agencies regarding future land use. Mr. Balasek has worked with redevelopment teams in numerous northern California cities and extensively under EPA community-wide assessment grants in the Cities of West Sacramento, Esparto, and Rancho Cordova. He has worked with local, State, and Federal agencies in evaluating a wide range of environmental contaminated and lighted, assessing community needs, and using tools to develop site cleanup goals. His skills of using land use covenants and maintenance tools provides for blighted property that have led to showcases community revitalization efforts. Mr. Balasek has completed numerous landfill characterization studies and provided detailed analysis to assist in consolidation and clean closure decision making.

Representative Project Experience:

City of Rancho Cordova, California, Community Redevelopment Agency, Brownfield Assessments-Mr. Balasek provided senior management oversight on a community-wide assessment of over 460 properties in Rancho Cordova, California. Approximately 30 parcels warranting Phase I and/or Phase II Environmental Site Assessments (ESAs) were identified. To date, a Phase I and II ESA were conducted on two parcels of a planned community college campus.

Qualifications

Registrations:

Professional Geologist, California, No. 6162

Certified Hydrogeologist, California, No. 299

Education:

MS, Hydrogeology, California State University, Chico 1989

BA, Geology. University of California, Santa Barbara, 1985

Experience:

BSK Associates 2009

1991-2009, Wallace-Kuhl Director of Environmental Services

1989 – 1991 Terrestrial Tech. Senior Staff Hydrogeologist

Putah Creek Park North Bank Improvement Project, California-The North Bank Improvement Project stemmed from a federal appropriation of 2 million dollars to enhance the Solano County Transportation Department's automobile bridge replacement at the City of Winters. The project funds are administered by **CalTrans** so extensive coordination with this agency regarding project description and permitting has been a substantial portion of this project. The project was developed by the City of Winters. Mr. Balasek and his team were initially tasked with obtaining the biological opinion for mitigation as it related to disturbance of Valley Elderberry shrubs. Instead of purchasing mitigation credits from a Service-approved mitigation bank, Mr. Balasek and his staff devises a unique plan to develop a small on-site mitigation area within the Winters Putah Creek Nature Park. If approved, the mitigation area will provide enough mitigation credits to offset the Solano County Bridge project, the north bank improvement project and a proposed pedestrian bridge. Money will be set aside for maintenance of the mitigation area in perpetuity but will enable the project proponents to mitigate habitat damage locally and keep local control of the money. To develop this plan, Mr. Balasek and his team developed the financial model to predict the amount of money required to establish a non-wasting endowment. This model was submitted to USFWS and is undergoing review. U.S. Representative Mike Thompson and his staff are involved in the project and are assisting with negotiations with USFWS.

Winters Putah Creek Park Revised Master Plan CEQA Support- Winters, California-Mr. Balasek and his team prepared the Initial Study/Mitigated Negative Declaration (IS/MND) based on the revised master plan for Winters Putah Creek Park. This document was compiled in advance of implementing several projects outlined in the park master plan. The document was reviewed by the Winters City Council and adopted by the Winters planning commission without comment by the trustee agencies and with only one comment from the public. The document framed the foundation for environmental permitting for all of the following restoration-related projects.

City of West Sacramento, Housing and Community Investment Division, West Sacramento, California- Mr. Balasek has managed several Environmental Projects for the City of West Sacramento, including: West Capitol Corridor Study, 427 "C" Street, Tower Court, Sacramento Generator, and Vlad's Toyota.

City of Winters PG&E Training Center, Winters California-During critical property negotiations, due diligence studies revealed the historic presence of an underground fuel storage tank. Me. Balasek we retained by the City on an emergency basis to advise City Council and staff. Mr. Balasek mobilized BSK resources and conducted a comprehensive, soil, groundwater and soil vapor investigation on the site. Mr. Balasek also advised the City throughout the project and represented the City in numerous negotiations with PG&E. As a result of a well planned and executed investigation, a $70 million state-of-the-art training facility project is moving through the CEQA process and is scheduled to break ground late in 2015. This project is a huge success for the small City of Winters and will act as a catalyst for a downtown hotel project. Mr. Balasek's work in the field and at the negotiating table were a key part of the success of this project.

Stockton Worknet Center, Stockton, California-Provided project management for a contaminated site. The site characterization and remediation was funded by a State of California Brownfield Grant. The source of contamination was determined to have come from a pipeline located under railroad tracks. Removal and backfill of soil from an excavation that was 35 feet wide by 400 feet long was completed prior to construction of the new center.

River City Baseball – River Cats Stadium, West Sacramento, California-The site was located adjacent to a chemical mixing plant and as part of the owner's due diligence an environmental assessment was conducted. Contamination of volatile organics was determined and remediation followed. Based on these findings the foundation design was also adjusted to accommodate shallow groundwater. Based on Mr. Balasek's recommendation, Gorsorb™, a passive form of soil vapor testing, was used to delineate the contamination. A Risk Assessment report was provided to determine if the level of contamination exposure based on the properties intended use. All this work was completed at an accelerated pace to facilitate construction.

Colusa County, Three UST Sites, Colusa, California-Underground storage tanks at the County Sheriff's Department, Central Services, and County Jail were removed soil and water samples were tested for contamination. As project manager, Mr. Balasek managed the team who provided soil excavation and shallow groundwater monitoring for petroleum hydrocarbons. The three projects took place concurrently resulting in a cost savings to the county.

Sacramento International Airport Terminal Construction, Sacramento, California-Mr. Balasek and his team installed monitoring wells and conducted aquifer performance tests in advance of massive dewatering efforts to facilitated construction at the new Sacramento International Airport Terminal project. Data developed from this study was used to quantify discharge volumes and evaluate water quality. The data was subsequently used as the basis for dewatering design related to a large basement structure extending approximately 17 feet below grade for the entire terminal building as well as subterranean tunnel structures. The new Sacramento Terminal opened in the fall of 2011.

Yolo Ranch Agricultural Landfill Remediation, Yolo County, California-Provided project management and oversight during landfill excavation and remediation. This project involved careful coordination with regulatory personnel from the Illegal Abandoned Landfill Group at the former California Integrated Waste Management Board to remove and/or encapsulate a wide range of ag-related waste in the Yolo ByPass. The work involved remediation and subsequent site closure of an agricultural landfill adjacent to sensitive natural habitats. This work was done as part of a property transaction and demonstrated creative problem solving that included an on-site solution which saved the client tens of thousands of dollars.

Kurt M. Balasek, PG, CHG, QSD– Senior Hydrogeologist

Butte County, California-Mr. Balasek and his team conducted the base-line hydrogeologic analysis of the site vicinity in support of the gravel mining permit application submitted to Butte County. Mr. Balasek's team also conducted the slope stability evaluations for the propose mine. Both technical documents were used to support an EIR commissioned by Butte County on behalf of the project proponent. In addition, Mr. Balasek's team provided consultation on pit capture and anadromous fish entrapment if high water resulted in overtopping of the pit. The work also involved analyzing resource data to identify the bottom of economically recoverable resource.

Cold Spring Rancheria, Tollhouse, California-Mr. Balasek oversaw the preparation of a comprehensive long range water development program for the Cold Springs Rancheria. This program examined available surface and groundwater resources, outlined potential problems with existing infrastructure and water rights and prioritize projects for improvement. Mr. Balasek and his staff also prepared a revised Quality Assurance Assessment Plan (QAAP) for the Rancheria that outlined procedures for all field sampling activities. These plans were funded by the Bureau of Indian Affairs and are required planning documents in advance of project implementation funding.

Professional Organizations

American Society of Civil Engineers
Association of Environmental and Engineering Geologists
ASFE - Professional Firms Practicing in the Geosciences
Water Resource Association of Yolo County
Winters Education Foundation
City of Winters, Putah Creek Park Committee
Solano Resource Conservation District
Groundwater Resources Association of California

EXHIBIT E

July 13, 2015

Memo

To: Patrick Soluri, Attorney at Law

From: Philip King, Ph.D.

Re: Urban Decay Analysis of Proposed Relocation of Golden State Warriors from Oakland to San Francisco

Upon your request I examined the Environmental Review[1] prepared in conjunction for the proposed relocation of the NBA franchise Golden State Warriors from Oracle Arena in Oakland to San Francisco. The project description for the AB900 Application included significantly reduced events at Oracle Arena in order to take advantage of GHG reductions. However, the project's EIR took an inconsistent approach to the scope of the project, and did not analyze the potential for urban decay resulting from these significant event reductions, which has been recognized as an environmental impact that should be analyzed under the California Environmental Quality Act (CEQA).

My analysis (Table A below and described in more detail in this memo) indicates that the move from Oakland to San Francisco would lead to a direct loss of $44.9 million and 494 jobs. When one also includes the indirect and induced impacts, this impact increases to $86.6 million and 805 jobs.

Although Oakland has benefited from the recent economic recovery, it's well known that the City suffers from high crime rates as well as high levels of blight and urban decay. Indeed, the Oracle Arena is located in a former Redevelopment Area (RDA) that the City declared blighted. Removing these jobs and this economic activity will exacerbate existing urban decay and seriously impact the City's ability to respond to this decay.

[1] See Application for Environmental Leadership Development Project Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 ("AB900 Application").

Table A: Economic Impact of the Golden State Warriors in Alameda County

Economic Impact in Alameda County

Impact Type	Employment	Labor Income	Output
Direct Effect	494.3	$28,490,621	$43,900,000
Indirect Effect	110.8	$6,084,031	$13,153,869
Induced Effect	200.6	$10,746,179	$29,546,005
Total Effect	**805.6**	**$45,320,831**	**$86,599,874**

The Economics of Moving a Basketball Team

A convenient starting point to examine the economic impact of the Golden State Warriors' relocation to San Francisco from Oakland is the Seattle Supersonics' relocation to Oklahoma City. An economic report prepared in conjunction with the move indicated that the departure of the team would result in the loss of 1,200 – 1,300 jobs and $188 million in economic activity, slightly larger than the $170 million that the City of Oklahoma projected it would gain from the arrival of the team. Contrary to both of these projections, a sports economist for the Supersonics testified to the broad consensus within the economics literature that the departure or arrival of a professional sports team has no significant economic impact whatsoever upon the larger metropolitan area as a whole. When pressed by the city's legal team, this economist did, however, concede that the arrival, departure or relocation of a professional sports team can have a measureable effect upon the *distribution* of economic activity within the larger metropolitan area.[2]

There are two primary reasons given within the sports economics literature for why the presence of a professional sports team within a metropolitan area has no significant economic impact: substitution and leakage.

> "Promotional impact studies ignore or underestimate the effects of consumer substitution and leakages from the local economy connected to sports facilities… These studies rely largely on the assumption that all (or much of the) spending on sports teams is new to the local economy and that this spending has a similar effect on the local economy as spending on other consumption goods and services. Both of these assumptions are false." [3]

When a sports team relocates to a city, the money that is spent at its games does not come from outside the metropolitan area, but instead generally comes from money that is already being spent on leisure activity within that same metropolitan area. Similarly, when the team departs, the money that was previously being spent at the games will

[2] http://sports.espn.go.com/nba/news/story?id=3452509
http://www.seattletimes.com/sports/nba/sonics-argue-team-has-little-economic-impact-on-seattle/
http://www.forbes.com/2008/06/25/seattle-supersonics-nba-biz-sports-cx_mw_0625seattle.html
[3] Siegfried, John and Zimbalist, Andrew, "A Note on the Local Economic Impact of Sports Expenditures" Journal of Sports Economics, Vol. 3 No. 4, November 2002, 361-366, http://web.centre.edu/johnsonb/eco406/Apr%2021/seigfried.pdf

now be spent on other leisurely activities within the same area. The amount of money that people spend on leisurely activity is relatively fixed and spending at a sports venue only comes as a substitute for and thus at the expense other venues within the area. "The net effect on spending within the metropolitan area then is zero, or very close to zero. While sports teams may rearrange the spending and economic activity in an urban area, they are not likely to add much to it." [4]

In addition to the high degree of substitution associated with spending on professional sports, a high degree of economic leakage is also cited as a reason for the low impact that a professional sports team has upon a metropolitan area. The professional sports industry involves almost always involves the large transfer of money from local spectators to highly paid athletes and investors whose households typically do not reside and thus do not frequent businesses within the same metropolitan area. This outward flow of money typically cancels out whatever economic activity the team might bring from outside the metropolitan area.

The high degrees of economic substitution and leakage associated with the professional sports industry are responsible for the negligible economic impact that results from the relocation of a professional team from one metropolitan to another. **However, the same cannot be said for the relocation of a professional sports team within the same metropolitan area as in the case of the Golden State Warriors.**

> "Even though it is difficult to justify new stadium construction on economic growth grounds, it is possible that such construction would facilitate efforts to redevelop an urban core… [I]t is possible for sports facilities to reposition economic activity within a metropolitan area." [5]

Since the Warriors are relocating *within* the larger San Francisco/Oakland metropolitan area we can reasonably assume both substitution and leakage will remain constant before and after the move. Whereas we could not say that Oklahoma City was taking economic activity from the City of Seattle since the same fans would no longer be attending Supersonic games, we can, however, say that the City of San Francisco will take economic activity from the City of Oakland since the same fans will continue to attend Warriors games.

[4] Siegfried, John and Zimbalist, Andrew, "The Economics of Sports Facilities and Their Communities", The Journal of Economic Perspectives, Vol. 14, No. 3, (Summer 2000), 95-114, http://www.csus.edu/indiv/h/howellj/econ145_s2009/Assignments/SportsStadiumFunding.pdf See also: http://www.forbes.com/2008/06/25/seattle-supersonics-nba-biz-sports-cx_mw_0625seattle.html

[5] Siegfried, John and Zimbalist, Andrew, "The Economics of Sports Facilities and Their Communities", The Journal of Economic Perspectives, Vol. 14, No. 3, (Summer 2000), 95-114, http://www.csus.edu/indiv/h/howellj/econ145_s2009/Assignments/SportsStadiumFunding.pdf

Reversing Directions across the Bay Bridge

After the relocation of the Warriors from Oakland to San Francisco, spectators from the East Bay will then choose between finding a local substitute within the East Bay and traveling to the West Bay to watch the Warriors games. While it is the case that leisured spending has a high substitution effect over a large community such as a metropolitan area, the same cannot be said for more narrowly deigned areas, such as the East Bay industrial area.

> "A stadium or arena will have more added effects on a very narrowly defined community than on a largely encompassing community. The reason for this is that the more narrowly the host community is defined, the more of the spending at the stadium and the nearby restaurants, bars, and hotels will come from outside the community. However, that spending will come largely at the expense of the home communities of the fans that travel into the stadium from outlying areas. The substitution effect for the broadly defined area is quite large, but for the narrowly defined stadium community it is much smaller. What this points out is that stadiums and sports teams may be a tool for redistributing income in which the people from suburbs subsidize businesses in the city."[6]

Consequently, we can expect that most Warriors fans will continue attending games after the relocation rather than seeking local substitutes. The relocation of the Warriors, then, constitutes a significant redistribution of economic activity within the larger Bay Area.

During the Warriors' 2014/15 season 803,436 fans attended home games in Oakland (34% more than the Supersonic their last season in Seattle) and took in $168 million dollars in total revenue.[7] Table 1 (below) shows that, assuming that the distribution of Warriors spectators is proportionate to the distribution of residents within the larger metropolitan area, $99 million in Warriors revenue came from the East Bay while $69 million came from San Francisco and the Peninsula. It is worth emphasizing, however, that the Warriors relocation to San Francisco does not merely entail that the $69 million will cease coming into the East Bay from the West, but that the additional $99 million that was being spent by local East Bay residents will be lost to San Francisco. Spending in Oakland will decrease by $168 million regardless of where the fans actually reside.

[6] Coates, Dennis and Humphreys, Brad R., "The Stadium Gambit and Local Economic Development" Regulation, Volume 23, No. 2, July 2000, 15-20, http://object.cato.org/sites/cato.org/files/serials/files/regulation/2000/7/coates.pdf

[7] http://www.forbes.com/teams/golden-state-warriors/ http://www.census.gov/popest/data/counties/totals/2013/CO-EST2013-01.html

Table 1. Attendance and Revenue for Warriors' 2014/15 Season

Attendance and Revenue for Golden State Warriors Home Games (2014/15 Reg. Season)			
	Total	East Bay (59%)	West Bay (41%)
Attendance	803,436	475,538	327,898
Spending	$168,000,000	$99,435,935	$68,564,065

Leakage

In the last section we discussed where the money that is spent on Warriors games comes from within the larger Bay Area. In this section we will briefly consider where the money goes after these games, as well as the effect of economic leakage.

Table 2. The Redistribution of Economic Activity due to the Warriors' Relocation

The Redistribution of Economic Activity due to the Golden State Warriors' Relocation			
	Total (millions)	**Percent**	**Redistributed** (millions)
Operating Income:	$44.9	0%	$0.0
Players' Salary:	$78.0	10%	$7.8
Other Expenses:	$45.1	80%	$36.1
Total:	**$168.0**	**26%**	**$43.9**

Table 2 (above) divides up the Warriors' $168 million in total revenue into three categories: operating income, players' salary and other expenses. $44.9 million in operating income is the money that goes to the owners and investors of the Warriors. Since we have little reason to assume that these people live within the larger metropolitan area, let alone the East Bay, we can assume that relocating the team will not redistribute this money to any significant degree. Similarly, only 29% of NBA players live within the same larger metropolitan area as the team they play for[8]. We can also expect a large amount of the $78.0 in Warriors players' salary to be spent outside of, and thus "leak" from the larger San Francisco/Oakland metropolitan area leaving 10%, or $7.8 million to be redistributed within the Bay Area. This leaves $45.1 million that went to other expenses (wages, inventory, etc.) during the 2014/15 season. We assume that 80%, or $36.1 million, was spent within the larger metropolitan area.

[8] Siegfried, John and Zimbalist, Andrew, "A Note on the Local Economic Impact of Sports Expenditures" Journal of Sports Economics, Vol. 3 No. 4, November 2002, 361-366, http://web.centre.edu/johnsonb/eco406/Apr%2021/seigfried.pdf

While $168 million was spent by fans within the Bay Area on Warriors games, we estimate that only 26% or $43.9 million stayed within the area. It is this $43.9 million that will be redistributed from the Easy Bay to the West with the Warriors' relocation. Table 3 (below) lists the most popular professions among the 3,432 Bay Area residents that are employed within the sports spectator industry and gives a general idea regarding how a professional sports team such as the Warriors spend their money[9].

Table 3. Occupations within the Sports Spectator Industry

Employed	Sports Spectator Industry within the San Francisco/Oakland Metropolitan Area	Hourly Wage	Annual Salary
878	Personal Care and Service Occupations	$12.06	$25,080
572	Arts, Design, Entertainment, Sports, and Media Occupations	$31.60	$65,730
559	Entertainment Attendants and Related Workers	$11.32	$23,540
455	Entertainers and Performers, Sports and Related Workers	$33.10	$68,850
402	Athletes, Coaches, Umpires, and Related Workers	*	$72,060
324	Sales and Related Occupations	$15.70	$32,660
285	Office and Administrative Support Occupations	$16.91	$35,170
258	Protective Service Occupations	$15.76	$32,790
251	Food Preparation and Serving Related Occupations	$10.28	$21,380
243	Other Protective Service Workers	$15.26	$31,730
243	Animal Care and Service Workers	$12.49	$25,980
233	Ushers, Lobby Attendants, and Ticket Takers	$10.21	$21,230
3,432	**Industry Total**	**$20.45**	**$42,540**

Economic Impact

In addition to the direct loss of $43.9 million in economic activity to the City of Oakland, there are also indirect and induced effects which are associated with this loss. However, in addition to this direct spending, there are indirect and induced impacts, often referred to as "multiplier effects" –since arena and team spending also generate other jobs and economic activities in the region, and without the Warriors' spending other economic sectors of the Alameda County would shrink as well.

IMPLAN is standard Input/Output software specifically design to project the indirect and induced multiplier effects associated with the Warriors' direct spending in Alameda County. Table 4 (below) lists the economic impact of the Golden State Warriors within Alameda County by impact type. With indirect and induced impacts included, the Warriors generate 805 jobs and $86.6 million in economic activity. Table 5 (below) lists 10 most impacted industries within the county. In addition to the 547 jobs and $48.6 million in economic activity created within spectator sports industry, food and drinking

[9] http://www.bls.gov/opub/ted/2014/ted_20140131.htm

places, real estate establishments, private hospitals and other physicians are significantly affected by the East Bay presence of the Warriors.

Table 4. Economic Impact of the Golden State Warriors in Alameda County

Economic Impact in Alameda County

Impact Type	Employment	Labor Income	Output
Direct Effect	494.3	$28,490,621	$43,900,000
Indirect Effect	110.8	$6,084,031	$13,153,869
Induced Effect	200.6	$10,746,179	$29,546,005
Total Effect	**805.6**	**$45,320,831**	**$86,599,874**

Table 5. Industries in Alameda County Impacted by the Golden State Warriors

Industries in Alameda County Impacted by the Golden State Warriors

Description	Employment	Labor Income	Output
Spectator sports companies	547.3	$31,541,779	$48,601,401
Food services and drinking places	25	$617,563	$1,701,992
Real estate establishments	13.1	$299,013	$2,820,104
Promoters and agents for public figures	12.9	$133,694	$717,837
Private hospitals	11.6	$1,363,445	$2,336,587
Physicians and other health practitioners	10.4	$886,704	$1,498,858
Employment services	7.2	$287,482	$370,425
Retail Stores - Food and beverage	7.2	$290,137	$520,763
Nursing and residential care facilities	6.5	$274,706	$490,435
Private household operations	6.5	$77,727	$82,572
All Industries	**805.6**	**$45,320,831**	**$86,599,874**

Urban Decay

Although the EIR ignores the issue in the context of urban decay impacts, the EIR and AB900 Application conclude that that Oracle Arena will continue to operate with approximately 21 events per year. This is an impractical assumption from an economic perspective. As a practical matter, one of two outcomes will occur. The first possible outcome is that the Oracle Arena will continue to operate by attracting more than 21 non-NBA events per year.

The second possible outcome is that Oracle Arena will close without the Golden State Warriors. I spoke with Alexander Michael, an expert on the business and financing of

sporting arenas. Based on that information, a strong argument exists that the Oracle Arena (or indeed any similar venue in a similar situation) will not be viable without the Golden State Warriors and there are no other sports teams in the offing for this venue. A similar case is the IZOD center located in East Rutherford, New Jersey. The IZOD center housed the New Jersey Devils hockey team Nets NBA basketball team until they left in 2007. The IZOD arena also hosted the New Jersey Nets basketball team, who left in 2010. The State of New Jersey attempted to keep the Izod arena open for many years. However, the demand for other events such as concerts, ice shows, etc., was insufficient. As with the Oracle arena in Oakland, the Izod arena is located near a number of other sports venues and near Manhattan, which offers a wide variety of venues. The Izod arena shutdown earlier this year after an official forecast that the center would lose $8.5 million a year.[10]

It is difficult to determine which outcome is more likely since the EIR ignored the issue of potential urban decay associated with reduced events at Oracle Arena. The EIR should have included an economic impacts analysis that would have provided more information about the ultimate fate of Oracle Arena and, by extension, impacts to the physical environment.

Once the Oracle arena has been shutdown, it would be extremely difficult and expensive to repurpose the arena for other activities and thus it will almost certainly be shuttered and perhaps demolished at some future date. A closed arena will be a magnet for graffiti, crime, drug deals and other signs of urban decay. The City of Oakland can mitigate for this urban decay, but it would involve a costly increase in police and other public safety officials.

The City of Oakland and Alameda County are obligated to a $79.7 million dollar Lease Revenue Bond that must be paid or default. Without revenues from the Oracle Arena the bond would either go into default or the City/County would have to pay the principal and interest on the bond. If the City County pay out of their General Fund dollars, it will reduce their ability to fund other needed public services. If the default it could damage their credit rating and make it more difficult to finance other future (non-sports) projects which could enhance the welfare of the City and County

Oakland was rated the third most dangerous City in the Country in 2012.[11] According to the FBI, Oakland had the highest crime rate of any major City in California[12] and this year (2015) homicides in Oakland are on track to exceed 2014.[13]

[10] See http://www.nytimes.com/2015/01/16/nyregion/deserted-by-devils-nets-and-profits-izod-center-in-north-jersey-is-to-close.html?_r=0.

[11] See http://www.forbes.com/sites/danielfisher/2012/10/18/detroit-tops-the-2012-list-of-americas-most-dangerous-cities/.

[12] See https://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2013/crime-in-the-u.s.-2013/tables/table-8/table-8-state-cuts/table_8_offenses_known_to_law_enforcement_california_by_city_2013.xls.

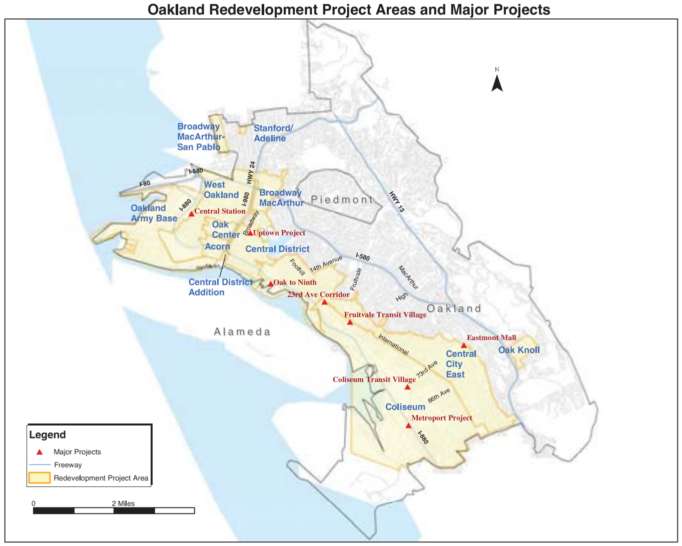
[13] See https://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2013/crime-in-the-u.s.-2013/tables/table-8/table-8-state-cuts/table_8_offenses_known_to_law_enforcement_california_by_city_2013.xls.

The City declared the area blighted and formed a redevelopment area (see Figure 1 below). Although Redevelopment Areas have been disbanded, the blight issues remain. Indeed, the suspension of RDAs eliminates a funding stream for the City to help ameliorate urban decay and blight.

The reduction in economic activity also significantly reduces the tax base for the City that reduces its ability to mitigate for urban decay and provide police and other public safety officials.

In my professional opinion, this issue (urban decay) should have been identified in any environmental analysis and mitigated where possible. A number of mitigation options are available including: (1) paying a mitigation fee to the City of Oakland, (2) preserving some of the jobs for Oakland residents; (3) shifting some of the taxes/fees to the City of Oakland. Without any kind of urban decay analysis none of these mitigation options are possible.

Oakland Redevelopment Project Areas and Major Projects



Source: City of Oakland, Community Economic Development Agency
Map produced by the Urban Strategies Council, June 2004

Figure 1: Oakland Redevelopment Area

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Education:

July, 87 — **Ph.D. in ECONOMICS** — **CORNELL UNIVERSITY**
Fields: Applied Microeconomics, Economic Development, International Economics
Dissertation: Bargaining between Multinational Corporations and Less Developed Countries over Mineral Concessions Contracts.

May, 78 — **B. A. in PHILOSOPHY & ECONOMICS** — **WASHINGTON UNIVERSITY**
Nominated to Omicron Delta Epsilon (Economics Honor Society.)

Work Experience:

1/06-present	**ASSOCIATE PROFESSOR**	**SAN FRANCISCO STATE UNIVERSITY**
9/02-12/05	**CHAIR, ECONOMICS DEPARTMENT**	**SAN FRANCISCO STATE UNIVERSITY**
9/93-present	**ASSOCIATE PROFESSOR**	**SAN FRANCISCO STATE UNIVERSITY**
9/87-9/93	**ASSISTANT PROFESSOR**	**SAN FRANCISCO STATE UNIVERSITY**
9/83-5/85	**ASSISTANT PROFESSOR, ECONOMICS**	**S.U.N.Y. at CORTLAND**

Current Policy Work

- Improving Current Mitigation Strategies for the California Coastal Commission, including adding mitigation for Ecological Losses (Grant through SFSU).
- Economics of Sea Level Rise in Southern Monterey Bay (Grant from the Coastal Conservancy funded through The Nature Conservancy).
- Economic Analysis provided for City of Goleta Sea Level Rise Vulnerability Assessment (w. David Revell).
- Economic Analysis provided for San Luis Obispo County Coastal Sediment Master Plan (w. Everest Consulting).

Recent Refereed Papers:

"Can California Coastal Managers Plan for Sea-Level Rise in a Cost-Effective Way?", Journal of Environmental Planning and Management, January 2015.

"The Economic Costs of Sea Level Rise to California Beach Communities," w. A. McGregor and J. Whittet, California Resources Agency & Dept. of Boating and Waterways (Refereed through California Ocean Science Trust).

"Size Matters: The Economic Value of Beach Erosion and Nourishment in Southern California', with L. Pendleton, C. Mohn, R. Vaughn, and J. Zoulas., *Contemporary Economic Policy*, April 2012.

"Who's Counting: An Analysis of Beach Attendance Estimates in Southern California," w. A. McGregor, *Ocean and Coastal Management*, March 2012, Pages 17–25.

“ESTIMATING THE POTENTIAL ECONOMIC IMPACTS OF CLIMATE CHANGE ON SOUTHERN CALIFORNIA BEACHES,” with L. Pendleton, C. Mohn, D. G. Webster, R. Vaughn, and P. Adams, *Climatic Change,* 2011, Volume 109, Issue 1.

“Economic Analysis of Reconfiguring the Long Beach Breakwater,” w. A. McGregor, *Shore and Beach*, April/May 2011.

"Potential Loss in GNP and GSP from a Failure to Maintain California’s Beaches", Fall 2004, with Douglas Symes, *Shore and Beach*.

Professional Services:

Member of Editorial Board, Journal of Ocean and Coastal Economics (JOCE), New Journal, Berkeley Electronic Press.

Books: *International Economics and International Economic Policy*, 5th Edition, McGraw-Hill, 2009.

International Economics and International Economic Policy, 4th Edition, McGraw-Hill, 2004.

International Economics and International Economic Policy, 3rd Edition, McGraw-Hill, 2000.

International Economics and International Economic Policy, 2nd Edition, McGraw-Hill, 1995.

International Economics and International Economic Policy, 1st Edition, McGraw-Hill, 1990.

Policy Papers prepared for Government and Non-Profit Organizations:

Adapting to Coastal Erosion in Southern Monterey Bay, w. D. Revell, B. Battalio., M. Caldwell, E. Thornton and A. McGregor.

Contributed Economics portion of Regional Sediment Master Plan for San Francisco, Pacifica and Daly City, with PWA/ESA.

Contributed Economics portion of Regional Sediment Master Plan for BEACON (Beach Erosion Authority for Clean Oceans and Nourishment—Santa Barbara and Ventura Counties), February 2009, with Noble Consultants.

ESTIMATING THE POTENTIAL ECONOMIC IMPACTS OF CLIMATE CHANGE ON SOUTHERN CALIFORNIA BEACHES, prepared for the California Energy Commission (Energy Commission) and the California Environmental Protection Agency (Cal/EPA), with Linwood Pendleton, Craig Mohn, D. G. Webster, Ryan K. Vaughn, and Peter Adams.

Prepared for the City of Stockton: Economic Analysis of A Proposed Ordinance to Limit Grocery Sales at Superstores in Stockton, California, May 10, 2007

Contributed Economics Portion of: "The ARC GIS Coastal Sediment Analysis Tool: A GIS Support Tool for Regional Sediment Management Program: White Paper, Draft Technical Report for U.S. Army Corps of Engineers, by Ying Poon (Everest Consultants), Los Angeles District, April 2006.

Contributed Economics Portion of: "Coastal Sediment Analysis Tool (CSBAT) Beta Version--Sediment Management Decision Support Tool for Santa Barbara and Ventura Counties," Draft Technical Report for U.S. Army Corps of Engineers, by Ying Poon (Everest Consultants), Los Angeles District, June 2006.

"The ArcGIS Coastal Sediment Analyst: A Prototype Decision Support Tool for Regional Sediment Management, John Wilson et. al., USC Geography Department, 2004 (contributed economic analysis for paper).

"The Economic of Regional Sediment Management in Ventura and Santa Barbara Counties," prepared for the California State Resources Agency, Final draft (refereed) , Fall 2006, prepared for the Coastal Sediment Management Work group (CSMW).

"The Potential Loss in GNP and GSP from a failure to Maintain California's Beaches," with Douglas Symes, prepared for the California State Resources Agency, 2002, http://userwww.sfsu.edu/~pgking/pubpol.htm.

"The (Economic) Benefits of California's Beaches,” prepared for the California State Resources Agency, 2002, http://dbw.ca.gov/beachreport.htm.

"The Economic and Fiscal Impact of Beach Recreation in San Clemente," presented as part of Hearings on Congressional Appropriations for California Coastal Projects, US House of Representatives, April 2002. Also completed similar projects for Cities of Carlsbad, Carpinteria, Encinitas, and Solana Beach.

"Do Beaches Benefit Local Communities?: A Case Study of Two California Beach Towns," Fall 2002, *Proceedings of the Conference on California and the World Oceans*.

San Francisco's Economic Growth 1995-2000: The Fiscal Health of the City and Implications for the Future**,”** prepared for the San Francisco Committee on Jobs Summer 2001. This report was widely cited in the San Francisco press including front page articles by the *Chronicle* and *Examiner*.

"The Demand for Beaches in California," prepared for the California Dept. of Boating and Waterways, Spring 2001.

"Cost Benefit Analysis of Shoreline Protection Projects in California," prepared for the California Dept. of Boating and Waterways, Spring 2000.

"The Fiscal Impact of Beaches in California," prepared for the *Public Research Institute*, San Francisco State University, Fall 1999, available at http://online.sfsu.edu/~pgking/beaches.htm.

"An Economic Analysis of Coastal Resources on the Majuro Atoll," prepared for the *United Nations Development Program* Project MAS 95/001/D01/99 and the *Majuro Atoll Local Government*, September, 1997.

"The Economic Impact of California's Beaches," prepared for the *Public Research Institute*, San Francisco State University, Summer, 1997 (with Michael Potepan.)

"The Revenue Impact of the Proposed Marine Link Pipeline System in Richmond, California," prepared for the *Public Research Institute*, San Francisco State University, Spring, 1997 (with Ted Rust.)

"The Economic Impact of California's Ports and Harbors," prepared for the *Public Research Institute*, San Francisco State University, Spring, 1997 (with Ted Rust).

Public Testimony:

Testified and prepared report to the California Coastal Commission in San Diego on the economic loss due to a proposed seawall at Las Brisas, Solana Beach, California, 2005.

Submitted testimony for over forty urban decay cases in California.

Current SFSU Committees:

Member, SFSU Foundation Investment Committee and member of SFSU Foundation. Chair of Finance and Investment Committee 2006-2014.

Chair, SFSU University Corporation Finance Committee and member of University Corporation Board.

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July 26, 2015

Ms Tiffany Bohee
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Re: **Air Quality Impacts** - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter.

This letter incorporates by reference, as comments on the DSEIR, all of the comments on the DSEIR contained in the July 19, 2015, letter report authored by Greg Gilbert (attached as Exhibit 1) and the July 20, 2015, letter report authored by Paul Rosenfeld and Jessie Jaeger (attached as Exhibit 2).

I. The DSEIR Is Not Sufficient as an Informational Document with Respect to Air Quality Impacts.

A. Dust: the DSEIR's impact assessment for construction-related dust pollution is based on legal errors and not supported by substantial evidence.

Regarding dust pollution, the DSEIR states:

> The site-specific Dust Control Plan would require the project sponsor to: submit a map to the Director of Public Health showing all sensitive receptors within 1,000 feet of the site; wet down areas of soil at least three times per day; provide an analysis of

> wind direction and install upwind and downwind particulate dust monitors; record particulate monitoring results; hire an independent, third-party to conduct inspections and keep a record of those inspections; establish shut-down conditions based on wind, soil migration, etc.; establish a hotline for surrounding community members who may be potentially affected by project-related dust; limit the area subject to construction activities at any one time; install dust curtains and windbreaks on the property lines, as necessary; limit the amount of soil in hauling trucks to the size of the truck bed and securing with a tarpaulin; enforce a 15 mph speed limit for vehicles entering and exiting construction areas; sweep affected streets with water sweepers at the end of the day; install and utilize wheel washers to clean truck tires; terminate construction activities when winds exceed 25 mph; apply soil stabilizers to inactive areas; and sweep off adjacent streets to reduce particulate emissions. The project sponsor would be required to designate an individual to monitor compliance with these dust control requirements.

(DSEIR, p. 5.4-30.)

The Dust Control Plan is either part of the project description, or a mitigation measure, or both. Either way, what the Project Sponsor is actually going to do to control dust - on the ground - must be described. Otherwise, the DSEIR violates CEQA.

If the Dust Control Plan is part of the project description, the DSEIR fails to present a complete project description, making it impossible for the public or other agencies to comment on the potential environmental impacts of this part of the project.

If the Dust Control Plan is a mitigation measure, the DSEIR defers the development of this mitigation measure until after Project approval, without meeting CEQA requirements for doing so, because (1) Article 22 B specifies a suite of measures but does not require the adoption of any in particular, (2) the DSEIR does not specify a performance standard by which the success of the Dust Control Plan can be judged, and (3) there is no evidence it is impracticable to develop and include the Dust Control Plan in the DSEIR, before project approval. (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 95 (*CBE*); *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; 1394 (*Gentry*).

Also, by failing to identify the Dust Control Plan as a CEQA mitigation measure, the DSEIR throws the enforceability of the Plan under CEQA into doubt. (See *Federation of Hillside & Canyon Associations v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1260-1262; *Lincoln Place Tenants Association v. City of Los Angeles* (2005) 130 Cal.App.4th 1491, 1508 ["mitigating conditions are not mere expressions of hope..."].)

B. Criteria air pollutants: the DSEIR's impact assessment for construction and operational criteria air pollutants is based on legal errors and not supported by substantial evidence.

1. The City cannot use the DSEIR's thresholds of significance for criteria air pollutants until it formally adopts them in a rule--making procedure.

The DSEIR's thresholds of significance are:

> For the impacts analyzed in this section, the project would have a significant impact related to air quality if it were to:
> ● Conflict with or obstruct implementation of the applicable air quality plan;
> ● Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
> ● Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
> ● Expose sensitive receptors to substantial pollutant concentrations; or
> ● Result in a cumulative air quality impact in combination with past, present and reasonably foreseeable future projects in the vicinity.

(DSEIR 5.4-23.)

For criteria pollutants, the DSEIR uses numerical thresholds of significance borrowed from the Bay Area Air Quality Management District ("BAAQMD") for ROG (54 lbs/day); NOx (54 lbs/day); Exhaust PM10 (82 lbs/day); Exhaust PM2.5 (54 lbs/day).

> The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants that may contribute to an existing or projected air quality violation is based on the State and federal Clean Air Acts emissions limits for stationary sources. To ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors ROG and NOx, the offset emissions level is an annual average of 10 tons per year (or 54 pounds (lbs.) per day). These levels represent emissions below which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants that could result in increased health effects.

(DSEIR p. 5.4-25; see also p. 5.4-31.)

The City uses these numerical thresholds of significance for virtually all land use development projects in the city that require CEQA review. This is shown by the following sample of excerpts from recent Environmental Impacts Reports and Negative Declarations attached hereto as Exhibits 4 through 16. All of them use the BAAQMD numbers as the thresholds of significance for these pollutants.

Therefore, the City is required to undertake its own rule-making proceeding to adopt these thresholds as its own and determine in a public process that they are supported by substantial evidence.

> (b) Thresholds of significance to be adopted for general use as part of the lead agency's environmental review process must be adopted by ordinance, resolution, rule, or regulation, and developed through a public review process and be supported by substantial evidence.
> (c) When adopting thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence.

(CEQA Guideline, § 15064.7.) Since the City has not formally adopted the air quality significance thresholds in a public process supported by substantial evidence, it cannot use these thresholds on an ad hoc basis as it has done in this EIR.

2. The DSEIR's numerical thresholds of significance for criteria pollutants (ozone precursors, PM10, PM2.5) borrowed from the BAAQMD are invalid.

As noted above, for its impact assessment and mitigation strategy for criteria pollutants, the DSEIR uses numerical thresholds of significance borrowed from the BAAQMD. But the DSEIR cannot merely reference a project's compliance with another agency's regulations. Lead agencies must conduct their own fact-based analysis of project impacts, regardless of whether the project complies with other regulatory standards.

The result of using these thresholds is a deeply misleading impact assessment and mitigation strategy because using these invalid thresholds allows the DSEIR to avoid finding impacts are significant, and it allows the DSEIR to understate the severity of impacts deemed "significant" because it implies that most of the quantity of emissions below the thresholds are not "significant." Also, using these invalid thresholds underestimates the degree of mitigation required to reduce significant impacts to less then significant, and therefore, the DSEIR curtails its consideration of the feasibility of additional mitigation measures that could further substantially reduce emissions.

The numerical thresholds borrowed from the BAAQMD are logically and legally invalid, and

they are not supported by substantial evidence. The thresholds are contained in the BAAQMD's "CEQA Air Quality Guidelines."[1] But neither the DSEIR or the BAAQMD CEQA Air Quality Guidelines describe any evidence that might support the use of these thresholds. The same is true of BAAQMD's other publications relating to these thresholds, i.e., Appendix D of the BAAQMD CEQA Air Quality Guidelines, BAAQMD's Revised Draft Options and Justification Report, (October 2009), and the Bay Area AQMD Proposed Air Quality CEQA Thresholds of Significance, published May 3, 2010.

While these BAAQMD publications purport to include substantial evidence supporting the use of these thresholds for all criteria air pollutants for which the Bay Area is in non-attainment, they do not. Instead, the BAAQMD CEQA Air Quality Guidelines merely provide policy rationales for why it is a good idea to have thresholds of significance. Nowhere does the document actually provide evidence for why any number of pounds per day below, for example, 54 for NOx or ROG, is not "cumulatively considerable."

The BAAQMD's Revised Draft Options and Justification Report (October 2009) states the thresholds "are based on the trigger levels for the federal New Source Review (NSR) Program and BAAQMD's Regulation 2, Rule 2 for new or modified sources." (See page 2.) These New Source Review Program rules provides that any new source that will emit pollutants above the levels stated in the left hand column of Table 4 (e.g., 10 lbs/day of NOx and ROG) must impose "Best Available Control Technology ("BACT")." (Id. pp. 16-17.) These rules also provide that any new source emitting pollutants above the levels stated in the right hand column of Table 4 (e.g., 54 lbs/day of NOx and ROG) must offset all emissions. (Id. pp. 16-17.)

In addition to the inherent flaws in the NSR rules described above, it is inappropriate to base the EIR's significance determination for purposes of CEQA on the Air District's "triggers" for an entirely different regulatory program, i.e., New Source Review under the Clean Air Act ("CAA").[2] One of CEQA key purposes is to require "disclosure" of significant impact, and it allows agencies to approve projects where emissions exceed its thresholds of significance after feasible mitigations are first adopted and as long as the project's benefits outweigh the environmental harm. The CAA, in contrast, is not primarily concerned with public disclosure, and it provides absolute limits on emissions (i.e., the offset triggers in Table 4) that cannot be exceeded under any circumstances. A

[1] The BAAQMD CEQA Air Quality Guidelines were published May 2010, and updated May 3, 2011.

[2] The CAA establishes health-based ambient air quality standards and ranks air districts nationwide based on their level of attainment of those standards. The CAA also establishes a timetable for air districts to reach attainment, and authorizes specific penalties where a deadline is not met. CEQA, on the other hand, requires lead agencies to analyze and discuss significant impacts on air quality, and to continue to mitigate those impacts so long as they remain significant or no additional mitigation is feasible.

standard that shuts down economic activity (i.e., the CAA offset standard) is necessarily and appropriately different than a standard (i.e. a CEQA threshold of significance) that requires disclosure of the impact to the public and the adoption of feasible mitigation measures.

Indeed, if it is possible to borrow any CAA NSR standard for use as a CEQA threshold of significance, it would be the BACT triggers in Table 4 (i.e., when ROG or NOx emissions exceed only 10 lbs/day), because those standards force the adoption of feasible mitigation measures, similar to CEQA's thresholds of significance.

NSR Regulation 2, Rule 2 for new or modified sources requires that if ozone precursor emissions exceed 54 lbs per day (i.e., 10 tpy), the polluter must offset *all* emissions. In contrast, the DSEIR Mitigation Measure M-AQ-2b only requires offsetting emissions above 54 lbs per day (i.e., 10 tpy). This BACT standard is much lower than the NSR offset standard and the DSEIR's threshold of significance of 54 lbs/day. But, there is no parallel requirement in the DSEIR for imposing anything like BACT to this Project's construction or operational emissions that exceed 10 lbs/day.

Regarding NSR Regulation 2, Rule 2's offset standards (i.e., 54 lbs/day for ROG or NOx), the BAAQMD's Revised Draft Options and Justification Report (October 2009) observes: "These levels represent a cumulatively considerable contribution."[3] But there is no evidence that emissions below these thresholds are not also "cumulatively considerable."

Moreover, regardless of any evidence included in these other BAAQMD documents, no such evidence can overcome a fundamental logical and legal flaw in the EIR's assumption that these thresholds are appropriate for the purpose for which the DSEIR uses them. Using the DSEIR's logic, if the City finds that one project will add 53 lbs/day of ozone precursors, it is considered a less-than-significant impact, but if that project will add 55 lbs/day of ozone precursors, it is considered significant. Yet, if the City approved two new large projects in the area in the same 2- or 3-year period, or where operational impacts cause increased emissions, each emitting 53 lbs/day of ozone precursors, it is considered a less-than-significant impact even though the total of the two added together equals 106 lbs/day of ozone precursors!

This scenario is not hypothetical; it is unfolding in San Francisco, and in the Mission Bay area now. (See Table 3, July 21, 2015, letter report by traffic engineer Larry Wymer, attached as Exhibit 2 to the July 27, 2015, letter from this office regarding impacts on Transportation for a list of project undergoing or about to undergo construction in this area of San Francisco.) As a result, the thresholds violate a fundamental CEQA principal that regardless of whether projects' incremental impacts are deemed insignificant in isolation, they may be cumulatively significant.

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[3]Exhibit 4, p. 2.

The significance of a cumulative impact depends on the environmental setting in which it occurs, especially the severity of existing environmental harm. (*Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120 ("*CBE*") ["[T]he relevant question"... is not how the effect of the project at issue compares to the preexisting cumulative effect, but whether "any additional amount" of effect should be considered significant in the context of the existing cumulative effect. [footnote omitted] In the end, the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant. [footnote omitted]"]; *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 720-721.)

This area is in "non-attainment" status under federal and state clean air laws for these criteria pollutants; and this project, along with many others, will substantially contribute to that existing significant adverse impact. There is no evidence to the contrary. The City's untenable position is that public agencies in the Air Basin can approve project after project, each emitting (in the case of ozone precursors) up to 54 lbs/day of new and additional ozone precursors, without ever causing a cumulatively considerable increase in air pollution. This approach runs counter to the reason for conducting cumulative impact analysis. If the City (and other agencies in the Air Basin) continues to find that projects that make air quality worse - when it is already significantly degraded - do not have a significant adverse cumulative impact on air quality, then the City will have no legal obligation to adopt feasible mitigation measures to reduce the significant cumulative impact.

Here, the BAAQMD CEQA Guidelines present ample evidence that the Bay Area's air quality is degraded and has been for a very long time. Therefore, the idea that agencies can forever approve multiple projects that each add 53 lbs of ROG and NOx to the air every day and never be deemed cumulatively considerable is absurd. Rather than explain why this is not true, the BAAQMD documents simply ignore the issue.

The DSEIR's use of the BAAQMD thresholds of significance is erroneous as a matter of law for several other reasons.[4] The DSEIR cannot merely reference a project's compliance with another agency's regulations. Lead agencies must conduct their own fact-based analysis of project impacts, regardless of whether the project complies with other regulatory standards. The DSEIR uses BAAQMD's thresholds of significance uncritically, without any factual analysis of its own, in violation of CEQA.[5] This uncritical application of the BAAQMD's thresholds of significance

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[4] *Endangered Habitats League v County of Orange* (2005) 131 Cal.App.4th 777, 793 ("The use of an erroneous legal standard [for the threshold of significance in an EIR] is a failure to proceed in the manner required by law that requires reversal.").

[5] *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1109 [underscore emphasis added], citing *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 114 ("*CBE*"); accord *Mejia v. City of Los Angeles*

represents a failure of the City to exercise its independent judgment in preparing the DSEIR.[6] Just as disagreement from another agency does not deprive a lead agency of discretion under CEQA to judge whether substantial evidence supports its conclusions,[7] agreement from another agency does not relieve a lead agency of separately discharging its obligations under CEQA. The BAAQMD CEQA Guidelines do not provide any factual explanation as to why the 54 lbs. per day standard represents an appropriate threshold for judging the significance of project-level ozone pollution impacts. More importantly, the DSEIR also fails to include any such explanation, and is therefore inadequate as a matter of law.[8] It is well-settled that compliance with other regulatory standards cannot be used under CEQA as a basis for finding that a project's effects are insignificant, nor can it substitute for a fact-based analysis of those effects.[9]

Also, the DSEIR's reliance on information not contained in the DSEIR for purposes of showing these thresholds are supported by substantial evidence violates CEQA's informational requirements. (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 405 ["whatever is required to be considered in an EIR must be in that formal report; what any official might have known from other writings or oral presentations cannot supply what

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(2005) 130 Cal.App.4th 322, 342 ["A threshold of significance is not conclusive...and does not relieve a public agency of the duty to consider the evidence under the fair argument standard."].)

[6] *Friends of La Vina v. County of Los Angeles* (1991) 232 Cal.App.3d 1446.

[7] *California Native Plant Society v. City of Rancho Cordova* (2009) 172 Cal.App.4th 603, 626.

[8] *Santiago County Water Dist. v. County of Orange*, *supra*, 118 Cal.App.3d 818.

[9] *See*, e.g., *Californians for Alternatives to Toxics v. Department of Food & Agriculture* (2005) 136 Cal.App.4th 1, 16 (lead agencies must review the site-specific impacts of pesticide applications under their jurisdiction, because "DPR's [Department of Pesticide Regulation] registration does not and cannot account for specific uses of pesticides..., such as the specific chemicals used, their amounts and frequency of use, specific sensitive areas targeted for application, and the like"); *Citizens for Non-Toxic Pest Control v. Department of Food & Agriculture (*1986) 187 Cal.App.3d 1575, 1587-1588 (state agency applying pesticides cannot rely on pesticide registration status to avoid further environmental review under CEQA); *Oro Fino Gold Mining Corporation v. County of El Dorado* (1990) 225 Cal.App.3d 872, 881-882 (rejects contention that project noise level would be insignificant simply by being consistent with general plan standards for the zone in question). *See also City of Antioch v. City Council of the City of Pittsburg* (1986) 187 Cal.App.3d 1325, 1331-1332 (EIR required for construction of road and sewer lines even though these were shown on city general plan); *Kings County Farm Bureau v. City of Hanford*, *supra*, 221 Cal.App.3d at pp. 712-718 (agency erred by "wrongly assum[ing] that, simply because the smokestack emissions would comply with applicable regulations from other agencies regulating air quality, the overall project would not cause significant effects to air quality.").

is lacking in the report"]; *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 442 ["[I]nformation 'scattered here and there in EIR appendices' or a report 'buried in an appendix,' is not a substitute for 'a good faith reasoned analysis'"], 443 ["The audience to whom an EIR must communicate is not the reviewing court but the public and the government officials deciding on the project. That a party's briefs to the court may explain or supplement matters that are obscure or incomplete in the EIR, for example, is irrelevant ... The question is therefore not whether the project's significant environmental effects *can* be clearly explained, but whether they *were*"] (emphasis in original).)

Finally, the attached report by Greg Gilbert and Paul Rosenfeld and Jessie Jaeger detail additional reasons why the DSEIR has not adequately supported its use of these thresholds.

3. The DSEIR's impact assessments for construction related criteria pollutants (ozone precursors, PM10, PM2.5) and TAC emissions are invalid.

DSEIR Table 5.4-8 shows construction-related daily emissions of the ozone precursor ROG at 47 lbs/day (mitigated by Tier 2 and NOx VDECS engines) or 49 lbs/day (mitigated by Tier 4 engines) and of the ozone precursor NOx at 144 lbs/day (mitigated by Tier 2 and NOx VDECS engines) or 73 lbs/day (mitigated by Tier 4 engines).

The DSEIR's impact assessments for construction-related ozone precursor emissions are invalid because the DSEIR uses the invalid thresholds of significance discussed above.

Because NOx construction-related emissions are reported as higher than the applicable (but invalid) threshold of significance for ROG (i.e., 54 lbs/day), the DSEIR concludes the Project's impact on ozone pollution is significant. While this conclusion is correct, it is also misleading because it understates the severity of the impact deemed "significant." The DSEIR implies that the only fraction of the Project's NOx emissions that are "significant" is the fraction above 54 lbs/day. But as discussed above, this threshold of significance is invalid. Using this invalid threshold implies that most of the quantity of emissions below the threshold are not "significant." (*Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831 ["The conclusion that one of the unavoidable adverse impacts of the project will be the 'increased demand upon water available from the Santiago County Water District' is only stating the obvious. What is needed is some information about how adverse the adverse impact will be"].)

The DSEIR assumes that adoption of Mitigation Measure M-AQ-1, requiring use of off-road equipment with engines meeting Tier 2 or Tier 4 standards, will reduce construction-related ROG emissions to 47 or 49 pounds per day, respectively, which are both below the applicable (but invalid) threshold of significance for ROG (i.e., 54 lbs/day). (DSEIR, p. 5.4-33, Table 5.4-8.) But equipment meeting Tier 2 or Tier 4 standards are not sufficiently available to meet either requirement. (See Exhibit 2.) Therefore, the impact assessment must be recalculated to more realistically estimate the percentage of construction equipment that will meet Tier 2 or 4 standards.

Also, the DSEIR incorrectly utilizes a default hauling trip length of 20-miles, provided by the California Emissions Estimator Model ("CalEEMod"), to determine the on-road hauling emissions that would occur during construction. Using this default value, rather than a site-specific trip length to the actual haul destination, results in an underestimation of the Project's construction emissions. Therefore, the impact assessment must be recalculated to realistically account for the actual haul destination of the excavation spoils. (See Exhibit 2.)

a. Mitigation Measure M-AQ-1 does not comply with CEQA's legal requirements.

Mitigation Measure M-AQ-1 (at DSEIR, p. 5.4-35) does not comply with CEQA's legal requirements. As discussed above, the requirement that off-road equipment meet Tier 2 standards is illusory, and therefore ineffective, because the Project Sponsor will not be able to obtain enough equipment meeting this standard.

M-AQ-1 includes a limit on idling time of two minutes, and provides exceptions to this limit as provided in state law (DSEIR, p. 5.4-36), but utterly fails to describe what these exceptions are. The DSEIR must fully describe this measure in order for the public and City decision makers to assess its effectiveness.

M-AQ-1 requires the Project Sponsor prepare a Construction Emissions Minimization Plan, and the Project Sponsor must certify compliance with the Plan. (DSEIR, p. 5.4-36.) This is asking the fox to guard the henhouse. (See Exhibit 1.)

4. The DSEIR's impact assessments for operational criteria pollutants (ozone precursors, PM10, PM2.5) and TAC emissions are invalid.

The operational impact assessment for ozone precursor, PM10, PM2.5 and TAC emissions is invalid for many reasons.

DSEIR Table 5.4-9 shows operational daily emissions of criteria pollutants as follows:

ROG:	79 lbs/day [14 tpy]
NOx:	124 lbs/day [23 tpy]
PM10:	80 lbs/day [14.6 tpy]
PM2.5:	25 lbs/day [4.5 tpy]

(DSEIR, p. 5.4-39.)

The DSEIR's impact assessments for these criteria pollutants emissions are invalid because

they are based on the invalid thresholds of significance discussed above.

Because construction-related emissions of ROG and NOx are higher than the applicable (but invalid) threshold of significance for these pollutants, the DSEIR concludes the Project's impact on ozone pollution is significant. As discussed above, while correct, this conclusion is misleading because it understates the severity of the impact deemed "significant" by implying that the only fraction of the Project's NOx emissions is are "significant" is the fraction above 54 lbs/day.

The DSEIR's impact assessment for operational ozone precursor emissions is also misleading because it omits from its quantitative tally of criteria pollutants the emissions the Project will generate in San Francisco and the Mission Bay neighborhood from basketball game-associated "vehicle miles traveled" (DSEIR, p. 5-37.) The DSEIR's rationale for this startling omission is that moving the Warriors games from Oakland to San Francisco will reduce the same number of "vehicle miles traveled" in Oakland that the Project will generate in San Francisco and the Mission Bay neighborhood.

This rationale is based on the unstated, but incorrect, assumption that the environmental setting at Oracle Arena and the Mission Bay site are identical. These settings are very different, in many crucial respects. First and foremost, the Mission Bay neighborhood and the surrounding areas of San Francisco are populated by San Franciscans, not Oaklanders. The residents, citizens, and registered voters of San Francisco are entitled to know what the Project's air quality impacts will be *on them*, regardless of whether the residents, citizens, and registered voters of Oakland will experience an air quality benefit as a result of the move.

Second, Oracle Arena sits in the middle of a vast parking lot. To the west is I-880, various commercial properties, wetlands, and the Bay. To the east is the Coliseum, railroad tracks, ABC Supply (provider of industrial equipment), East Bay Truck and Auto Repair, BART tracks and the Coliseum BART Station, and then, over 2,000 feet away to the northeast there is a group of apartment buildings. To the north and south stretch commercial properties for well over a mile without any residences. This stands in stark contrast to the dense residential population surrounding the Mission Bay site.

The DSEIR's suggestion that respiratory disease, heart disease, and cancer-causing air pollution is fungible and transferable, without regard to the location or environmental setting in which it occurs, is unsupported.

a. Mitigation Measure M-AQ-2b does not comply with CEQA's legal requirements.

Mitigation Measure M-AQ-2b requires the Project Sponsor pay a fee to the BAAQMD that the BAAQMD will use to purchase ozone precursor offsets. The purpose is to offset the amount by which the project's ozone precursors emissions exceed the numerical thresholds discussed in the previous section of this letter.

Therefore, to the extent the thresholds are invalid, as argued above, M-AQ-2b fails to reduce ozone precursor emissions to less-than-significant levels. Further, the DSEIR does not even consider the feasibility or effectiveness of more robust mitigation strategies that could reduce ozone precursor emissions further below the (invalid) thresholds. (See DSEIR, p. 5.4-39, Table 5.4-9, "Estimated Emissions Reduction Required".)

The amount of the offset fee required by M-AQ-2b is calculated by multiplying the total amount of *annual* criteria pollutant emissions exceeding the annual (invalid) thresholds by $18,030 per weighted ton of criteria pollutant emissions; then adding 5% of that product for BAAQMD's administrative fees, as follows:[10]

ROG tons	4.4
NOx tons	12.6
PM tons x 20	0
Subtotal	17
Fee per ton	$18,030.00
Subtotal	$306,510.00
Admin fee 5%	0.05
Admin fee	$15,325.50
Total Fee	$321,835.50

The DSEIR indicates M-AQ-2b requires the Project Sponsor to pay only $321,835.50, which is the amount required to offset one year's worth of the Project's operational criteria pollutant emissions. (See DSEIR, p. 5.4-41.) But the sports and entertainment arena portion of this Project has an operational life of at least 50 years, probably much longer,[11] and the office towers will last even longer. In contrast, the life spans of offset credit sources are much shorter than the expected life span of this Project. (See Exhibit 1.) Therefore, the actual amount required to offset the Project's above-threshold ozone precursor emissions is much higher than $321,835.50. Therefore, the DSEIR's premise that M-AQ-2b will achieve a complete offset of the Project's above threshold construction and operational criteria pollutant emissions is misleading and false.[12]

To address this deficiency, M-AQ-2b must be amended. The DSEIR must disclose the

[10]54 lbs per day of ROG emissions equals 10 tons per year.

[11]Oracle Arena was built in 1966, 49 years ago, and is still functional.

[12]The DSEIR indicates that construction-related criteria pollutant emissions are mitigated by including them in the operational period emission mitigation strategy. (DSEIR, p. 5.4-34.)

average life span of the offset credit sources the BAAQMD typically buys, then amend M-AQ-2b to require recalculation of the offset fee or other offset requirement after the average life span of such offset credit sources to account for their limited life span, changes in emissions, changes in attainment status, etc. In addition, M-AQ-2b must be amended to include a mechanism, in the event that BAAQMD does not spend the offset fee and returns it, to ensure the required offsets are purchased through another bona fide, verifiable offset program.

Accepting, *arguendo*, the validity of the 17 ton offset requirement, the DSEIR's discussion of Mitigation Measure M-AQ-2b leaves many questions unanswered regarding BAAQMD's offset program. For example, the effectiveness of the measure depends directly on the validity of numerous assumptions, including: (1) the assumption that $18,030 is enough to purchase a ton of criteria pollutant emissions; (2) the assumption that the offset market has 17 tons of criteria pollutant emissions that can be reduced by engine retrofits or other offset techniques; (3) the assumption the Project Sponsor will accurately measure actual construction and operational emissions for purpose of determining how many tons of criteria pollutants must be offset; and (4) the assumption that BAAQMD has and will have reliable verification procedures in place ensuring that 17 tons of offset will actually be achieved.

5. The DSEIR's impact assessment for Project-caused increases in Toxic Air Contaminants (TACs) is invalid.

The DSEIR's impact assessment for operational Toxic Air Contaminants (TACs) - Impact AQ-3 - is invalid for a number of reasons, in particular because the DSEIR's use of thresholds of significance for Project-caused increases in cancer risk and $PM_{2.5}$ is inconsistent, confusing, and legally erroneous.

a. The DSEIR's health impact assessment for the Project-caused increases in cancer risk from TACs is invalid.

The DSEIR uses a threshold of significance for the Project's impact of increasing cancer risk in the area of "100 in one million." As discussed above, for criteria pollutants the DSEIR borrows thresholds of significance from the BAAQMD to determine the significance of both the direct, incremental increase in emissions caused by the Project, and the Project's contribution to cumulative increase in emissions in the area.

In contrast, in its assessment of the Project's impact of increasing cancer risk in the area, the Project ignores BAAQMD's stated "Individual Project" threshold of significance "for Risk and Hazards for new sources and receptors" which is stated as "Increased cancer risk of >10.0 in a million." (Exhibit 1, p. 2-2.) Instead, the DSEIR uses BAAQMD's stated "Cumulative Project" threshold of significance "for Risk and Hazards for new sources and receptors" which is stated as "Increased cancer risk of >100.0 in a million." (DSEIR, p. 5.4-13; see, May 2011, BAAQMD

Updated CEQA Guidelines, p. 2-2.).[13]

The DSEIR estimates the Project's impact of increasing cancer risk for children living at UCSF's Hearst Tower as either 91 or 46 additional cancer cases per one million persons, depending on whether the Project is able to successfully use off-road construction equipment meeting Tier 2 and NOx VDECS standards. (See Figure 1, based on DSEIR, p. 5.4-49, Table 5.4-11.)

Table 1

Hearst Tower Child		No Tier 2/VDECS	Tier 2/VDECS
Background	26	26	26
No Tier 2/VDECS	54	54	
Tier 2/VDECS	9.2		9.2
Operations - Generators	30	30	30
Operations - Mobile	7.2	7.2	7.2
Total	126.4	117.2	72.4
less background		26	26
Project incremental impact		91.2	46.4

The DSEIR estimates the Project's impact of increasing cancer risk for adults living at UCSF's Hearst Tower as either 40 or 38 additional cancer cases per one million persons, depending on whether the Project is able to successfully use off-road construction equipment meeting Tier 2 and NOx VDECS standards. (See Figure 2, DSEIR, p. 5.4-49, Table 5.4-11.)

Table 2

Hearst Tower - Adult		No Tier 2/VDECS	Tier 2/VDECS
Background	26	26	26
No Tier 2/VDECS	2.8	2.8	
Tier 2/VDECS	0.48		0.48
Operations - Generators	30	30	30
Operations - Mobile	7.2	7.2	7.2
Total	66.48	66	63.68
less background		26	26
Project incremental impact		40	37.68

[13]This is also a City criterion for defining "Air Pollutant Exposure Zones" (APEZ). (DSEIR, p. 5.4-12.) An APEZ is "an area in which modeled air pollution exceeds "either: (1) a cancer risk of greater than 100 per one million exposed, and/or (2) PM2.5 concentrations in excess of 10 microgram per cubic meter (ug/m3) (including ambient).... Since the Project is not in an APEZ, the subsequent criterion of significance is whether or not the Project will create an APEZ." (DSEIR, Appendix-TR, Air Quality Appendix, p. 9.)

The DSEIR estimates the Project's impact of increasing cancer risk for adults living at UCSF's Hearst Tower as either 45 or 42 additional cancer cases per one million persons, depending on whether the Project is able to successfully use off-road construction equipment meeting Tier 2 and NOx VDECS standards. (See Figure 3, DSEIR, p. 5.4-49, Table 5.4-11.)

Table 3

UCSF Hospital Child		No Tier 2/VDECS	Tier 2/VDECS
Background	44	44	44
No Tier 2/VDECS	28	28	
Tier 2/VDECS	4.8		4.8
Operations - Generators	30	30	30
Operations - Mobile	7.2	7.2	7.2
Total	114	109.2	86
less background		44	44
Project incremental impact		65.2	42

As discussed above, the DSEIR's premise that the Project Sponsor can obtain a substantial quantity of off-road construction equipment meeting Tier 2 and NOx VDECS standards is illusory. Therefore, the only relevant numbers are the three higher numbers, i.e., 91, 40 and 45. But even using the lower numbers, i.e., 46, 38, and 42, all of them exceed the BAAQMD's "Individual Project" threshold of significance for increased cancer risk of 10 per one million." (Exhibit 1, p. 2-2.) Instead of explaining why, after using BAAQMD's thresholds of significance for all criteria pollutants, the DSEIR does not use the BAAQMD's "Individual Project" increased cancer risk threshold of significance of 10 per one million, the DSEIR simply ignores this threshold.

Thus, the DSEIR uses at least two strategies to avoid disclosing a significant increase in cancer risk: using BAAQMD's cumulative standard instead of its individual project standard, and assuming the Project Sponsor can obtain a substantial quantity of off-road construction equipment meeting Tier 2 and NOx VDECS standards. Dropping either of these unwarranted predicates reveals the Project's impact of increasing cancer risk is significant.[14]

The DSEIR explains its choice of a threshold of significance for cancer risk from TAC's of

[14]See e.g., DSEIR, p. 5.4-49 ["With the minimum level of compliance with this mitigation measure (Tier 2 plus NOX VDECS), increased cancer risk as a result of project construction activities at the maximally impacted receptor would be approximately 9.2 in one million and cumulative excess cancer risk at all receptor locations would be reduced to below the significance threshold of 100 per one million. ¶ While unmitigated increased cancer risk at the maximally impacted receptors would exceed the threshold of 100 in one million, with implementation of Mitigation Measure M-AQ-1 (Construction Emissions Minimization), increased cancer risk at the maximally impacted receptors would be below the threshold of 100 in one million"].)

100 per one million persons as follows:

> The 100 per one million persons (100 excess cancer risk) criterion discussed above is based on USEPA guidance for conducting air toxic analyses and making risk management decisions at the facility and community-scale level. As described by the BAAQMD, the USEPA considers a cancer risk of 100 per million to be within the "acceptable" range of cancer risk. Furthermore, in the 1989 preamble to the benzene National Emissions Standards for Hazardous Air Pollutants (NESHAP) rulemaking, the USEPA states that it "…strives to provide maximum feasible protection against risks to health from hazardous air pollutants by (1) protecting the greatest number of persons possible to an individual lifetime risk level no higher than approximately one in one million and (2) limiting to no higher than approximately one in ten thousand [100 in one million] the estimated risk that a person living near a plant would have if he or she were exposed to the maximum pollutant concentrations for 70 years." The 100 per one million excess cancer cases is also consistent with the ambient cancer risk in the most pristine portions of the Bay Area based on BAAQMD regional modeling.

(DSEIR, p. 5.4-13.)[15]

The City's reliance on the EPA's judgment of "acceptable" cancer risk is legally flawed for several reasons. First, the City relies on a simplistic misrepresentation of actual EPA policy. Second, even if EPA policy is what the City implies it is, the DSEIR errs as a matter of CEQA law by using the EPA's judgment of "acceptable" cancer risk to determine the significance of the Project's impacts.

The EPA's actual policy is to assess increased cancer risk based on a host of site-specific factors within a range of values from 1 in one million to 100 in one million. This policy reflects the agency's attempt to balance the costs and benefits of protecting public health in its implementation of a host of federal environmental laws, including the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, CERCLA (Superfund), etc. (See e.g., Starfield, L.E., "The 1990 National Contingency Plan: More Detail and More Structure, But Still a Balancing Act"; Environmental Law Reporter, June 1990, pp. 10222-10251, attached hereto as Exhibit 3.)[16]

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[15]Footnote 21 cites to "54 Federal Register 38044, September 14, 1989." As of July 6, 2015, this document was not included on the City's AB900 mandated web page dedicated to preparing the administrative record concurrently with its CEQA review of the Project. (See Pub. Res. Code § 21186 (a), (b), and (c).)

[16]"In the proposed NCP [Superfund National Contingency Plan], the Agency [EPA] had defined the acceptable risk range as being from 10^{-4} to 10^{-7}, meaning that when the excess risk to an individual

Instead of following this analytic approach, the DSEIR selects one value at the least environmentally protective end of the EPA's "acceptable risk" range and uses it to determine the significance of the Project's impacts, but without regard to the Project's site-specific considerations. Again, the DSEIR has cherry-picked a threshold of significance to avoid finding the Project's cancer risk impact significant.

Also, CEQA neither requires nor allows the City to use the EPA's judgment of "acceptable" cancer risk to determine the significance of the Project's impacts. The City's discretion to decide that significant environmental harm is "acceptable" in light of the project's benefits arises at the end of the CEQA analysis, in the context of a statement of overriding considerations, not at the beginning of the process, in determining whether impacts are significant.

> A statement of overriding considerations is required, and offers a proper basis for approving a project despite the existence of unmitigated environmental effects, only when the measures necessary to mitigate or avoid those effects have properly been found to be infeasible. (Pub. Resources Code, § 21081, subd. (b).) Given our conclusion the Trustees have abused their discretion in determining that CSUMB's remaining effects cannot feasibly be mitigated, that the Trustees' statement of overriding circumstances is invalid necessarily follows. CEQA does not authorize an agency to proceed with a project that will have significant, unmitigated effects on the environment, based simply on a weighing of those effects against the project's

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of contracting cancer due to a lifetime exposure to a certain concentration of a carcinogen falls between approximately 1 in 10,000 [100 in one million] and 1 in 10 million, it is judged to be an acceptable exposure. As a measure of additional protection, the proposal provided that there should be a "point of departure" of 10^{-6}, toward the more protective end of the scale, that should be used in setting preliminary remediation goals; if conditions warranted, the final remedy could achieve a level elsewhere within the range. ¶ The final rule maintained the point of departure of 10^{-6}, but narrowed the risk range to 10^{-4} through 10^{-6}. This action was taken in response to public comment and concerns that the Superfund range went below the accepted de minimis level used by other EPA programs and those of other federal agencies. ... the Agency has retained the discretion to select a cleanup level outside the range in appropriate circumstances (e.g., where concerns about sensitive populations, synergistic effects among chemical mixtures, etc., suggest that the remedy should attain a level below 10^{-6}. The use of a range of acceptable risk is general practice for most government programs. As discussed below in the section on role of cost, it affords the Agency the flexibility to take into account different situations, different kinds of threats, and different kinds of technical remedies. If a single risk level had been adopted, (e.g., at the more stringent end of the risk range), fewer alternatives would be expected to pass the protectiveness threshold and qualify for consideration in the balancing phase of the remedy selection process." (Id., 20 ELR 10237 [footnotes omitted].)

> benefits, unless the measures necessary to mitigate those effects are truly infeasible. Such a rule, even were it not wholly inconsistent with the relevant statute (id., § 21081, subd. (b)), would tend to displace the fundamental obligation of "each public agency [to] mitigate or avoid the significant effects on the environment of projects that it carries out or approves whenever it is feasible to do so" (id., § 21002.1, subd. (b)).

City of Marina v. Board of Trustees of the California State University (2006) 39 Cal.4th 341, 368-69.

This is a critical distinction, because where the Project does not exceed thresholds of significance that are erroneously inflated by the concept of "acceptable risk," the City is absolved of further legal obligation to mitigate the impact. As a result, the public cannot know whether the City will allow an unknown number of cancer cases to occur that it could have feasibly avoided had it scrupulously followed CEQA. Nor does the public know, had the EIR determined that 46 additional child cancer cases per one million persons is significant, whether or not the City would have found the Project's benefits outweigh its environmental and adverse human health effects.

The DSEIR also attempts to support its "100 in a million excess cancer cases" by stating: "The 100 in a million excess cancer cases is also consistent with the ambient cancer risk in the most pristine portions of the Bay Area based on the District's recent regional modeling analysis." (DSEIR p. 5.4-13, citing the 2009 BAAQMD Justifications report, p. 67). Neither document, however, explains what this means. For example, how are "excess" cancer cases "consistent" with "ambient" cancer risk? What does "most pristine" mean? On a scale of 1 to 10, are Mission Bay and the "most pristine areas" separated by 1 unit, or 10 units, or somewhere in between? In short, this justification for the threshold is mere verbiage.

b. The DSEIR's health impact assessment for Project-caused increases in $PM_{2.5}$ invalid.

The DSEIR uses a threshold of significance for the Project's health impact of increasing $PM_{2.5}$ concentrations of "10 µg/cubic meter." As discussed above, for criteria pollutants, the DSEIR borrows thresholds of significance from the BAAQMD to determine the significance of both the direct, incremental increase in emissions caused by the Project, and the Project's contribution to cumulative increase in emissions in the area.

In contrast, in its assessment of the Project's health impact of increasing $PM_{2.5}$ concentrations, the Project ignores BAAQMD's stated cumulative threshold of 0.8 µg/cubic meter. (See Exhibit 1, p. 2-2.) According to BAAQMD, "Cumulative emissions within the 1,000 foot evaluation zone would be considered significant where the increased average annual ground-level concentrations of $PM_{2.5}$ would be greater than 0.8 µg/m^3." (Exhibit 4, p. 5.)

Obviously, there is a huge discrepancy between the 10 µg/cubic meter threshold used in the DSEIR compared to the 0.8 ug/cubic meter threshold recommended by BAAQMD. This discrepancy is particularly troubling given that the DSEIR reports Project-caused cumulative increases in $PM_{2.5}$ concentrations just below the 10 µg/cubic meter threshold, but well above the 0.8 µg/cubic meter threshold.

It would appear, once again, that the DSEIR has cherry-picked a threshold of significance to avoid finding the Project's health risk impact from increases in $PM_{2.5}$ significant.

Thank you for your attention to this matter.

Very Truly Yours,

Thomas N. Lippe

List of Exhibits

Exhibits 1 through 16 are referenced in this letter.
Exhibit 17 is referenced in Exhibit 1 to this letter.
Exhibits 18 through 30 are referenced in Exhibit 2 to this letter.

1. **July 19, 2015, letter report authored by Greg Gilbert.**
2. **July 20, 2015, letter report authored by Paul Rosenfeld and Jessie Jaeger**
3. **Starfield, L.E., "The 1990 National Contingency Plan: More Detail and More Structure, But Still a Balancing Act"; Environmental Law Reporter, June 1990.**
4. **Excerpts from EIR for the 5M Project, October 15, 2014, pp. 425-426.**
5. **Excerpts from EIR for the SF Museum Of Modern Art Project, July 11, 2011, pp. 367-368.**
6. **Excerpts from EIR for the 706 Mission Project, June 27, 2012, pp. IV.G.20.**
7. **Excerpts from EIR for the 8 Washington Street/Seawall Lot 351 Project, June 15, 2011, pp. IV.E.15-IV.E.18.**
8. **Excerpts from EIR for the 801 Brannan St 1 Henry Adams St Project, June 22, 2011,**

pp.262-266, 270-272.

9. **Excerpts from EIR for the Transit Center District Plan and Transit Tower Project, September 28, 2011, pp. 381-382, 387-388, 413-414, 419-420.**

10. **Excerpts from EIR for the 34th America's Cup and James R. Herman Cruise Terminal and Northeast Wharf Plaza Project, July 11, 2011, pp. 5.8-15 - 5.8-20, 5.8-26 - 5.8-27, 5.8-32 - 5.8-33.**

11. **Excerpts from EIR for the Western SoMa Community Plan, Rezoning of Adjacent Parcels and 350 Eighth Street Project, June 20, 2012, pp. 4.G.18 - 4.G.21, 4.G.53 - 4.G.54, 4.G.58 - 4.G.59.**

12. **Excerpts from DEIR for the 200-214 6th Street Affordable Housing with Ground-Floor Retail Project, February 27, 2013, pp. 69 - 72, 76 - 78.**

13. **Excerpts from Preliminary Mitigated Negative Declaration for the 345 Brannan Street Project, March 20, 2013, pp.63 - 66, 69 - 72.**

14. **Excerpts from Preliminary Mitigated Negative Declaration for the 101 Polk Street Residential Project, March 27, 2013, pp. 63 - 64, 68 - 69, 74.**

15. **Excerpts from Mitigated Negative Declaration for 850 Bryan St - Hall of Justice Project, May 13, 2015, pp. 113-114.**

16. **Excerpts from EIR for the Academy of Art Project, February 15, 2015, pp. 4.8.26-27.**

17. **March 17, 2015, Sacramento Bee newspaper, Business & Real Estate section, article New 'green diesel' rolls out for Sacramento motorists.**

18. **California Emissions Estimator Model, CALEEMOD.COM.**

19. **San Francisco Ordinance No. 27-06.**

20. **San Francisco Ordinance No. 27-06, List of Registered Transporters and Registered Facilities.**

21. **March 4, 2015, San Francisco Planning Department Notice of Availability of and Intent to Adopt a Negative Declaration; Agreement for Disposal of San Francisco Municipal Solid Waste at Recology Hay Road Landfill in Solano County.**

22. **California Environmental Protection Agency, Air Resources Board, EMFAC2011 Web**

Database.

23. **April 4, 2014, United States Environmental Protection Agency, Climate Leadership; Emission Factors for Greenhouse Gas Inventories.**

24. **Dieselnet.com Emission Standards, Nonroad Diesel Engines.**

25. **August 2012, United States Environmental Protection Agency, Office of Transportation and Air Quality; Frequently Asked Questions from Owners and Operators of Nonroad Engines, Vehicles, and Equipment Certified to EPA Standards.**

26. **August 2012, Northeast Diesel Collaborative, Best Practices for Clean Diesel Construction.**

27. **Northeast Diesel Collaborative, Construction, NEDC Clean Construction Workgroup.**

28. **Construction Industry Air Quality Coalition (CIAQC), White Paper: An Industry Perspective on the California Air Resources Board Proposed Off Road Diesel Regulations .**

29. **Milton CAT, Tier 4 – How it will affect your equipment, your business and your environment.**

30. **September 20, 2013, United States Environmental Protection Agency, Federal Register Volume 78, Number 183.**

EXHIBIT 1

Comments Regarding Air Quality Impact Analysis and Mitigation

Event Center and Mixed-Use Development at Mission Bay Blocks 29 – 32

Draft Subsequent EIR (San Francisco, CA)

Autumn Wind Associates, Inc.
Newcastle, CA

Prepared for Tom Lippe, Attorney

July 19, 2015

I. Introduction

Autumn Wind Associates provides the following comments regarding air quality analysis and mitigation measures identified in the Event Center and Mixed-Use Development at Mission Bay Blocks 29 – 32 (hereinafter referred to as "Events Center" or "project") DSEIR at the request of Tom Lippe, Esq.

This review and commentary focuses on the DEIR's use of flawed construction mitigation measures that will not deliver purported emission benefits; a failure to provide substantive discussion on whether wastewater improvement-related emissions made necessary for completion of the Event Center project should have been reviewed in the DSEIR; failure to meaningfully evaluate and mitigate with effective alternatives to diesel equipment and diesel fuel, including requirement to use zero-emission electric options when appropriate; the unjustified use of trip-related emissions of major sports events from the Oracle Arena for application to the project's sports arena; failure to evaluate the use of the latest available OEHHA health risk guidance known to be under discussion during the preparation of the DSEIR; the Lead Agency's reliance on thresholds of significance that have not been adopted in compliance with CEQA Guidelines; and the use of emission offsets with substantially less lifetime mitigation value than that relied upon by the Lead Agency in the DSEIR.

II. Construction Emissions From Wastewater Improvements Have Not Been Adequately Reviewed in the DSEIR

At DSEIR pg. 1-9, significant environmental impact areas in the Event Center environmental review process are identified. One of those includes sewer processing plant and related utility improvements made necessary for the Events Center and associated development of the 11 acre project area:

> "As indicated on Table 1-2, the SEIR determined that the proposed project would result in significant and unavoidable impacts in the areas of....utilities (construction of new or upgraded wastewater facilities, and determination by the San Francisco Public Utilities Commission that it currently has inadequate capacity to serve the project's wastewater demand)."

Based on the language noted above, it appears the DSEIR's project at Mission Bay Blocks 29 – 32 cannot proceed without sewer and associated utility improvements. However, at DSEIR pg. 1-43 it appears that the project is considered by the Lead Agency to not require or result in the construction of new wastewater treatment facilities or expansion of existing facilities. Then, at DSEIR pg. 1-44 information from measure M-C-UT-4 shows that the project sponsor must pay for "fair share" improvements to the Mariposa Pump Station:

> The project sponsor shall pay its fair share for improvements to the Mariposa Pump Station and associated wastewater facilities required to provide adequate sewer capacity within the project area and serve the project as determined by the SFPUC. The contribution shall be in proportion to the wastewater flows from the proposed project relative to the total design capacity of the upgraded pump station(s). The project sponsor shall not be responsible for any share of costs to address pre-existing pump station deficiencies.

However, at DSEIR, pg. 5.7-13, it appears the wastewater improvements are made necessary by the project and that it cannot proceed without them:

> "Therefore, permanent improvements to the pump station and a long term increase in capacity would be needed to accommodate the proposed project in combination with other proposed and planned development in the Mission Bay South Plan area. In addition, as discussed in Section 5.9, Hydrology and Water Quality, the increased wastewater flows from **the proposed project** (emphasis added) in combination with other foreseeable future projects could increase the volume of combined sewer discharges (CSDs) from the Mariposa Pump Station which could necessitate improvements to the Mariposa wet weather pump station."

If the DSEIR project necessitates the improvements to local wastewater treatment facilities and related utility improvements, the associated construction emissions should be analyzed and mitigated as appropriate within the DSEIR and not piecemealed to some other review process or ignored altogether. No information is found in the DSEIR's Air Quality element that shows that construction-related emissions from the necessary wastewater utility improvements were recognized and evaluated within the DSEIR.

III. Air Quality Thresholds of Significance Used in the DSEIR Are Based On Outdated, Non-Scientific NSR Values

BAAQMD (District) is regionally responsible for attaining or maintaining healthy air quality in the 9-county Bay Area that includes the proposed Event Center and Mission Bay Blocks 29 -32; the District implements a number of programs for attainment of regional air quality, including issuance of CEQA guidance used by Lead Agencies in the review and mitigation of air quality impacts and specified emissions of new development. The District has historically acted under CEQA as a commenting agency for new developments subject to CEQA review not otherwise subject to District regulations. CEQA thresholds, used by the City as Lead Agency and applied to the DSEIR (see Table 5.4-6 Criteria Air Pollutant Thresholds), were developed by the BAAQMD many years ago, well prior to the last Ozone Attainment Plan issued by the District in 2001.

How the District's air quality CEQA thresholds were developed is relevant to whether they are appropriate and effective for use in evaluating the potential significance of air impacts of the proposed event center and other land use types anticipated within the DSEIR. While CEQA encourages the use of thresholds (Guidelines section 15064.7) to promote consistency and integration of environmental review activities across regulatory and planning disciplines and programs, the Lead Agency's air quality thresholds must reflect the true significance of the environmental impact for which they act as an impact or mitigation measuring device. Moreover, the courts have found that use of regulatory thresholds must not be applied "in a way that forecloses the consideration of any other substantial evidence showing there may be a significant effect" (CBE v. CA Resources Agency; 126 Cal. Rptr. 2d. 441, Cal.App.3 Dist., 2002).

In this case, the Lead Agency's use of District thresholds ignores air pollution nonattainment and ambient air quality monitoring evidence that they have not been adequately effective in reducing land-use related mobile source emissions in the air basin. Importantly, the BAAQMD's CEQA threshold increments (expressed in lbs/day or tons/yr of specified pollutants) were based decades ago on NSR (New Source Review) quantitative increments intended solely for ensuring that the region's stationary source emissions, regulated under permits issued by the BAAQMD, would not cause the region to fall out of "attainment" status for complying with federal air quality ozone standards. NSR increments were established decades ago within federal Clean Air Act programs, aimed exclusively at regulating stationary (not mobile) sources of air pollution, and were keyed quantitatively to an area's air quality designations; worse air quality invokes use of more restrictive NSR daily or annual emission limits.

Surprisingly, there is no scientific basis for how NSR values were established, nor is there any substantive information regarding their formulation or formation left in the historical record; we have researched this issue extensively and have been unable to find written material or anyone in regulatory air agencies (CARB, EPA) who is intimately familiar with or is still alive who can recall how NSR increments were established nearly fifty years ago.

In the DSEIR, BAAQMD's CEQA thresholds of significance were used; those thresholds were established by borrowing NSR values intended to ensure that the BAAQMD's stationary sources would not lead to regional air pollution "nonattainment" episodes. As a practical matter, the region's failure to attain the federal ozone standard is evidence of the lack of scientific credibility in how the BAAQMD's CEQA thresholds were established, as well as their lack of efficacy—had they been scientifically tied to land use growth and the mobile source emissions they create, it would be easily argued that the Bay Area would not now be designated "marginal nonattainment" for ozone air pollution after years of nonattainment.

Use of NSR values that were never scientifically designed, to establish current BAAQMD CEQA thresholds, makes even less sense when comparing the emissions inventory of stationary sources in the Bay Area to emissions resulting from mobile sources (vehicles) that routinely emit regulated pollutants traveling to or from new land use developments. Quite simply, there is no rational nexus between the two categories since stationary source emissions equate to typically less than one-sixth those emitted by the basin's mobile sources.

A more effective method for use by BAAQMD in designing CEQA threshold levels would have been to base them on growth in vehicle emissions expected to occur from projected land use growth in the basin---this method was developed and used in 2002 by the Sacramento Metropolitan Air Quality Management District (SMAQMD) to establish CEQA thresholds logically and arithmetically based on estimated increments of mobile source emissions of new development. The increment of new development-related emissions was derived from careful review of five years of immediately-prior building permit records obtained in the nonattainment area, and then adjusted to account for processes (such as ongoing development of rapid transit in the basin) expected to reduce vehicle-miles-travelled from new developments. CEQA threshold emission quantities (expressed as lbs/day or tons/yr) were then set at levels that would account for---and mitigate---only that new land use portion of the basin's total emissions determined by modeling and inventory analyses as necessary to achieve attainment of air quality standards under federal Clean Air Act requirements.

Under this "nexus analysis" approach, CEQA thresholds are scientifically established by correlating increased mobile source emissions from projected land use growth in the nonattainment area to the number of tons of related reductions needed for attainment by CAA-specified date(s). Such an approach greatly reduces the risk of under- or over-mitigating, and provides far more certainty that the estimated tons of emission reductions to result from their use, and critical to ensuring attainment of ambient air quality standards, will be realized. BAAQMD CEQA thresholds were not established scientifically, and the region has continued to violate ambient air quality standards for ozone for many years now—both act as potent evidence to call into serious question the effectiveness of BAAQMD's NSR-based CEQA thresholds in the DSEIR for Event Center/Mission Bay Blocks 29 – 32. Further, they suggest that air quality impacts are likely underestimated, and mitigation values are overestimated in the DSEIR.

IV. Construction and Operational Mitigation Options Have Not Been Thoroughly Reviewed for Diesel Alternatives

Mitigation Measure M-AQ-1 at DSEIR pg. 5-4.36 under item B requires reporting of alternative fuel quantities used to power construction vehicles and equipment at the project site during its 26 month duration. M-AQ-1 should be revised to require the use of low-emission and/or low-CO2 alternative fuels unless costs are substantially (~100%) greater than routine diesel fuel costs. One such product that should have been carefully evaluated in the DSEIR is "Diesel HPR", made from 98% renewable content (a rate about 4 times greater than regular B-20 biodiesel) and currently marketed at 18 locations throughout northern CA and the Bay Area. The price for this ultra-low carbon-intensity diesel, said to have better performance characteristics than traditional petroleum diesel fuel, is competitive with standard onroad and offroad diesel available in CA (as advertised recently in the Sacramento area at $2.89 a gallon).

Fossil diesel has a cetane rating of 40. The HPR Diesel product, or similar, has a cetane rating of 74. That level of higher cetane results in lower PM and NOx---which are needed reductions for the project. Because the density of the fuel is slightly lower, so is the chemical energy per unit volume (3%). But because the cetane rating is so much higher PM otherwise not emitted is converted into productive energy, with tractive horsepower (per unit volume) slightly higher than fossil diesel (1%).

Onroad project-serving construction vehicles that cannot otherwise operate without diesel fuel should also be required to use the very low carbon-intensity "Diesel HPR" or similarly effective product, with receipts proving purchase and use provided to the independent, onsite construction mitigation manager (referred to inappropriately as an "Air Quality Specialist" in the DSEIR, as noted elsewhere in this letter) for regular, weekly relay to the OCII. ("Similarly effective" does not mean use of B-20, since its proportion of bio-derived fuel will not exceed 20%, whereas the Diesel HPR product or similar will come almost entirely from renewable sources.)

Additionally, the project will rely on several emergency diesel gensets---these power units will produce emissions during regular testing, and are very likely to emit far greater quantities of emissions during any actual power outages. Those units should be operated on an alternative, low-emission non-diesel fuel. If not possible, those diesel units should be operated solely on the "Diesel HPR" or similar product. No information is found in the DEIR that discusses whether the diesel (and not alternatively fueled) genset option is critically necessary, whether lower-emitting options are available for them, and why those options are or are not permissible for use at the project.

See http://www.sacbee.com/news/business/article15203738.html for more information on the Diesel HPR product, and particularly its locations for purchase, costs, and emission benefits over traditional diesel fuel.

V. Construction Mitigation Is Unenforceable and Places Inappropriate Reliance on Project Sponsor for Interpretation and Compliance Determinations

At DSEIR pg. 5.4-35, Mitigation Measure M-AQ-1 is identified and discussed for reducing project-related construction equipment emissions. Under this measure's Item A, a Construction Emissions Minimization Plan is required:

> **"Construction Emissions Minimization Plan**. Prior to issuance of a construction permit, the project sponsor shall submit a Construction Emissions Minimization Plan (Plan) to the OCII or its designated representative for review and approval by an Air Quality Specialist."

The measure then goes on to lay out "Compliance Alternatives" that require use of specified types of engines with prescribed emission standards (known as Tiers) utilizing VDECS (Verified Diesel Emission Control Strategies) to reduce equipment NOx emissions and particulates.

Because the project's construction emissions are estimated to exceed the BAAQMD's NOx threshold of significance, and due to the serious nature of diesel particulate matter (DPM) as a toxic air contaminant subject to EPA and CARB regulations resulting from PM2.5 emissions for which the region is designated nonattainment, it is essential that this measure be implemented and executed effectively for the duration of the project. As written, however, the measure lacks enforceability because there is no recognized definition of or qualification process provided in the DSEIR for "Air Quality Specialist" who will pass judgment on the adequacy of construction equipment and emissions levels to be submitted by the project sponsor for approval.

While the BAAQMD has agency positions designated "Air Quality Specialist", those positions possess skillsets exclusive to their particular area of expertise, ranging across the sub-specialties of air quality planning, permitting, compliance and enforcement, stationary source inspection, engineering, air monitoring, incentive programs, etc. There is no generic "air quality specialist", as implied in the DEIR's use of the term, and the DSEIR fails to identify the necessary skillsets for this important position. Ensuring compliance with the components of M-AQ-1 will require an individual experienced with CEQA mitigation requirements; air quality regulations and VDECS technology options and functionality; construction site operations and safety issues; a wide variety of offroad and onroad construction equipment and vehicle engines; hands-on engine and VDECS experience to ensure daily compliance with the applicable Compliance Alternative; and precise, effective record-keeping skills, across the 26 month construction duration. The "'Specialist" must be present during all work hours at the site for each day of construction work across the two-plus years of work that would involve operations of construction engines and vehicles at the 11-acre site.

Because of the importance of the role of the "air quality specialist" in ensuring compliance with M-AQ-1 across the many phases and months of the Arena's construction, this position must be independent, full-time on the project site, and required to provide weekly report submittals to OCII. At pg. 5.4-36, reporting to OCII is required on a quarterly basis. This is without doubt too long a duration since equipment will come and go on a daily basis, and as written now M-AQ-1 can (and probably will) permit a project sponsor "Specialist" to creatively develop post-hoc equipment compliance records that may appear legitimate but are, in fact, not. Considering that there are no checks and balances built into the Measure, the Lead Agency cannot ensure that compliance with the essential objective of the mitigation measure will actually occur.

Because of the unusual nature of the duties of the Measure's "Specialist", and as a result of the need for independence from the Applicant to prevent conflict of interest, the EIR must discuss filling the position with a capable, qualified BAAQMD employee under contract to OCII. Should this not be possible, the position must be filled by a qualified, independent contractor chosen by and subject only to the authority of OCII.

Further, M-AQ-1 specifies numerous sub-part requirements (A 1 through 5) to be included in the Construction Emissions Mitigation Plan, and in each case compliance with those sub-parts is left to the "project sponsor". So, too, is compliance with the Measure's additional duties required under M-AQ-1 items B and C. This is not appropriate when considering the extent, complexity,

and costs that will be incurred for effective mitigation measure compliance across the 26-month construction period; permitting the project sponsor to create, implement, report, and determine compliance with the Measure is akin to having the fox guard the henhouse and must not be allowed.

As written, the measure is not enforceable due to the subjective, undefined nature of "Air Quality Specialist" who will approve the project sponsor's Construction Emissions Mitigation Plan. Further, it is unacceptable that the Measure will permit the project sponsor to determine compliance with each of the measure's components, record and report information signifying compliance, and then, under part C certify their own compliance with the Plan and its various requirements.

We have inspected construction project sites, under air district contract, to determine compliance with air district-imposed construction equipment mitigations and have found uniformly poor compliance; to exemplify, at one residential subdivision project in south Sacramento County we determined that only one offroad construction vehicle out of nearly twenty were actually compliant with the mitigation requirements that had been imposed on the project by the Lead Agency. This is because there has traditionally been very little, if any, post-EIR follow-through to verify mitigation compliance by Lead Agencies or by the local air district after the CEQA project has been approved for development and construction has started. Knowing this, construction and development firms commonly let air quality mitigations go unmet, although records purporting to show compliance can be easily formulated and submitted post hoc in order to fulfill a paper requirement. Without an independent, qualified 3rd party contractor onsite each day to track, verify, and record emissions- and activity-related information on construction vehicles used at the project site to ensure the EIR's mitigations are implemented effectively, the project is very unlikely to produce more than a token of the emission reductions claimed in the DSEIR.

Similarly, M-AQ-2a begins with "The project sponsor shall implement the following measures as feasible:"... The introduction of "as feasible" is a poison pill, since the measure does not conclusively identify the party responsible (and liable) for determining sub-component measure feasibility. This determination must not be left to the project sponsor, but, rather, vested with a qualified independent contractor chosen by and reporting solely to the OCII, or to the BAAQMD on behalf of OCII, to ensure measure implementation at every truly "feasible" turn. Without specifying duties for the accurate determination of what constitutes "as feasible", and then ensuring that those duties are actually implemented by a non-conflicted 3rd party (which, as written currently, the project sponsor cannot possibly fulfill without potential for conflict of interest), M-AQ-2a lacks necessary enforceability and cannot be expected to produce those real, quantifiable, surplus mitigated emission benefits claimed in the DSEIR.

Finally, M-AQ-2b leaves it to the project sponsor to calculate the amount of emission offsets required to satisfy the project's estimated ozone precursor burden of 17 tons per year, after they have decided what is feasible for Tier 4 equipment to be used at the site and what then to report to OCII under the requirements of M-AQ-1. In total, the construction mitigations proposed in the DEIR are riddled with potential conflicts of interest by leaving the determination of compliance and feasibility to the very party that must identify, implement and pay for them. As written, they cannot be relied upon to deliver the emission benefits that the DEIR assumes will actually occur. The DEIR must be revised to place a qualified, independent, 3rd party entity at the project site daily for the 26 month project duration, making them responsible and liable for accurate, weekly (not quarterly) verifications of equipment emission rates and reductions in reports to the City.

VI. Operational Mitigation Measure for Electrical Outlets is Vague and Unenforceable

Mitigation Measure M-AQ-2a at DSEIR pg. 5.4-42 is designed to reduce the project's operational emissions, requiring the project sponsor to provide outlets for electrically powered landscape equipment "as feasible." As written, this measure is unenforceable since it permits the sponsor to determine feasibility. There is no doubt that the measure will be feasible, since electric power will be ubiquitous across the project site in built structures, at their exteriors, and in power supplied to lighting and other exterior improvements across the project's eleven acres.

Additionally, the mitigation measure should be revised to require that the project sponsor and any future property owners or tenants require in any landscaping contracts the requirement that landscape maintenance firms at the project use only electrically powered landscape equipment. Merely requiring outlets without mandating their use for landscaping onsite renders this portion of M-AQ-2a entirely unreliable for producing actual emission benefits.

VII. Offsets for Operational Emissions from Warriors Games Appear to be Double-Counted

At DSEIR pg. 5.4-37, new operational emissions from vehicle trips generated by Warrior games are, for the purposes of mitigation, discounted based on the assumption that those emissions have already been counted in the CEQA-review process conducted for Warriors' games at the Oracle Arena (Oakland). This approach is used in the DSEIR to justify the purchase of fewer

emission offsets from BAAQMD necessary to reduce the project's onroad emission impacts to less-than-significant levels, and it is predicated on the assumption that no new large sports events will occur at the Oakland Coliseum/Oracle Arena once large-venue sports games move across the Bay to the proposed Arena in San Francisco. From pg. 5.4-37:

> "Some of the motor vehicle trips that would be generated by Golden State Warriors basketball games at the proposed event center would be regional trips similar to those currently generated by basketball games occurring at the Oracle Arena in Oakland, and as a result, the emissions associated with these regional trips would not represent new emissions to the air basin."

At the bottom of the same page, additional material reinforces the crediting strategy:

> "It is unlikely that there would be another NBA franchise in the Bay Area, so all of the professional basketball games occurring in the region would likely be played at the new event center. This assumption is consistent with that of the City of Oakland in its CEQA related analyses."

For the purposes of estimating vehicle trip emissions from large Warriors game-style sporting events that will be held at the proposed San Francisco Events Center, the Lead Agency has assumed that existing (Oracle Arena-based) Warriors game-related vehicle trip emissions will shift from Oakland to the new San Francisco Events Center. Under this DSEIR perspective, there would be no net increase in vehicle trips (and related emissions) since game attendees are expected to drive the same distance (25 miles on average) to the new facility in San Francisco that they are assumed to currently drive to attend a Warriors game (or similar large-venue sports event) at the Oracle Arena in Oakland. Crucial to this perspective is the notion that there would be no new, large-venue sporting events at the Oracle arena which would then act to backfill the loss of Warriors games---otherwise there must be a net gain in total, large-venue sporting event emissions created between the two arenas. In fact, the "no net gain" perspective taken by the Lead Agency in the DSEIR is used to justify deducting those Warriors game "existing trip" emissions from the project's emissions modeling so that fewer emission offsets would be required for the project. Based on our review of information contained in a recent Oakland EIR, this appears to be inappropriate.

For the above-referenced approach to be viable for use in the DSEIR, the vehicle-trip emissions resulting currently from the large-sports venue games held at Oracle must transfer to the proposed San Francisco Event Center *and must then not be backfilled with new, large-sports venue games at Oracle*—otherwise there will be a net gain in emissions not accounted for in either the new Events Center DSEIR or the EIR conducted for the expanding Oracle Arena.

In contradiction to the DSEIR's claim is this statement from Oakland's Coliseum Area Specific Plan DEIR1, Vol. I, pg. 1-1:

> "The Project seeks to retain Oakland's three major professional sports franchises with three new venues and an accompanying mixed-use residential....."

On the next page, this information further clarifies that Oakland will backfill with large sports venues that will continue the emissions currently associated with the Warriors operation at the Oracle Arena:

> "The development of Sub-Area A and a portion of Sub-Area B (the "Coliseum District") is based on the Coliseum City Master Plan, which calls for three new sports venues (a new football stadium and a new baseball park in Sub-Area A plus a new basketball arena and multi-purpose events center in Sub-Area B)..."

At Coliseum Area Spa DEIR, pg. 4.2-59, mobile source emission impacts were modeled based on three scenarios:

- Existing criteria pollutant emissions from the Coliseum District area ("Existing No Project", or "2013 Baseline"),
- Future 2035 criteria pollutant emissions from the Coliseum District if the Project were not developed (i.e., future no Project, or 2035 Baseline), and
- Future 2035 criteria pollutant emissions from the Coliseum District (i.e., future plus Project, or 2035 plus Project).

By logical inference from the first- and second-bulleted points noted above, large sports venue-related emissions currently attributed to Warriors games appear to remain "on the books" for Oracle. Correspondingly, at pg. 4.2-60, existing emissions quantities associated with the Warriors games are retained:

> "Table 4.2-7 shows estimated average daily and annual maximum criteria emissions under current conditions (2013 Baseline), as well as the emissions projected from current land uses at the Coliseum District as they would occur in 2035 (2035 Baseline). These projected 2035 baseline emissions are based on a continuation of existing land uses, vehicle trips, and VMTs."

[1] City of Oakland; Coliseum Area SPA DEIR Vol I; SCH #2013042066; August 2014

Based on the information cited above, it is clear that the City of Oakland anticipates retention of mobile source emissions generated by the equivalent of Warriors games at their Coliseum/Oracle Arena. Further, it appears that the Coliseum/Oracle EIR was certified prior to issuance of the Warriors NOP---thus the claim in the Warriors EIR that large sports venue-related emissions can be transferred from Oakland to San Francisco, and with credit applied to compliance with Mitigation Measure M-AQ-2b (Emission Credits) shown at pg. 5.4-41, is likely neither applicable nor appropriate under CEQA.

VIII. Project Health Risks May Be Underestimated Using Older Guidance

The DSEIR provides analysis and discussion of the project's potential to cause significant health risks from project-related toxics, with specific details on health risks and PM2.5 calculations and methodology found in Appendix AQ. Exposure parameters presented in Section 3 of Appendix AQ do not appear to reflect current methods for calculating excess cancer risks, and as a result it is likely that the HRA underestimates Warriors Arena's potential excess cancer risks.

Table 3 lists daily breathing rates referencing BAAQMD's Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines released in January 2010.[2] These breathing rates are consistent with rates recommended by the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) Air Toxics Hot Spots Program Risk Assessment Guidelines released in 2000.[3] After publicly working on revisions during 2014, OEHHA released updated Risk Assessment Guidelines in early 2015 that outline risk calculations for specific age groupings. The new methods incorporate higher daily breathing rates than those listed in the BAAQMD's 2010 Guidelines and used in the HRA. To comply with the latest OEHHA Guidelines, the inhalation intake factors should be re-calculated for the EIR using the updated 95% daily breathing rate for children of 1,090 L/kg-day.[4]

Additionally, the screening approach taken in the HRA to evaluate operational cancer risks should be revised to include a refined, site-specific analysis of impacts using the USEPA AERMOD

[2] BAAQMD, January 2010. Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines. Available at: http://www.baaqmd.gov/~/media/Files/Engineering/Air%20Toxics%20Programs/hrsa_guidelines.ashx?la=en.
[3] OEHHA, September 2000. Air Toxics Hot Spots Program Risk Assessment Guidelines. Part IV: Technical Support Document for Exposure Assessment and Stochastic Analysis. Available at: http://www.oehha.ca.gov/air/hot_spots/pdf/stoch4f.pdf.
[4] OEHHA, February 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessment. Section 5.4.1.1: Residential Inhalation Dose for Cancer Risk Assessment. Available at: http://oehha.ca.gov/air/hot_spots/hotspots2015.html.

model. With respect to the number of years of data to model, the USEPA Guideline on Air Quality Models states:

> "Five years of representative meteorological data should be used when estimating concentrations with an air quality model. Consecutive years from the most recent, readily available 5-year period are preferred.[5]"

The DSEIR used meteorological data from 2008; updated AERMOD results, employing five years of the most recent meteorological data, should be used with exposure parameters and methodology in compliance with the 2015 OEHHA Risk Assessment Guidelines to calculate excess cancer risk.

IX. CEQA Air Quality Thresholds of Significance Have Not Been Adopted By the Lead Agency

At Page 5.4-25 the DSEIR establishes criteria pollutant thresholds adopted by the Bay Area Air Quality Management District (BAAQMD). Following their adoption by the BAAQMD, the City of San Francisco has used these numerical thresholds for virtually all land use development projects undertaken in the City and requiring CEQA review.

However, CEQA Guidelines, § 15064.7(b) requires that "[t]hresholds of significance to be adopted for general use as part of the lead agency's environmental review process must be adopted by ordinance, resolution, rule, or regulation, and developed through a public review process and be supported by substantial evidence." Without exception, this Guidelines section requires that, prior to application of thresholds in actual CEQA environmental reviews, the City undertake its own rule-making proceeding to adopt these thresholds as their own after determining in a public process that they are supported by substantial evidence. Since the City has not formally adopted the air quality significance thresholds in a public process, supported by substantial evidence, their ad hoc application to the DSEIR is inappropriate.

X. Mobile-Based Emission Offsets Are Unlikely To Produce Needed Project-Lifetime Reductions

Mitigation Measure M-AQ-2b at DSEIR pg. 5.4-42 identifies the use of emission offsets for the project, requiring the project sponsor pay a mitigation-offset fee to the Bay Area Air Quality Management District's (BAAQMD) Strategic Incentives Division. The measure is designed to

[5] USEPA, November 9, 2005, Guideline on Air Quality Models. 40 CFR 51, Appendix W, Section 8.3.1.2.a.

offset operational project emissions that have been estimated to exceed the DSEIR's air quality thresholds of significance. As noted at pg. 5.4-42:

> "...the project sponsor shall pay a mitigation offset fee to the Bay Area Air Quality Management District's (BAAQMD) Strategic Incentives Division in an amount not to exceed $18,030 per weighted ton per year of ozone precursors plus a 5 percent administrative fee to fund one or more emissions reduction projects within the San Francisco Bay Area Air Basin (SFBAAB). This fee is intended to fund emissions reduction projects to achieve reductions of 17.0 tons per year of ozone precursors."

There is a serious, fundamental flaw in the logic applying to the measure's requirement to purchase emission offsets, since emission reductions developed through the BAAQMD's Strategic Incentives Division are based on mobile source emission reduction projects with limited and intentionally impermanent lifetimes. These projects typically operate for several years before they are rendered obsolete by new vehicle emission control standards and technologies, and thus they must not be expected to produce the 17 tons per year of ozone precursor offsets, year in and year out, across what is at least a 30 year project planning lifetime.

Accordingly, M-AQ-2b must be revised to require emission offsets for project operations for, at a minimum, the aforementioned 30 year life of the project. To exemplify, if the BAAQMD purchases mobile emission offsets with an emission reduction life of less than 10 years, the project sponsor must then pay mitigation-offset fees for mobile emission reductions until emission offsets are realized for the minimum 30 year period. Without such protection the project can be expected to offset its significant ozone precursors for no more than one-third of its lifetime; this is clearly inconsistent with CEQA's interest in mitigating the project's significant impacts across its planned lifetime.

** ** **

In summary, we believe the project DSEIR's treatment of air quality impact analysis and mitigation has inaccurately characterized certain project emissions, applied mitigation measures which are unenforceable or will simply not be implemented effectively if they are substantively implemented at all, failed to use thresholds of significance previously adopted by the Lead Agency's Board of Directors pursuant to CEQA Guidelines, and has incorrectly assumed the transfer of Warriors game-related operational emissions established for the Oracle Arena to apply to the project arena to be built in San Francisco.

Should you have any questions regarding this comment letter, please feel free to contact me at your convenience.

Sincerely,

Greg Gilbert

STATEMENT OF QUALIFICATIONS

Autumn Wind Associates

Greg Gilbert is director and founder of Autumn Wind Associates, Inc, located northeast of Sacramento, CA. Utilizing primarily ex-air agency personnel, AWA provides expert review, analysis, and estimation of potential air quality and associated environmental impacts of proposed land-use development projects involving both indirect- (mobile) and stationary (operating under air agency permit) sources of air pollution. He has consulted on air quality land use planning, mobile, and stationary source matters and projects to private and public clients since leaving public service as an air agency manager in 2000. Previously, he was national marketing director for an emissions catalyst products and technology firm with international markets in mobile and stationary sources. Between 1990 and 2000 Mr. Gilbert was employed in two California air agencies, most recently as project manager in the Mobile Source Division of the Sacramento Metropolitan Air Quality Management District (SMAQMD). While at SMAQMD Mr. Gilbert was responsible for assisting in the development and implementation of the agency's heavy-duty diesel vehicle low-emission incentive program that would later serve as the model for the statewide Moyer Program of the California Air Resources Board (CARB); the evaluation of land use-related air quality emission impacts and control strategies, development of California Environmental Quality Act (CEQA) thresholds to evaluate and mitigations to reduce, offset, or eliminate air quality impacts of new land use; development of air-related CEQA guidance; and creation of the first air quality CEQA mitigation fee program with percentage-based emission reduction options for developers to mitigate project-specific construction and operational development-related emissions.

Since 2001, AWA has provided consulting expertise to private entities and air agencies, provided input for revisions to the URBEMIS (urban emissions model to predict development-related mobile- and area-source emissions) model, conducted research on construction practices and equipment emissions, assisted with development of CEQA land-use guidance documents and mitigation strategies for CA air quality agencies, and provided modeling and consulting expertise for toxics-related health risk assessments. Mr. Gilbert reviews and provides expert written and testimony on CEQA- and development-related project-specific environmental analysis, mitigation, and documentation for a wide range of public-, private-, and environmental-sector clients, including law firms specializing in CEQA-NEPA cases.

EXHIBIT 2

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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July 20, 2015

Thomas N. Lippe
The Law Offices of Thomas N. Lippe
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Comments on the Event Center and Mixed-Use Development Project at Mission Bay Blocks 29-32

Dear Mr. Lippe:

We have reviewed the June 5, 2015 Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center and Mixed-Use Development Project ("Project") at Mission Bay Blocks 29-32. GSW Arena LLC (GSW), an affiliate of Golden State Warriors, LLC, which owns and operates the Golden State Warriors National Basketball Association (NBA) team, proposes to construct a multi-purpose event center and a variety of mixed uses, including office, retail, open space and structured parking on an approximately 11-acre site on Blocks 29-32 within the Mission Bay South Redevelopment Plan Area of San Francisco. The proposed event center would host the Golden State Warriors basketball team during the NBA season, and provide a year round venue for a variety of other uses, including concerts, family shows, other sporting events, cultural events, conferences, and conventions.

Our review concludes that the DSEIR fails to adequately assess the Project's air quality impacts.

1. The FEIR incorrectly utilizes a default hauling trip length of 20-miles, provided by the *California Emissions Estimator Model* ("CalEEMod"),[1] to determine the on-road hauling emissions that would occur during construction; however, utilizing this default value, rather than a site specific trip length, results in an underestimation of the Project's construction emissions.
2. The DSEIR attempts to mitigate the Project's criteria air pollutant emissions by limiting the off-road equipment used during construction to machinery equipped with, at a minimum, Tier 2 engines with 40 percent NOx verified diesel emission control strategies (VDECS), and at a maximum, Tier 4 or Tier 4 interim engines (Volume 2, p. 5.4-32). However, the DSEIR does not demonstrate the feasibility of this proposed measure. The Project will need to acquire approximately 195 pieces of equipment outfitted with Tier 2 and/or Tier 4 engines. Due to the

[1] CalEEMod website, *available at*: http://www.caleemod.com/

limited supply of cleaner-burning off-road equipment, the implementation of this measure, in its entirety, is highly unrealistic. As a result, the proposed Project should not rely on this mitigation measure to reduce emissions; rather the Project should pursue additional, feasible mitigation measures other than Tier 2/Tier 4 construction equipment to reduce the Project's criteria air pollutant emissions.

3. The DSEIR does not assess the Project's individual excess cancer risk to the Bay Area Air Quality Management District's (BAAQMD) 10 in one million significance threshold.[2] Rather, it determines the Project's significance by comparing the cumulative cancer risk (background risk plus Project risk) to BAAQMD's cumulative risk threshold of 100 in one million.
4. The DSEIR also fails to utilize BAAQMD's cumulative PM2.5 threshold of 0.8 $\mu g/m^3$.

A revised DSEIR should be prepared to address these inadequacies and to incorporate mitigation to reduce impacts which otherwise would affect regional air quality, and health impacts from toxic air contaminants.

Inadequate Use of CalEEMod Default Values

The DSEIR calculates the emissions from on-road haul trucks during Project construction by assuming a trip length of 20-miles, which represents the default hauling trip length provided by CalEEMod (Volume 3, Appendix AQ, p. 6). This default trip length, however, does not represent the actual haul trip length that would occur. Therefore, in an effort to accurately estimate the actual haul trip length, we conducted an independent analysis using the best resources available.

The DSEIR "estimates that the maximum depth of excavation on-site would be approximately 30 feet below San Francisco City Datum; this would require approximately 350,000 cubic yards of soils on-site to be excavated and removed from the site" (Volume 3, Appendix AQ, p. 17). In order to transport this soil off-site, the DSEIR anticipates that approximately 39,952 haul trips will be required over the course of approximately four months (Volume 3, Appendix AQ, Table 6.1-13, pp. 1243).

The DSEIR fails to disclose where this excavated soil will be transported to. According to the DSEIR, in 2006, the City of San Francisco adopted the Construction and Demolition Waste Ordinance[3], which mandates that 75 percent of construction and demolition debris be recycled (Volume 3, Appendix AQ, p. 70). Therefore, it can be assumed that 75 percent of the approximately 350,000 cubic yards of construction debris will be transported to a registered construction and demolition (C&D) debris recovery facility, and the remaining 25 percent will be transported to a registered landfill. The Construction and Demolition Waste Ordinance requires that C&D materials be transported to a registered recovery facility, and provides a list of the facilities currently approved by the City.[4] The

[2] "California Environmental Quality Act Air Quality Guidelines." Bay Area Air Quality Management District, May 2011. *Available at:* http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20CEQA%20Guidelines_May%202011_5_3_11.ashx, p. 2-2

[3] San Francisco Ordinance No. 27-06, *available at:* http://sfenvironment.org/sites/default/files/fliers/files/cd_ordinance.pdf

[4] San Francisco Ordinance No. 27-06, List of Registered Transporters and Registered Facilities, *available at:* http://sfenvironment.org/sites/default/files/fliers/files/sfe_zw_cd_registered_facilities_list.pdf

permitted daily capacity of each facility is not disclosed in the DSEIR; however, due to the large amount of debris that will have to be transported off-site over a very short period of time (four months), it can be assumed that this material will most likely be transported to multiple recovery facilities. Again, because the DSEIR does not disclose where this material will be transported to, we measured the distance of each recovery facility to the Project site, and then used the average distance of these facilities to represent the one-way hauling trip length (see table below).

Recovery Facility Name	Distance From Project Site (miles)
Big for Hauling and Demolition	2.1
Marin Resource Recovery Center	25.6
Smart Demolition	3.1
Blue Line Transfer, Inc.	12.1
Premier Recycle	55.3
West Contra Costa Sanitary Landfill	21.1
Certified Blue Recycling, Inc	19.6
Recology San Francisco	5.0
Windsor Materials Recovery Facility	70.6
Davis Street Transfer & Recycling Center	19.5
SF Recovery Inc	5.5
Zanker Materials Processing Facility	58.5
Average Distance From Project Site	**25**

Using this method, we can assume that approximately 29,964 haul trips will transport 262,500 cubic yards of material approximately 25 miles one-way.

The remaining 25 percent, or approximately 87,500 cubic yards, of C&D material will most likely be transported to a landfill. San Francisco currently has a contract with Waste Management, Inc., to transport waste to the Altamont Landfill, which is approximately 53 miles away from the Project site.[5] Once the Altamont Landfill contract expires in 2016, the City of San Francisco is proposing to enter a new agreement with Recology's Hay Road Landfill, which is located approximately 70 miles away from the Project site.[6] According to the DSEIR, construction activities are anticipated to occur starting in 2015, with full Project build out in 2018 (Volume 3, Appendix AQ, p. 5). For that reason, depending on when construction activities actually start, there is the possibility that C&D materials will be transported to the Hay Road Landfill. Therefore, we estimated total haul emissions assuming that 25 percent of C&D material would be transported to the Altamont Landfill (Scenario 1), and then we estimated emissions

[5] "Agreement for Disposal of San Francisco Municipal Solid Waste at Recology Hay Road Landfill in Solano County." Notice of Availability of and Intent to Adopt a Negative Declaration, March 4, 2015. *Available at:* http://sfmea.sfplanning.org/2014.0653E_NOA.pdf

from an alternative scenario, where we assumed that 25 percent of C&D material would be transported to the Hay Road Landfill (Scenario 2).

The tables below summarize the results of our analysis for each scenario.

Scenario 1: Current Contract with Altamont				
Location		One-Way Distance (miles)	Total One-Way Haul Trips	Total Vehicle Miles Traveled
75%	Recovery Facilities	25	29,964	744,106
25%	Altamont Landfill	53	9,988	527,366
100%	-	-	**39,952**	**1,271,472**

Scenario 2: Proposed Contract with Hay Road Landfill Approved				
Location		One-Way Distance (miles)	Total One-Way Haul Trips	Total Vehicle Miles Traveled
75%	Recovery Facilities	25	29,964	744,106
25%	Hay Road Landfill	70	9,988	695,165
100%	-	-	**39,952**	**1,439,271**

When we compared the total vehicle miles traveled (VMT) from each of the above scenarios to the VMT from the CalEEMod default trip length of 20 miles, we found that Scenario 1 would result in a 37 percent increase in VMT, and found that Scenario 2 would result in a 44 percent increase in VMT (see table below).

Scenario	Vehicle Miles Traveled (VMT)
1 – Altamont Landfill	1,271,472
CalEEMod Default	799,040
Net Increase in VMT	**472,432**
Percent Increase in VMT	***37%***
2 – Hay Road Landfill	1,439,271
CalEEMod Default	799,040
Net Increase in VMT	**640,231**
Percent Increase in VMT	***44%***

[6] "Agreement for Disposal of San Francisco Municipal Solid Waste at Recology Hay Road Landfill in Solano County." Notice of Availability of and Intent to Adopt a Negative Declaration, March 4, 2015. *Available at:* http://sfmea.sfplanning.org/2014.0653E_NOA.pdf

We derived emission factors from the California Air Resources Board's (CARB) EMFAC2011 model to estimate the increase in emissions when site specific hauling trip lengths are used.[7] We specified a 2015 calendar year for Scenario 1, which assumes that the Altamont Landfill contract is still active, and we specified a 2016 calendar year for Scenario 2, which assumes that the Altamont Landfill contract has expired, and has been replaced by a new contract with Hay Road Landfill. Additional parameters used to derive these emission factors are specified in the table below.

EMFAC2011 Parameter	Input
Region Type	Air Basin
Region	San Francisco Bay Area
Season	Annual
Vehicle Class	T7 Tractor
Model Year	Aggregated
Speed	Aggregated

EMFAC2011 does not provide emission factors for CH_4 and N_2O, which are mobile-source greenhouse gases that contribute to the effects of climate change. Therefore, we used heavy duty diesel truck emission factors from the Environmental Protection Agency's (EPA) *Emission Factors for Greenhouse Gas Inventories,* which specifies a CH_4 emission factor of 0.0051 grams per mile (g/mile), and a N_2O emission factor of 0.0048 g/mile.[8] We applied Global Warming Potentials (GWPs) to each of these pollutants in order to convert these emissions to carbon dioxide equivalents (CO_2e).[9]

According to the DSEIR, the CalEEMod default vehicle type for hauling is a mix of all heavy-heavy duty trucks (HHDT), labeled as a T7 vehicle type (Volume 3, Appendix AQ, pp. 1244). Furthermore, the CalEEMod emissions estimates take into account idling emissions, starting exhaust, evaporative emissions, and running losses, as well as emissions from road dust (Volume 3, Appendix AQ, pp. 1245 – 1248). Because our analysis is a bit more simplistic than the emissions calculated in CalEEMod, we estimated the emissions, using the methods and input parameters described above, from a 20-mile default hauling trip length. In an effort to demonstrate consistency, we used 2015 emissions factors to estimate the net increase in emissions for Scenario 1, and used 2016 emission factors to estimate the net increase in emissions for Scenario 2. The results of our analyses are summarized in the table below (see attachment for calculation details).

Scenario 1 vs. CalEEMod Default Hauling Emissions						
	ROG	CO	NOx	CO2e	PM10	PM2.5
Pounds per Day:						

[7] EMFAC2011 Web Database, *available at*: http://www.arb.ca.gov/emfac/2011/
[8] "Emission Factors for Greenhouse Gas Inventories." Climate Leadership United States Environmental Protection Agency, April 4, 2014. *Available at:* http://www.epa.gov/climateleadership/documents/emission-factors.pdf
[9] "Emission Factors for Greenhouse Gas Inventories." Climate Leadership United States Environmental Protection Agency, April 4, 2014. *Available at:* http://www.epa.gov/climateleadership/documents/emission-factors.pdf, CH_4 GWP is equal to 25, and the N_2O GWP is equal to 298.

Scenario 1	9.530	42.934	287.657	54,337	7.346	5.023
CalEEMod Default (2015)	5.989	26.982	180.774	34,147	4.616	3.157
Net Increase	**3.541**	**15.953**	**106.883**	**20,190**	**2.729**	**1.866**
	ROG	**CO**	**NOx**	**CO2e**	**PM10**	**PM2.5**
Tons per Year (CO2e in Metric Tons per Year):						
Scenario 1	0.419	1.889	12.657	2,173	0.323	0.221
CalEEMod Default (2015)	0.264	1.187	7.954	1,366	0.203	0.139
Net Increase	**0.156**	**0.702**	**4.703**	**808**	**0.120**	**0.082**

Scenario 2 vs. CalEEMod Default Hauling Emissions						
	ROG	**CO**	**NOx**	**CO2e**	**PM10**	**PM2.5**
Pounds per Day:						
Scenario 2	8.800	39.466	273.077	60,759	6.947	4.427
CalEEMod Default (2016)	4.886	21.910	151.604	33,732	3.857	2.458
Net Increase	**3.915**	**17.556**	**121.473**	**27,027**	**3.090**	**1.969**
	ROG	**CO**	**NOx**	**CO2e**	**PM10**	**PM2.5**
Tons per Year (CO2e in Metric Tons per Year):						
Scenario 2	0.387	1.737	12.015	2,430	0.306	0.195
CalEEMod Default (2016)	0.215	0.964	6.671	1,349	0.170	0.108
Net Increase	**0.172**	**0.772**	**5.345**	**1,081**	**0.136**	**0.087**

Our simple analysis indicates that the use of a CalEEMod default hauling trip length results in an approximate 37 – 44 percent underestimation in mobile-source, hauling emissions. CalEEMod default values should only be relied upon when site specific information is not available. As indicated by our analysis above, hauling destinations can be derived very easily. If site specific information is used to determine hauling trip lengths, the emissions increase significantly. As a result, an updated DSEIR should be prepared to adjust the hauling trip length to reflect site specific distances. Furthermore, worker and vendor trip lengths, which we were not able to determine due to a lack of information disclosed in the DSEIR, should also be adjusted to reflect site specific distances.

Incorrectly Presumed the Use of Tier 2 and Tier 4 Interim Engines

In this updated analysis, it is presumed that all off-road construction equipment will be outfitted with, at a minimum Tier 2 engines with 40 percent NOx verified diesel emission control strategies (VDECS), and at a maximum, Tier 4 or Tier 4 interim engines (Volume 2, p. 5.4-32). There is no substantial evidence, however, to support the assumption that the roughly 195 pieces of off-road equipment utilized during Project construction will meet these standards. Furthermore, it may not be technically feasible to acquire machinery with Tier 2 or Tier 4 engines for the Project's entire construction equipment fleet. As a result, this mitigation measure should not be relied upon to reduce the Project's construction emissions to below levels of significance. Rather, the Project should pursue additional mitigation measures that are more technically feasible to implement.

The United States Environmental Protection Agency's (USEPA) 1998 nonroad engine emission standards were structured as a three-tiered progression. Tier 1 standards were phased-in from 1996 to 2000 and Tier 2 emission standards were phased in from 2001 to 2006. Tier 3 standards, which applied to engines from 37-560 kilowatts (kW) only, were phased in from 2006 to 2008. The Tier 4 emission standards were introduced in 2004, and were phased in from 2008 – 2015. [10] These tiered emission standards, however, are only applicable to newly manufactured nonroad equipment. According to the United States Environmental Protection Agency (USEPA) "if products were built before EPA emission standards started to apply, they are generally not affected by the standards or other regulatory requirements."[11] Therefore, pieces of equipment manufactured prior to 2000 are not required to adhere to Tier 2 emission standards, and pieces of equipment manufactured prior to 2008 are not required to adhere to Tier 4 emission standards. Construction equipment often lasts more than 30 years; as a result, Tier 1 equipment and non-certified equipment are currently still in use.[12] It is estimated that of the two million diesel engines currently used in construction, 31 percent were manufactured before the introduction of emissions regulations.[13] Furthermore, in a 2010 white paper, the California Industry Air Quality Coalition estimated that approximately 7% and less than 1% of all off-road heavy duty diesel equipment in California was equipped with Tier 2 and Tier 3 engines, respectively.[14] It goes on to explain that "cleaner burning Tier 4 engines…are not expected to come online in significant numbers until 2014." Given that significant production activities have only just begun within the last year, it can be presumed that there is limited availability of Tier 4 equipment. Furthermore, due to the complexity of Tier 4 engines, it is very difficult if not nearly impossible, to retrofit older model machinery with this technology.[15] Therefore, available off-road machinery equipped with Tier 4 engines are most likely new. According to a September 20, 2013 EPA Federal Register document, a new Tier 4 scraper or bulldozer would cost over $1,000,000 to purchase.[16] It is also relatively expensive to retrofit a piece of old machinery with a Tier 3 engine. For example, replacing a Tier 0 engine with a Tier 3 engine would cost roughly $150,000 or more.[17] Therefore, before applying mitigation measures of this caliber to a Project, the applicant should consider both the cost of the proposed equipment as well as determine the

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[10] Emission Standards, Nonroad Diesel Engines, *available at:* https://www.dieselnet.com/standards/us/nonroad.php#tier3

[11] "Frequently Asked Questions from Owners and Operators of Nonroad Engines, Vehicles, and Equipment Certified to EPA Standards." United States Environmental Protection Agency, August 2012. *Available at:* http://www.epa.gov/oms/highway-diesel/regs/420f12053.pdf

[12] "Best Practices for Clean Diesel Construction." Northeast Diesel Collaborative, August 2012. *Available at:* http://northeastdiesel.org/pdf/BestPractices4CleanDieselConstructionAug2012.pdf

[13] Northeast Diesel Collaborative Clean Construction Workgroup, *available at:* http://northeastdiesel.org/construction.html

[14] "White Paper: An Industry Perspective on the California Air Resources Board Proposed Off-Road Diesel Regulations." Construction Industry Air Quality Coalition, *available at:* http://www.agc-ca.org/uploadedFiles/Member_Services/Regulatory-Advocacy-Page-PDFs/White_Paper_CARB_OffRoad.pdf

[15] "Tier 4 – How it will affect your equipment, your business and your environment." Milton Cat, *available at:* http://www.miltoncat.com/News/Documents/Articles/For%20the%20Trenches%20-%20Tier%204.pdf

[16] Federal Register Volume 78, Number 183. United States Environmental Protection Agency, September 20, 2013. *Available at:* http://www.gpo.gov/fdsys/pkg/FR-2013-09-20/pdf/2013-22930.pdf

[17] Federal Register Volume 78, Number 183. United States Environmental Protection Agency, September 20, 2013. *Available at:* http://www.gpo.gov/fdsys/pkg/FR-2013-09-20/pdf/2013-22930.pdf

probability of obtaining an entirely Tier 2 or Tier 4 construction fleet. Unless the Project applicant can demonstrate to the public, either through budget or through a signed contractual agreement with a contractor or supplier, that they will purchase/rent exclusively Tier 2 or Tier 4 construction equipment, this mitigation measure should not be relied upon as a feasible way of reducing Project emissions.

Failure to Assess Individual Health Risk from Proposed Project

The DSEIR fails to assess the individual health risk that construction of the Project may have on nearby sensitive receptors. According to the DSEIR, because "both the PM2.5 and cancer risk assessments account for background (existing) concentrations and risk levels," the Project's contribution to PM2.5 concentrations and excess cancer risks are instead combined with background concentrations, and are then compared to cumulative significance thresholds (Volume 2, p. 5.4-45). Instead, the DSEIR uses the individual project cancer risk threshold of 10 in one million to determine the significance of emissions from the proposed emergency generators, exclusively (Volume p. 5.4-46). This application of the 10 in one million threshold is inconsistent with CEQA thresholds set forth by BAAQMD. As a result, the significance of the Project's toxic air contaminant (TAC) emissions during construction is not adequately determined. An updated DSEIR should be prepared to accurately assess the Project's individual health risk according to CEQA guidance set forth by BAAQMD.

The DSEIR does not apply the project risk threshold of 10 in one million to the Project as a whole (stationary, area, and mobile sources of TACs); rather, the DSEIR applies this threshold to stationary sources, exclusively, to the proposed emergency generators that will be used during Project operation (Volume 2, p. 5.4-46). The DSEIR explains this application by stating the following:

> "The permitting process under BAAQMD Regulation 2, Rule 5 requires a Health Risk Screening Analysis, the results of which are posted on the District's website. Per its Policy and Procedure Manual, the BAAQMD requires implementation of Best Available Control Technology for Toxics and would deny an Authority to Construct or a Permit to Operate for any new or modified source of TACs that exceeds a cancer risk of 10 in one million" (Volume 2, p. 5.4-46).

The requirements and thresholds set forth in BAAQMD's Regulation 2, Rule 5, as referred to in the DSEIR, however, apply only to stationary sources. As a result, the TAC emissions from on- and off-road mobile sources, such as construction equipment and heavy duty diesel trucks, are not held to any sort of significance threshold. This application of the 10 in one million threshold is inconsistent with CEQA thresholds set forth by BAAQMD. According to the BAAQMD's May 2011 *Recommended Methods for Screening and Modeling Local Risks and Hazards*, "the thresholds for local risks and hazards from TAC and PM2.5 are intended to apply to all sources of emissions, including both permitted stationary sources and on- and off-road mobile sources, such as sources related to construction, busy roadways, or freight movements."[18] Therefore, an individual project would be considered significant if the total project's TAC

[18] "Recommended Methods for Screening and Modeling Local Risks and Hazards." Bay Area Air Quality Management District, May 2011. *Available at:* http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20Modeling%20Approach.ashx

emissions, including exhaust from construction equipment, heavy duty diesel trucks, and diesel-powered generators, would result in an increased cancer risk greater than 10 in one million, or would result in an increased ambient air PM2.5 concentration greater than 0.3 $\mu g/m^3$.

The BAAQMD's October 2009 *Revised Draft Options and Justification Report*[19] outlines four ways of siting a new source and determining a significance threshold. Any project with the potential to expose people (receptors) to substantial levels of TAC is currently deemed to have a significant impact. The BAAQMD uses the following approach (Option 1) to determine significance:

> "Proposed development projects that have the potential to expose receptors to TAC in excess of the following thresholds from any source, mobile or stationary would be considered to have a significant air quality impact if the:
>
> - Probability of contracting cancer for the Maximally Exposed Individual (MEI) exceeds 10 in one million.
> - Ground-level concentrations of non-carcinogenic toxic air contaminants would result in a Hazard Index greater than 1 for the MEI" (p. 59).

The second option consists "of applying the current stationary source permitting thresholds to project-generated stationary, area-, and mobile-source TAC emissions" (p. 60). As previously stated, stationary sources of emissions are subject to BAAQMD's permit process per Regulation 2, Rule 5. The permitting process requires that all new or modified stationary sources that emit TACs perform modeling to determine what the concentration of TACs will be at the boundary of their property. This current permitting approach does not include area or mobile sources of emissions in the modeling or permitting assessment. If a proposed stationary source will have operational TAC concentrations from permitted equipment that result in an estimated 1 excess cancer risk in a million, the project is required to install Toxic Best Available Control Technology (TBACT) to minimize emissions of TACs. The TAC modeling must also demonstrate to BAAQMD that implementation of the proposed project would not result in additional incremental exposure of surrounding receptors to levels that exceed 10 in one million for excess cancer risk or a hazard index above one. The BAAQMD will not issue an authority to construct or permit to operate for any stationary source of TACs that would result in concentrations exceeding a 10 in one million threshold.

Option 2 expands on Option 1 by requiring the application of the one in a million threshold for stationary sources to install TBACT to projects that have TAC emissions from sources (primarily mobile) not currently required to obtain permits to operate. These non-stationary source type projects, such as the Warriors Arena Project, would be required to implement Toxic Best Practices (TBPs), such as site and circulation design, setbacks from roadways, air conditioning, and vegetation buffers, if their modeled cancer risks are above the one in a million threshold. The BAAQMD would identify a list of TBPs for non-

[19] "Revised Draft Options and Justification Report." Bay Area Air Quality Management District, October 2009. *Available at:* http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/revised-draft-ceqa-thresholds-justification-report-oct-2009.pdf?la=en

stationary sources to implement if they are above the one in a million threshold. The threshold of significant impact, thereby requiring implementation of all feasible on-site mitigation measures would be the 10 in a million excess cancer risk and a HI of 1.0.

The more stringent Option 3 involves application of a tiered CEQA threshold. New sources of TACs locating in impacted communities, as identified by the BAAQMD's Community Air Risk Evaluation (CARE) Program, would have to install TBACT and/or TBPs and would be subject to a significance threshold of 5 in one million (after consideration of TBACT and/or TBPs). New sources of TACs locating in a community other than an impacted community would be subject to a significance threshold of 10 in one million. Finally, Option 4 proposes a no net increase inhalation cancer risk. Option 4 does not define a "substantial change" because any increase would be considered significant.

The first two options suggest that projects with the potential to expose receptors to TACs greater than 10 in one million excess cancers, from any source, mobile or stationary, should be considered significant. The third option suggests a more stringent significance threshold of 5 in one million, and the fourth option suggests an even more stringent threshold, which deems any increase in TACs as significant. Regardless, all four options specify that emissions from both stationary and mobile sources be included when determining project significance. As a result, the maximum threshold that could reasonably apply to the Project's stationary and mobile source TAC emissions is the BAAQMD's individual project threshold of 10 in one million.

Failure to Use District's PM2.5 Cumulative Threshold

To evaluate the cumulative impacts of the Project, the DSEIR implements criteria used to define an Air Pollutant Exposure Zone (APEZ). The DSEIR states:

> "an APEZ [is] defined as an area in which modeled air pollution exceeds 'either: (1) a cancer risk of greater than 100 per one million exposed, and/or (2) PM2.5 concentrations in excess of 10 microgram per cubic meter (μg/m^3) (including ambient)'" (Volume 3, Appendix AQ, p. 9).

The cancer risk cumulative threshold of 100 in one million, used in the DSEIR, is consistent with the cumulative cancer risk threshold set forth by the BAAQMD, but not, as explained above, with the individual project cancer risk threshold. However, the PM2.5 threshold of 10 μg/m^3 is inconsistent with the BAAQMD's cumulative threshold, and represents a value that is far greater than the BAAQMD's recommended value. According to the BAAQMD's May 2011 CEQA Guidelines, "a project would have a significant cumulative impact if the total of all past, present, and foreseeable future sources within a 1,000 foot radius (or beyond where appropriate) from the fence line of a source, or from the location of a receptor, plus the contribution from the project, exceeds the following:

- Non- compliance with a qualified Community Risk Reduction Plan;
- An excess cancer risk levels of more than 100 in one million or a chronic hazard index greater than 10 for TACs; or

- 0.8 μg/m^3 annual average PM2.5."[20]

BAAQMD suggests that a project would have a significant cumulative impact if the total of all past, present, and foreseeable future sources within a 1,000 foot radius would result in an annual average PM2.5 concentration greater than 0.8 μg/m^3. This threshold is much more stringent when compared to the 10 μg/m^3 threshold used in the DSEIR. As a result, the DSEIR should implement the recommended cumulative threshold set forth by BAAQMD, rather than the 10 μg/m^3 threshold.

Furthermore, the DSEIR uses BAAQMD thresholds to determine the significance of other air quality impacts, but then uses APEZ criteria to determine health risk significance, even though BAAQMD suggests significance thresholds for cumulative health risks. For example, the DSEIR uses BAAQMD's average daily emissions construction thresholds to determine significance of construction emissions on air quality (Volume 2, p. 5.4-25). As is apparent, there is a huge discrepancy between the 10 μg/m^3 threshold used in the DSEIR and the 0.8 μg/m^3 cumulative threshold recommended by BAAQMD. Using an alternative threshold, rather than the one set forth by BAAQMD, demonstrates that the Applicant is picking and choosing the thresholds that apply to the Project to determine significance.

Sincerely,

Paul Rosenfeld

Jessie Jaeger

[20] "California Environmental Quality Act Air Quality Guidelines." Bay Area Air Quality Management District, May 2011. *Available at:* http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20CEQA%20Guidelines_May%202011_5_3_11.ashx, p. 5-15

Scenario 1:

25 Percent of Material Transported to Altamont Landfill

Factor	Value	Units
# of Haul Truck One-Way Trips per Day Transport to **Recovery Facility**	340.5	Trips per Day
# of Haul Truck One-Way Trips per Day Transport to **Altamont Landfill**	113.5	Trips per Day
Total # of Haul Truck One-Way Trips per Day	454	Total Trips per Day
Mileage per truck per one-way trip (**Recovery Facility**)	25	Miles
Mileage per truck per one-way trip (**Altamont Landfill**)	53	Miles
Total Haul Days	88	Days

Factor	Value	Units
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **ROG** Emission Factor	0.299	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CO** Emission Factor	1.348	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **NOx** Emission Factor	9.031	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CO2** Emission Factor	1,704.27	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Running Exhaust Emission Factor	0.133	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Tire Wear Emission Factor	0.036	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Break Wear Emission Factor	0.062	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Running Exhaust Emission Factor	0.122	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Tire Wear Emission Factor	0.009	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Break Wear Emission Factor	0.026	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CH4** Emission Factor	0.0051	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **N2O** Emission Factor	0.0048	grams/mile

Calculation	Value	Units	Notes
ROG:		-	
ROG Emissions	0.001	pounds/mile	
ROG Emissions	9.530	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
ROG Emissions	0.419	tons/year	(Pounds per day/pounds per ton) x haul days per year
CO:			
CO Emissions	0.003	pounds/mile	
CO Emissions	42.934	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CO Emissions	1.889	tons/year	(Pounds per day/pounds per ton) x haul days per year
NOx:			
NOx Emissions	0.020	pounds/mile	
NOx Emissions	287.657	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
NOx Emissions	12.657	tons/year	(Pounds per day/pounds per ton) x haul days per year
CO2:			
CO2 Emissions	3.757	pounds/mile	
CO2 Emissions	54,287.263	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CO2 Emissions	2,388.640	tons/year	(Pounds per day/pounds per ton) x haul days per year
CH4:			
CH4 Emissions	0.000	pounds/mile	
CH4 Emissions	0.162	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CH4 Emissions	0.007	tons/year	(Pounds per day/pounds per ton) x haul days per year
N2O:			
N2O Emissions	0.000	pounds/mile	
N2O Emissions	0.153	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
N2O Emissions	0.007	tons/year	(Pounds per day/pounds per ton) x haul days per year
PM10:			
PM10 Emissions	0.001	pounds/mile	
PM10 Emissions	7.346	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
PM10 Emissions	0.323	tons/year	(Pounds per day/pounds per ton) x haul days per year
PM2.5:			
PM2.5 Emissions	0.000	pounds/mile	
PM2.5 Emissions	5.023	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
PM2.5 Emissions	0.221	tons/year	(Pounds per day/pounds per ton) x haul days per year

CalEEMod Default Hauling Trip Length:

2015 Emission Factors

Factor	Value	Units
Total # of Haul Truck One-Way Trips per Day	454	Total Trips per Day
Mileage per truck per one-way trip (**CalEEMod Default**)	20	Miles
Total Haul Days	88	Days

Factor	Value	Units
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **ROG** Emission Factor	0.299	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CO** Emission Factor	1.348	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **NOx** Emission Factor	9.031	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CO2** Emission Factor	1,704.27	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Running Exhaust Emission Factor	0.133	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Tire Wear Emission Factor	0.036	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Break Wear Emission Factor	0.062	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Running Exhaust Emission Factor	0.122	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Tire Wear Emission Factor	0.009	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Break Wear Emission Factor	0.026	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CH4** Emission Factor	0.0051	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **N2O** Emission Factor	0.0048	grams/mile

Calculation	Value	Units	Notes
ROG:		-	
ROG Emissions	0.001	pounds/mile	
ROG Emissions	5.989	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
ROG Emissions	0.264	tons/year	(Pounds per day/pounds per ton) x haul days per year
CO:			
CO Emissions	0.003	pounds/mile	
CO Emissions	26.982	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CO Emissions	1.187	tons/year	(Pounds per day/pounds per ton) x haul days per year
NOx:			
NOx Emissions	0.020	pounds/mile	
NOx Emissions	180.774	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
NOx Emissions	7.954	tons/year	(Pounds per day/pounds per ton) x haul days per year
CO2:			
CO2 Emissions	3.757	pounds/mile	
CO2 Emissions	34,116.11	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CO2 Emissions	1,501.11	tons/year	(Pounds per day/pounds per ton) x haul days per year
CH4:			
CH4 Emissions	0.000	pounds/mile	
CH4 Emissions	0.102	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CH4 Emissions	0.004	tons/year	(Pounds per day/pounds per ton) x haul days per year
N2O:			
N2O Emissions	0.000	pounds/mile	
N2O Emissions	0.096	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
N2O Emissions	0.004	tons/year	(Pounds per day/pounds per ton) x haul days per year
PM10:			
PM10 Emissions	0.001	pounds/mile	
PM10 Emissions	4.616	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
PM10 Emissions	0.203	tons/year	(Pounds per day/pounds per ton) x haul days per year
PM2.5:			
PM2.5 Emissions	0.000	pounds/mile	
PM2.5 Emissions	3.157	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
PM2.5 Emissions	0.139	tons/year	(Pounds per day/pounds per ton) x haul days per year

Scenario 2:

25 Percent of Material Transported to Hay Road Landfill

Factor	Value	Units
# of Haul Truck One-Way Trips per Day Transport to **Recovery Facility**	340.5	Trips per Day
# of Haul Truck One-Way Trips per Day Transport to **Hay Road Landfill**	113.5	Trips per Day
Total # of Haul Truck One-Way Trips per Day	454	Total Trips per Day
Mileage per truck per one-way trip (**Recovery Facility**)	25	Miles
Mileage per truck per one-way trip (**Hay Road Landfill**)	70	Miles
Total Haul Days	88	Days

Factor	Value	Units
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **ROG** Emission Factor	0.244	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CO** Emission Factor	1.095	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **NOx** Emission Factor	7.573	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CO2** Emission Factor	1,683.51	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Running Exhaust Emission Factor	0.095	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Tire Wear Emission Factor	0.036	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Break Wear Emission Factor	0.062	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Running Exhaust Emission Factor	0.087	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Tire Wear Emission Factor	0.009	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Break Wear Emission Factor	0.026	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CH4** Emission Factor	0.0051	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **N2O** Emission Factor	0.0048	grams/mile

Calculation	Value	Units	Notes
ROG:		-	
ROG Emissions	0.001	pounds/mile	
ROG Emissions	8.800	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
ROG Emissions	0.387	tons/year	(Pounds per day/pounds per ton) x haul days per year
CO:			
CO Emissions	0.002	pounds/mile	
CO Emissions	39.466	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CO Emissions	1.737	tons/year	(Pounds per day/pounds per ton) x haul days per year
NOx:			
NOx Emissions	0.017	pounds/mile	
NOx Emissions	273.077	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
NOx Emissions	12.015	tons/year	(Pounds per day/pounds per ton) x haul days per year
CO2:			
CO2 Emissions	3.712	pounds/mile	
CO2 Emissions	60,702.99	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CO2 Emissions	2,670.93	tons/year	(Pounds per day/pounds per ton) x haul days per year
CH4:			
CH4 Emissions	0.000	pounds/mile	
CH4 Emissions	0.184	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CH4 Emissions	0.008	tons/year	(Pounds per day/pounds per ton) x haul days per year
N2O:			
N2O Emissions	0.000	pounds/mile	
N2O Emissions	0.173	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
N2O Emissions	0.008	tons/year	(Pounds per day/pounds per ton) x haul days per year
PM10:			
PM10 Emissions	0.000	pounds/mile	
PM10 Emissions	6.947	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
PM10 Emissions	0.306	tons/year	(Pounds per day/pounds per ton) x haul days per year
PM2.5:			
PM2.5 Emissions	0.000	pounds/mile	
PM2.5 Emissions	4.427	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
PM2.5 Emissions	0.195	tons/year	(Pounds per day/pounds per ton) x haul days per year

CalEEMod Default Hauling Trip Length:

2016 Emission Factors

Factor	Value	Units
Total # of Haul Truck One-Way Trips per Day	454	Total Trips per Day
Mileage per truck per one-way trip (**CalEEMod Default**)	20	Miles
Total Haul Days	88	Days

Factor	Value	Units
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **ROG** Emission Factor	0.244	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CO** Emission Factor	1.095	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **NOx** Emission Factor	7.573	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CO2** Emission Factor	1,683.51	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Running Exhaust Emission Factor	0.095	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Tire Wear Emission Factor	0.036	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM10** Break Wear Emission Factor	0.062	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Running Exhaust Emission Factor	0.087	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Tire Wear Emission Factor	0.009	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **PM2.5** Break Wear Emission Factor	0.026	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **CH4** Emission Factor	0.0051	grams/mile
Diesel Solid Waste Transport Truck (EMFAC2011: "T7 Tractor") **N2O** Emission Factor	0.0048	grams/mile

Calculation	Value	Units	Notes
ROG:		-	
ROG Emissions	0.001	pounds/mile	
ROG Emissions	4.886	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
ROG Emissions	0.215	tons/year	(Pounds per day/pounds per ton) x haul days per year
CO:			
CO Emissions	0.002	pounds/mile	
CO Emissions	21.910	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CO Emissions	0.964	tons/year	(Pounds per day/pounds per ton) x haul days per year
NOx:			
NOx Emissions	0.017	pounds/mile	
NOx Emissions	151.604	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
NOx Emissions	6.671	tons/year	(Pounds per day/pounds per ton) x haul days per year
CO2:			
CO2 Emissions	3.712	pounds/mile	
CO2 Emissions	33,700.48	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CO2 Emissions	1,482.82	tons/year	(Pounds per day/pounds per ton) x haul days per year
CH4:			
CH4 Emissions	0.000	pounds/mile	
CH4 Emissions	0.102	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
CH4 Emissions	0.004	tons/year	(Pounds per day/pounds per ton) x haul days per year
N2O:			
N2O Emissions	0.000	pounds/mile	
N2O Emissions	0.096	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
N2O Emissions	0.004	tons/year	(Pounds per day/pounds per ton) x haul days per year
PM10:			
PM10 Emissions	0.000	pounds/mile	
PM10 Emissions	3.857	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
PM10 Emissions	0.170	tons/year	(Pounds per day/pounds per ton) x haul days per year
PM2.5:			
PM2.5 Emissions	0.000	pounds/mile	
PM2.5 Emissions	2.458	pounds/day	Pounds per mile x one-way trip miles x # one-way trips per day
PM2.5 Emissions	0.108	tons/year	(Pounds per day/pounds per ton) x haul days per year

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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Paul Rosenfeld, Ph.D.

Chemical Fate and Transport & Air Dispersion Modeling

Principal Environmental Chemist

Risk Assessment & Remediation Specialist

Education:

Ph.D. Soil Chemistry, University of Washington, 1999. Dissertation on VOC filtration.
M.S. Environmental Science, U.C. Berkeley, 1995. Thesis on organic waste economics.
B.A. Environmental Studies, U.C. Santa Barbara, 1991. Thesis on wastewater treatment.

Professional Experience:

Dr. Rosenfeld is the Co-Founder and Principal Environmental Chemist at Soil Water Air Protection Enterprise (SWAPE). His focus is the fate and transport of environmental contaminants, risk assessment, and ecological restoration. Dr. Rosenfeld has a doctorate in soil chemistry and has evaluated odors from biosolids applications to soil and the effect of biosolids to agricultural crops. Dr. Rosenfeld has also evaluated odor emissions from the compost and food industry. His project experience ranges from monitoring and modeling of pollution sources as they relate to human and ecological health. Dr. Rosenfeld has investigated and designed remediation programs and risk assessments for contaminated sites containing petroleum, chlorinated solvents, pesticides, radioactive waste, PCBs, PAHs, dioxins, furans, volatile organics, semi-volatile organics, perchlorate, heavy metals, asbestos, PFOA, unusual polymers, MtBE, fuel oxygenates and odor. Dr. Rosenfeld has also evaluated and modeled emissions from fracking, boilers, incinerators and other industrial and agricultural sources relating to nuisance and personal injury. Dr. Rosenfeld has evaluated greenhouse gas emissions using various modeling programs recommended by California Air Quality Management Districts.

Professional History:

Soil Water Air Protection Enterprise (SWAPE); 2003 to present; Principal and Founding Partner
UCLA School of Public Health; 2007 to 2011; Lecturer (Assistant Researcher)
UCLA School of Public Health; 2003 to 2006; Adjunct Professor
UCLA Environmental Science and Engineering Program; 2002-2004; Doctoral Intern Coordinator
UCLA Institute of the Environment, 2001-2002; Research Associate
Komex H_2O Science, 2001 to 2003; Senior Remediation Scientist
National Groundwater Association, 2002-2004; Lecturer
San Diego State University, 1999-2001; Adjunct Professor
Anteon Corp., San Diego, 2000-2001; Remediation Project Manager
Ogden (now Amec), San Diego, 2000-2000; Remediation Project Manager
Bechtel, San Diego, California, 1999 – 2000; Risk Assessor
King County, Seattle, 1996 – 1999; Scientist
James River Corp., Washington, 1995-96; Scientist
Big Creek Lumber, Davenport, California, 1995; Scientist

Plumas Corp., California and USFS, Tahoe 1993-1995; Scientist
Peace Corps and World Wildlife Fund, St. Kitts, West Indies, 1991-1993; Scientist
Bureau of Land Management, Kremmling Colorado 1990; Scientist

Publications:

Chen, J. A., Zapata, A R., Sutherland, A. J., Molmen, D. R,. Chow, B. S., Wu, L. E., **Rosenfeld, P. E.,** Hesse, R. C., (2012) Sulfur Dioxide and Volatile Organic Compound Exposure To A Community In Texas City Texas Evaluated Using Aermod and Empirical Data. *American Journal of Environmental Science*, 8(6), 622-632.

Rosenfeld, P.E. & Feng, L. (2011). *The Risks of Hazardous Waste.* Amsterdam: Elsevier Publishing.

Cheremisinoff, N.P., & **Rosenfeld, P.E.** (2011). *Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Agrochemical Industry*, Amsterdam: Elsevier Publishing.

Gonzalez, J., Feng, L., Sutherland, A., Waller, C., Sok, H., Hesse, R., **Rosenfeld, P.** (2010). PCBs and Dioxins/Furans in Attic Dust Collected Near Former PCB Production and Secondary Copper Facilities in Sauget, IL. *Procedia Environmental Sciences*. 113–125.

Feng, L., Wu, C., Tam, L., Sutherland, A.J., Clark, J.J., **Rosenfeld, P.E.** (2010). Dioxin and Furan Blood Lipid and Attic Dust Concentrations in Populations Living Near Four Wood Treatment Facilities in the United States. *Journal of Environmental Health*. 73(6), 34-46.

Cheremisinoff, N.P., & **Rosenfeld, P.E.** (2010). *Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Wood and Paper Industries.* Amsterdam: Elsevier Publishing.

Cheremisinoff, N.P., & **Rosenfeld, P.E.** (2009). *Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Petroleum Industry*. Amsterdam: Elsevier Publishing.

Wu, C., Tam, L., Clark, J., **Rosenfeld, P**. (2009). Dioxin and furan blood lipid concentrations in populations living near four wood treatment facilities in the United States. *WIT Transactions on Ecology and the Environment, Air Pollution,* 123 (17), 319-327.

Tam L. K.., Wu C. D., Clark J. J. and **Rosenfeld, P.E.** (2008). A Statistical Analysis Of Attic Dust And Blood Lipid Concentrations Of Tetrachloro-p-Dibenzodioxin (TCDD) Toxicity Equivalency Quotients (TEQ) In Two Populations Near Wood Treatment Facilities. *Organohalogen Compounds*, 70, 002252-002255.

Tam L. K.., Wu C. D., Clark J. J. and **Rosenfeld, P.E.** (2008). Methods For Collect Samples For Assessing Dioxins And Other Environmental Contaminants In Attic Dust: A Review. *Organohalogen Compounds*, 70, 000527-000530.

Hensley, A.R. A. Scott, J. J. J. Clark, **Rosenfeld, P.E.** (2007). Attic Dust and Human Blood Samples Collected near a Former Wood Treatment Facility. *Environmental Research*. 105, 194-197.

Rosenfeld, P.E., J. J. J. Clark, A. R. Hensley, M. Suffet. (2007). The Use of an Odor Wheel Classification for Evaluation of Human Health Risk Criteria for Compost Facilities. *Water Science & Technology* 55(5), 345-357.

Rosenfeld, P. E., M. Suffet. (2007). The Anatomy Of Odour Wheels For Odours Of Drinking Water, Wastewater, Compost And The Urban Environment. *Water Science & Technology* 55(5), 335-344.

Sullivan, P. J. Clark, J.J.J., Agardy, F. J., **Rosenfeld, P.E.** (2007). *Toxic Legacy, Synthetic Toxins in the Food, Water, and Air in American Cities.* Boston Massachusetts: Elsevier Publishing,

Rosenfeld P.E., and Suffet, I.H. (Mel) (2007). Anatomy of an Odor Wheel. *Water Science and Technology*.

Rosenfeld, P.E., Clark, J.J.J., Hensley A.R., Suffet, I.H. (Mel) (2007). The use of an odor wheel classification for evaluation of human health risk criteria for compost facilities. *Water Science And Technology*.

Rosenfeld, P.E., and Suffet I.H. (2004). Control of Compost Odor Using High Carbon Wood Ash. *Water Science and Technology*. 49(9),171-178.

Rosenfeld P. E., J.J. Clark, I.H. (Mel) Suffet (2004). The Value of An Odor-Quality-Wheel Classification Scheme For The Urban Environment. *Water Environment Federation's Technical Exhibition and Conference (WEFTEC) 2004.* New Orleans, October 2-6, 2004.

Rosenfeld, P.E., and Suffet, I.H. (2004). Understanding Odorants Associated With Compost, Biomass Facilities, and the Land Application of Biosolids. *Water Science and Technology*. 49(9), 193-199.

Rosenfeld, P.E., and Suffet I.H. (2004). Control of Compost Odor Using High Carbon Wood Ash, *Water Science and Technology*, 49(9), 171-178.

Rosenfeld, P. E., Grey, M. A., Sellew, P. (2004). Measurement of Biosolids Odor and Odorant Emissions from Windrows, Static Pile and Biofilter. *Water Environment Research*. 76(4), 310-315.

Rosenfeld, P.E., Grey, M and Suffet, M. (2002). Compost Demonstration Project, Sacramento California Using High-Carbon Wood Ash to Control Odor at a Green Materials Composting Facility. *Integrated Waste Management Board Public Affairs Office*, Publications Clearinghouse (MS–6), Sacramento, CA Publication #442-02-008.

Rosenfeld, P.E., and C.L. Henry. (2001). Characterization of odor emissions from three different biosolids. *Water Soil and Air Pollution*. 127(1-4), 173-191.

Rosenfeld, P.E., and Henry C. L., (2000). Wood ash control of odor emissions from biosolids application. *Journal of Environmental Quality.* 29, 1662-1668.

Rosenfeld, P.E., C.L. Henry and D. Bennett. (2001). Wastewater dewatering polymer affect on biosolids odor emissions and microbial activity. *Water Environment Research*. 73(4), 363-367.

Rosenfeld, P.E., and C.L. Henry. (2001). Activated Carbon and Wood Ash Sorption of Wastewater, Compost, and Biosolids Odorants. *Water Environment Research*, 73, 388-393.

Rosenfeld, P.E., and Henry C. L., (2001). High carbon wood ash effect on biosolids microbial activity and odor. *Water Environment Research*. 131(1-4), 247-262.

Chollack, T. and **P. Rosenfeld. (**1998). Compost Amendment Handbook For Landscaping. Prepared for and distributed by the City of Redmond, Washington State.

Rosenfeld, P. E. (1992). The Mount Liamuiga Crater Trail. *Heritage Magazine of St. Kitts*, 3(2).

Rosenfeld, P. E. (1993). High School Biogas Project to Prevent Deforestation On St. Kitts. *Biomass Users Network*, 7(1).

Rosenfeld, P. E. (1998). Characterization, Quantification, and Control of Odor Emissions From Biosolids Application To Forest Soil. Doctoral Thesis. University of Washington College of Forest Resources.

Rosenfeld, P. E. (1994). Potential Utilization of Small Diameter Trees on Sierra County Public Land. Masters thesis reprinted by the Sierra County Economic Council. Sierra County, California.

Rosenfeld, P. E. (1991). How to Build a Small Rural Anaerobic Digester & Uses Of Biogas In The First And Third World. Bachelors Thesis. University of California.

Presentations:

Rosenfeld, P.E., Sutherland, A; Hesse, R.; Zapata, A. (October 3-6, 2013). Air dispersion modeling of volatile organic emissions from multiple natural gas wells in Decatur, TX. *44th Western Regional Meeting, American Chemical Society.* Lecture conducted from Santa Clara, CA.

Sok, H.L.; Waller, C.C.; Feng, L.; Gonzalez, J.; Sutherland, A.J.; Wisdom-Stack, T.; Sahai, R.K.; Hesse, R.C.; **Rosenfeld, P.E.** (June 20-23, 2010). Atrazine: A Persistent Pesticide in Urban Drinking Water. *Urban Environmental Pollution*. Lecture conducted from Boston, MA.

Feng, L.; Gonzalez, J.; Sok, H.L.; Sutherland, A.J.; Waller, C.C.; Wisdom-Stack, T.; Sahai, R.K.; La, M.; Hesse, R.C.; **Rosenfeld, P.E.** (June 20-23, 2010). Bringing Environmental Justice to East St. Louis, Illinois. *Urban Environmental Pollution.* Lecture conducted from Boston, MA.

Rosenfeld, P.E. (April 19-23, 2009). Perfluoroctanoic Acid (PFOA) and Perfluoroactane Sulfonate (PFOS) Contamination in Drinking Water From the Use of Aqueous Film Forming Foams (AFFF) at Airports in the United States. *2009 Ground Water Summit and 2009 Ground Water Protection Council Spring Meeting*, Lecture conducted from Tuscon, AZ.

Rosenfeld, P.E. (April 19-23, 2009). Cost to Filter Atrazine Contamination from Drinking Water in the United States" Contamination in Drinking Water From the Use of Aqueous Film Forming Foams (AFFF) at Airports in the United States. *2009 Ground Water Summit and 2009 Ground Water Protection Council Spring Meeting*. Lecture conducted from Tuscon, AZ.

Wu, C., Tam, L., Clark, J., **Rosenfeld, P**. (20-22 July, 2009). Dioxin and furan blood lipid concentrations in populations living near four wood treatment facilities in the United States. Brebbia, C.A. and Popov, V., eds., *Air Pollution XVII: Proceedings of the Seventeenth International Conference on Modeling, Monitoring and Management of Air Pollution*. Lecture conducted from Tallinn, Estonia.

Rosenfeld, P. E. (October 15-18, 2007). Moss Point Community Exposure To Contaminants From A Releasing Facility. *The 23rd Annual International Conferences on Soils Sediment and Water.* Platform lecture conducted from University of Massachusetts, Amherst MA.

Rosenfeld, P. E. (October 15-18, 2007). The Repeated Trespass of Tritium-Contaminated Water Into A Surrounding Community Form Repeated Waste Spills From A Nuclear Power Plant. *The 23rd Annual International Conferences on Soils Sediment and Water*. Platform lecture conducted from University of Massachusetts, Amherst MA.

Rosenfeld, P. E. (October 15-18, 2007). Somerville Community Exposure To Contaminants From Wood Treatment Facility Emissions. The *23rd Annual International Conferences on Soils Sediment and Water*. Lecture conducted from University of Massachusetts, Amherst MA.

Rosenfeld P. E. (March 2007). Production, Chemical Properties, Toxicology, & Treatment Case Studies of 1,2,3-Trichloropropane (TCP). *The Association for Environmental Health and Sciences (AEHS) Annual Meeting*. Lecture conducted from San Diego, CA.

Rosenfeld P. E. (March 2007). Blood and Attic Sampling for Dioxin/Furan, PAH, and Metal Exposure in Florala, Alabama. *The AEHS Annual Meeting.* Lecture conducted from San Diego, CA.

Hensley A.R., Scott, A., **Rosenfeld P.E.,** Clark, J.J.J. (August 21 – 25, 2006). Dioxin Containing Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility. *The 26th International Symposium on Halogenated Persistent Organic Pollutants – DIOXIN2006*. Lecture conducted from Radisson SAS Scandinavia Hotel in Oslo Norway.

Hensley A.R., Scott, A., **Rosenfeld P.E.,** Clark, J.J.J. (November 4-8, 2006). Dioxin Containing Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility. *APHA 134 Annual Meeting & Exposition.* Lecture conducted from Boston Massachusetts.

Paul Rosenfeld Ph.D. (October 24-25, 2005). Fate, Transport and Persistence of PFOA and Related Chemicals. Mealey's C8/PFOA. *Science, Risk & Litigation Conference.* Lecture conducted from The Rittenhouse Hotel, Philadelphia, PA.

Paul Rosenfeld Ph.D. (September 19, 2005). Brominated Flame Retardants in Groundwater: Pathways to Human Ingestion, *Toxicology and Remediation PEMA Emerging Contaminant Conference*. Lecture conducted from Hilton Hotel, Irvine California.

Paul Rosenfeld Ph.D. (September 19, 2005). Fate, Transport, Toxicity, And Persistence of 1,2,3-TCP. *PEMA Emerging Contaminant Conference.* Lecture conducted from Hilton Hotel in Irvine, California.

Paul Rosenfeld Ph.D. (September 26-27, 2005). Fate, Transport and Persistence of PDBEs. *Mealey's Groundwater Conference.* Lecture conducted from Ritz Carlton Hotel, Marina Del Ray, California.

Paul Rosenfeld Ph.D. (June 7-8, 2005). Fate, Transport and Persistence of PFOA and Related Chemicals. *International Society of Environmental Forensics: Focus On Emerging Contaminants*. Lecture conducted from Sheraton Oceanfront Hotel, Virginia Beach, Virginia.

Paul Rosenfeld Ph.D. (July 21-22, 2005). Fate Transport, Persistence and Toxicology of PFOA and Related Perfluorochemicals. *2005 National Groundwater Association Ground Water And Environmental Law Conference*. Lecture conducted from Wyndham Baltimore Inner Harbor, Baltimore Maryland.

Paul Rosenfeld Ph.D. (July 21-22, 2005). Brominated Flame Retardants in Groundwater: Pathways to Human Ingestion, Toxicology and Remediation. *2005 National Groundwater Association Ground Water and Environmental Law Conference.* Lecture conducted from Wyndham Baltimore Inner Harbor, Baltimore Maryland.

Paul Rosenfeld, Ph.D. and James Clark Ph.D. and Rob Hesse R.G. (May 5-6, 2004). Tert-butyl Alcohol Liability and Toxicology, A National Problem and Unquantified Liability. *National Groundwater Association. Environmental Law Conference*. Lecture conducted from Congress Plaza Hotel, Chicago Illinois.

Paul Rosenfeld, Ph.D. (March 2004). Perchlorate Toxicology. *Meeting of the American Groundwater Trust*. Lecture conducted from Phoenix Arizona.

Hagemann, M.F., **Paul Rosenfeld, Ph.D.** and Rob Hesse (2004). Perchlorate Contamination of the Colorado River. *Meeting of tribal representatives.* Lecture conducted from Parker, AZ.

Paul Rosenfeld, Ph.D. (April 7, 2004). A National Damage Assessment Model For PCE and Dry Cleaners. *Drycleaner Symposium. California Ground Water Association*. Lecture conducted from Radison Hotel, Sacramento, California.

Rosenfeld, P. E., Grey, M., (June 2003) Two stage biofilter for biosolids composting odor control. *Seventh International In Situ And On Site Bioremediation Symposium Battelle Conference* Orlando, FL.

Paul Rosenfeld, Ph.D. and James Clark Ph.D. (February 20-21, 2003) Understanding Historical Use, Chemical Properties, Toxicity and Regulatory Guidance of 1,4 Dioxane. *National Groundwater Association. Southwest Focus Conference. Water Supply and Emerging Contaminants*.. Lecture conducted from Hyatt Regency Phoenix Arizona.

Paul Rosenfeld, Ph.D. (February 6-7, 2003). Underground Storage Tank Litigation and Remediation. *California CUPA Forum*. Lecture conducted from Marriott Hotel, Anaheim California.

Paul Rosenfeld, Ph.D. (October 23, 2002) Underground Storage Tank Litigation and Remediation. *EPA Underground Storage Tank Roundtable*. Lecture conducted from Sacramento California.

Rosenfeld, P.E. and Suffet, M. (October 7- 10, 2002). Understanding Odor from Compost, *Wastewater and Industrial Processes. Sixth Annual Symposium On Off Flavors in the Aquatic Environment. International Water Association*. Lecture conducted from Barcelona Spain.

Rosenfeld, P.E. and Suffet, M. (October 7- 10, 2002). Using High Carbon Wood Ash to Control Compost Odor. *Sixth Annual Symposium On Off Flavors in the Aquatic Environment. International Water Association*. Lecture conducted from Barcelona Spain.

Rosenfeld, P.E. and Grey, M. A. (September 22-24, 2002). Biocycle Composting For Coastal Sage Restoration. *Northwest Biosolids Management Association*. Lecture conducted from Vancouver Washington..

Rosenfeld, P.E. and Grey, M. A. (November 11-14, 2002). Using High-Carbon Wood Ash to Control Odor at a Green Materials Composting Facility. *Soil Science Society Annual Conference*. Lecture conducted from Indianapolis, Maryland.

Rosenfeld. P.E. (September 16, 2000). Two stage biofilter for biosolids composting odor control. *Water Environment Federation.* Lecture conducted from Anaheim California.

Rosenfeld. P.E. (October 16, 2000). Wood ash and biofilter control of compost odor. *Biofest.* Lecture conducted from Ocean Shores, California.

Rosenfeld, P.E. (2000). Bioremediation Using Organic Soil Amendments. *California Resource Recovery Association*. Lecture conducted from Sacramento California.

Rosenfeld, P.E., C.L. Henry, R. Harrison. (1998). Oat and Grass Seed Germination and Nitrogen and Sulfur Emissions Following Biosolids Incorporation With High-Carbon Wood-Ash. *Water Environment Federation 12th Annual Residuals and Biosolids Management Conference Proceedings*. Lecture conducted from Bellevue Washington.

Rosenfeld, P.E., and C.L. Henry. (1999). An evaluation of ash incorporation with biosolids for odor reduction. *Soil Science Society of America*. Lecture conducted from Salt Lake City Utah.

Rosenfeld, P.E., C.L. Henry, R. Harrison. (1998). Comparison of Microbial Activity and Odor Emissions from Three Different Biosolids Applied to Forest Soil. *Brown and Caldwell.* Lecture conducted from Seattle Washington.

Rosenfeld, P.E., C.L. Henry. (1998). Characterization, Quantification, and Control of Odor Emissions from Biosolids Application To Forest Soil. *Biofest.* Lecture conducted from Lake Chelan, Washington.

Rosenfeld, P.E, C.L. Henry, R. Harrison. (1998). Oat and Grass Seed Germination and Nitrogen and Sulfur Emissions Following Biosolids Incorporation With High-Carbon Wood-Ash. Water Environment Federation 12th Annual Residuals and Biosolids Management Conference Proceedings. Lecture conducted from Bellevue Washington.

Rosenfeld, P.E., C.L. Henry, R. B. Harrison, and R. Dills. (1997). Comparison of Odor Emissions From Three Different Biosolids Applied to Forest Soil. *Soil Science Society of America*. Lecture conducted from Anaheim California.

Teaching Experience:

UCLA Department of Environmental Health (Summer 2003 through 20010) Taught Environmental Health Science 100 to students, including undergrad, medical doctors, public health professionals and nurses. Course focused on the health effects of environmental contaminants.

National Ground Water Association, Successful Remediation Technologies. Custom Course in Sante Fe, New Mexico. May 21, 2002. Focused on fate and transport of fuel contaminants associated with underground storage tanks.

National Ground Water Association; Successful Remediation Technologies Course in Chicago Illinois. April 1, 2002. Focused on fate and transport of contaminants associated with Superfund and RCRA sites.

California Integrated Waste Management Board, April and May, 2001. Alternative Landfill Caps Seminar in San Diego, Ventura, and San Francisco. Focused on both prescriptive and innovative landfill cover design.

UCLA Department of Environmental Engineering, February 5, 2002. Seminar on Successful Remediation Technologies focusing on Groundwater Remediation.

University Of Washington, Soil Science Program, Teaching Assistant for several courses including: Soil Chemistry, Organic Soil Amendments, and Soil Stability.

U.C. Berkeley, Environmental Science Program Teaching Assistant for Environmental Science 10.

Academic Grants Awarded:

California Integrated Waste Management Board. $41,000 grant awarded to UCLA Institute of the Environment. Goal: To investigate effect of high carbon wood ash on volatile organic emissions from compost. 2001.

Synagro Technologies, Corona California: $10,000 grant awarded to San Diego State University.
Goal: investigate effect of biosolids for restoration and remediation of degraded coastal sage soils. 2000.

King County, Department of Research and Technology, Washington State. $100,000 grant awarded to University of Washington: Goal: To investigate odor emissions from biosolids application and the effect of polymers and ash on VOC emissions. 1998.

Northwest Biosolids Management Association, Washington State. $20,000 grant awarded to investigate effect of polymers and ash on VOC emissions from biosolids. 1997.

James River Corporation, Oregon: $10,000 grant was awarded to investigate the success of genetically engineered Poplar trees with resistance to round-up. 1996.

United State Forest Service, Tahoe National Forest: $15,000 grant was awarded to investigating fire ecology of the Tahoe National Forest. 1995.

Kellogg Foundation, Washington D.C. $500 grant was awarded to construct a large anaerobic digester on St. Kitts in West Indies. 1993.

Deposition and/or Trial Testimony:

In The Circuit Court of Ohio County, West Virginia
Robert Andrews, et al. v. Antero, et al.
Civil Action N0. 14-C-30000
Rosenfeld Deposition, June 2015

In The Iowa District Court For Muscatine County
Laurie Freeman et. al. Plaintiffs vs. Grain Processing Corporation, Defendant
Case No 4980
Rosenfeld Deposition: May 2015

In the Circuit Court of the 17th Judicial Circuit, in and For Broward County, Florida
Walter Hinton, et. al. Plaintiff, vs. City of Fort Lauderdale, Florida, a Municipality, Defendant.
Case Number CACE07030358 (26)
Rosenfeld Deposition: December 2014

In the United States District Court Western District of Oklahoma
Tommy McCarty, et al., Plaintiffs, v. Oklahoma City Landfill, LLC d/b/a Southeast Oklahoma City Landfill, et al. Defendants.
Case No. 5:12-cv-01152-C
Rosenfeld Deposition: July 2014

In the County Court of Dallas County Texas
Lisa Parr et al, *Plaintiff*, vs. Aruba et al, *Defendant.*
Case Number cc-11-01650-E
Rosenfeld Deposition: March and September 2013
Rosenfeld Trial: April 2014

In the Court of Common Pleas of Tuscarawas County Ohio
John Michael Abicht, et al., *Plaintiffs,* vs. Republic Services, Inc., et al., *Defendants*
Case Number: 2008 CT 10 0741 (Cons. w/ 2009 CV 10 0987)
Rosenfeld Deposition: October 2012

In the Court of Common Pleas for the Second Judicial Circuit, State of South Carolina, County of Aiken
David Anderson, et al., *Plaintiffs*, vs. Norfolk Southern Corporation, et al., *Defendants.*
Case Number: 2007-CP-02-1584

In the Circuit Court of Jefferson County Alabama
Jaeanette Moss Anthony, et al., *Plaintiffs*, vs. Drummond Company Inc., et al., *Defendants*
Civil Action No. CV 2008-2076
Rosenfeld Deposition: September 2010

In the Ninth Judicial District Court, Parish of Rapides, State of Louisiana
Roger Price, et al., *Plaintiffs*, vs. Roy O. Martin, L.P., et al., *Defendants*.
Civil Suit Number 224,041 Division G
Rosenfeld Deposition: September 2008

In the United States District Court, Western District Lafayette Division
Ackle et al., *Plaintiffs*, vs. Citgo Petroleum Corporation, et al., *Defendants*.
Case Number 2:07CV1052
Rosenfeld Deposition: July 2009

In the United States District Court for the Southern District of Ohio
Carolyn Baker, et al., *Plaintiffs*, vs. Chevron Oil Company, et al., *Defendants*.
Case Number 1:05 CV 227
Rosenfeld Deposition: July 2008

In the Fourth Judicial District Court, Parish of Calcasieu, State of Louisiana
Craig Steven Arabie, et al., *Plaintiffs*, vs. Citgo Petroleum Corporation, et al., *Defendants*.
Case Number 07-2738 G

In the Fourteenth Judicial District Court, Parish of Calcasieu, State of Louisiana

Leon B. Brydels, *Plaintiffs*, vs. Conoco, Inc., et al*., Defendants*.
Case Number 2004-6941 Division A

In the District Court of Tarrant County, Texas, 153rd Judicial District
Linda Faust, *Plaintiff*, vs. Burlington Northern Santa Fe Rail Way Company, Witco Chemical Corporation A/K/A Witco Corporation, Solvents and Chemicals, Inc. and Koppers Industries, Inc., *Defendants*.
Case Number 153-212928-05
Rosenfeld Deposition: December 2006, October 2007
Rosenfeld Trial: January 2008

In the Superior Court of the State of California in and for the County of San Bernardino
Leroy Allen, et al., *Plaintiffs*, vs. Nutro Products, Inc., a California Corporation and DOES 1 to 100, inclusive, *Defendants*.
John Loney, Plaintiff, vs. James H. Didion, Sr.; Nutro Products, Inc.; DOES 1 through 20, inclusive, *Defendants*.
Case Number VCVVS044671
Rosenfeld Deposition: December 2009
Rosenfeld Trial: March 2010

In the United States District Court for the Middle District of Alabama, Northern Division
James K. Benefield, et al., *Plaintiffs*, vs. International Paper Company, *Defendant*.
Civil Action Number 2:09-cv-232-WHA-TFM
Rosenfeld Deposition: July 2010, June 2011

In the Superior Court of the State of California in and for the County of Los Angeles
Leslie Hensley and Rick Hensley, *Plaintiffs*, vs. Peter T. Hoss, as trustee on behalf of the Cone Fee Trust; Plains Exploration & Production Company, a Delaware corporation; Rayne Water Conditioning, Inc., a California Corporation; and DOES 1 through 100, ***Defendants.***
Case Number SC094173
Rosenfeld Deposition: September 2008, October 2008

In the Superior Court of the State of California in and for the County of Santa Barbara, Santa Maria Branch
Clifford and Shirley Adelhelm, et al., all individually, *Plaintiffs*, vs. Unocal Corporation, a Delaware Corporation; Union Oil Company of California, a California corporation; Chevron Corporation, a California corporation; ConocoPhillips, a Texas corporation; Kerr-McGee Corporation, an Oklahoma corporation; and DOES 1 though 100, ***Defendants.***
Case Number 1229251 (Consolidated with case number 1231299)
Rosenfeld Deposition: January 2008

In the United States District Court for Eastern District of Arkansas, Eastern District of Arkansas
Harry Stephens Farms, Inc, and Harry Stephens, individual and as managing partner of Stephens Partnership, *Plaintiffs*, vs. Helena Chemical Company, and Exxon Mobil Corp., successor to Mobil Chemical Co., ***Defendants.***
Case Number 2:06-CV-00166 JMM (Consolidated with case number 4:07CV00278 JMM)
Rosenfeld Deposition: July 2010

In the United States District Court for the Western District of Arkansas, Texarkana Division
Rhonda Brasel, et al., *Plaintiffs*, vs. Weyerhaeuser Company and DOES 1 through 100, ***Defendants.***
Civil Action Number 07-4037
Rosenfeld Deposition: March 2010
Rosenfeld Trial: October 2010

In the District Court of Texas 21st Judicial District of Burleson County
Dennis Davis, *Plaintiff*, vs. Burlington Northern Santa Fe Rail Way Company, ***Defendant.***
Case Number 25,151

Rosenfeld Trial: May 2009

In the United States District Court of Southern District of Texas Galveston Division
Kyle Cannon, Eugene Donovan, Genaro Ramirez, Carol Sassler, and Harvey Walton, each Individually and on behalf of those similarly situated, *Plaintiffs,* vs. BP Products North America, Inc., ***Defendant.***
Case 3:10-cv-00622
Rosenfeld Deposition: February 2012
Rosenfeld Trial: April 2013

In the Circuit Court of Baltimore County Maryland
Philip E. Cvach, II et al., *Plaintiffs* vs. Two Farms, Inc. d/b/a Royal Farms, Defendants
Case Number: 03-C-12-012487 OT
Rosenfeld Deposition: September 2013

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UNIVERSITY OF CALIFORNIA, LOS ANGELES **B.S. CONSERVATION BIOLOGY & ENVIRONMENTAL SCIENCES** *JUNE 2014*

PROJECT EXPERIENCE

SOIL WATER AIR PROTECTION ENTERPRISE ***SANTA MONICA, CA***

AIR QUALITY SPECIALIST

SENIOR ANALYST: CEQA ANALYSIS & MODELING

- Calculated roadway, stationary source, and cumulative impacts for risk and hazard analyses at proposed land use projects.
- Quantified criteria air pollutant and greenhouse gas emissions released during construction and operational activities of proposed land use projects using CalEEMod and EMFAC2011 emission factors.
- Utilized AERSCREEN, a screening dispersion model, to determine the ambient air concentrations at sensitive receptor locations.
- Organized presentations containing figures and tables comparing results of particulate matter analyses to CEQA thresholds.
- Prepared reports that discuss results of the health risk analyses conducted for several land use redevelopment projects.

SENIOR ANALYST: GREENHOUSE GAS MODELING AND DETERMINATION OF SIGNIFICANCE

- Quantified greenhouse gas (GHG) emissions of a "business as usual" scenario for proposed land use projects using CalEEMod.
- Determined compliance of proposed projects with AB 32 GHG reduction targets, with measures described in CARB's Scoping Plan for each land use sector, and with GHG significance thresholds recommended by various Air Quality Management Districts in California.
- Produced tables and figures that compare the results of the GHG analyses to applicable CEQA thresholds and reduction targets.

PROJECT MANAGER: OFF-GASSING OF FORMALDEHYDE FROM FLOORING PRODUCTS

- Determined the appropriate standard test methods to effectively measure formaldehyde emissions from flooring products.
- Compiled and analyzed laboratory testing data. Produced tables, charts, and graphs to exhibit emission levels.
- Compared finalized testing data to Proposition 65 No Significant Risk Level (NSRL) and to CARB's Phase 2 Standard.
- Prepared a final analytical report and organized supporting data for use as Expert testimony in environmental litigation.
- Participated in meetings with clients to discuss project strategy and identify solutions to achieve short and long term goals.

PROJECT ANALYST: EXPOSURE ASSESSMENT OF CONTAMINANTS EMITTED BY INCINERATOR

- Reviewed and organized sampling data, and determined the maximum levels of arsenic, dioxin, and lead in soil samples.
- Determined cumulative and hourly particulate deposition of incinerator and modeled particle dispersion locations using GIS and AERMOD.
- Conducted risk assessment using guidance set forth by the Office of Environmental Health Hazard Assessment (OEHHA).
- Utilized LeadSpread8 to evaluate exposure, and the potential adverse health effects from exposure, to lead in the environment.
- Compared final results of assessment to the Environmental Protection Agency's (EPA) Regional Screening Levels (RSLs).

ACCOMPLISHMENTS

- **Recipient**, Bruins Advantage Scholarship, University of California, Los Angeles ***SEPT 2010 – JUNE 2014***
- **Academic Honoree,** Dean's List, University of California, Los Angeles ***SEPT 2013 – JUNE 2014***
- **Academic Wellness Director**, UCLA Undergraduate Students Associated Council ***SEPT 2013 – JUNE 2014***
- **Student Groups Support Committee Member**, UCLA Undergraduate Students Associated Council ***SEPT 2012 – JUNE 2013***

EXHIBIT 3

20 ELR 10222 | Environmental Law Reporter |

The 1990 National Contingency Plan — More Detail And More Structure, But Still a Balancing Act

Lawrence E. Starfield

Editors' Summary: The 1986 Superfund Amendments required EPA to make substantial changes in the national contingency plan, EPA's principal rulemaking under the Superfund program. Congress imposed potentially conflicting mandates on EPA, such as requirements to maximize treatment and to ensure cost-effective remedies. EPA's proposed NCP revisions, issued in December 1988, were analyzed in ELR's March 1989 issue by the EPA attorney who played a principal role in drafting the proposed revisions. In this Article, the final NCP revisions, which took effect on April 9, 1990, are analyzed by the EPA attorney primarily responsible for the legal issues in the final rule. The rule and preamble, which together cover 200 pages in the Federal Register, *include EPA's response to the 1986 amendments and revisions that reflect EPA's experience with the first decade of Superfund. The author provides an overview of the framework of the final NCP, analyzes the major issues addressed by the final rule, and discusses the prinicipal changes from the 1988 proposed rule. The author observes that the true test of the NCP's success will be in the field, and that Congress should give the new regulatory framework some time to be implemented before imposing another set of mandates and deadlines.*

Mr. Starfield is an attorney-adviser in the U.S. Environmental Protection Agency's Office of General Counsel. He has worked on Superfund issues at EPA since 1987, and in the private sector from 1981-87. He is the attorney principally responsible for legal issues in the National Contingency Plan's 1990 revisions, which are the subject of this Article. The views expressed are those of the author and do not necessarily represent the views of the U.S. Environmental Protection Agency.

List of Acronyms

The following abbreviations are used in this Article:

ACLs—alternate concentration limits

ARARs—applicable or relevant and appropriate requirements

BDAT—best demonstrated available technology

CERCLA—Comprehensive Environmental Response, Compensation, and Liability Act of 1980

CRP—community relations plan

EPA—Environmental Protection Agency

ESD—explanation of significant difference

FS—feasibility study

HRS—hazard ranking system

HSWA—Hazard and Solid Waste Amendments of 1984

LDR—land disposal restrictions

MCL—maximum contaminant level

MCLG—maximum contaminant level goal

NCP—national priorities list

O&M—operation and maintenance

PA—preliminary assessment

PRPs—potentially responsible parties

RCRA—Resource Conservation and Recovery Act

RD/RA—remedial design/remedial action

RI—remedial investigation

RI/FS—remedial investigation/feasibility study

ROD—record of decision

SARA—Superfund Amendments and Reauthorization Act of 1986

SDWA—Safe Drinking Water Act

SI—site investigation

SMOA—Superfund memorandum of agreement

TAG—technical assistance grant

TBC—to be considered

WQC—water quality criteria

[20 ELR 10225]

DATELINE: Washington, D.C. February 2, 1990. EPA Administrator William K. Reilly today signed the long-awaited rule to put into place a revised structure for the operation of EPA's Superfund program for cleaning up hazardous waste sites.

While this is not the type of sensational headline to grab the attention of the average reader, it is big news to those who are potentially responsible for, who regulate, or who live near Superfund sites.[1] The lack of a catchy headline is due in part to the fact that although the rule has been long-awaited (and court-ordered), its general content has been known or surmised for some time. The 1990 national contingency plan (NCP)[2] implements requirements in the Superfund Amendments and Reauthorization Act of 1986 (SARA),[3] and thus many aspects of the rule were pre-ordained. Further, the final rule is not dramatically different from the 1988 proposed NCP, which the Environmental Protection Agency (EPA) has been using as guidance since its publication.[4] Thus, to a large degree, the process for achieving Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)[5] remedies under the final rule should not be very different from the process that has been followed for the last year or two.

At the same time, the rule contains many highly significant changes and formalizes what were only proposed positions on how EPA will run the Superfund program. The onerous length of the NCP (the rule and preamble covered 978 double-spaced pages prior to its condensed 200 pages in the *Federal Register*) is due to the need to cover the many issues raised by SARA, plus EPA's desire to revise the program to reflect the experience of the first decade of

Superfund.[6]

The most notable changes from the 1988 proposal include the following: a more flexible standard against which private cleanup actions will be measured for determing "consistency with the NCP" for cost recovery purposes; a commitment for CERCLA cleanups to generally attain maximum contaminant level goals (MCLGs), where the MCLGs are above zero; a more limited risk range for cleanups involving carcinogenic constituents; and a presumption that variances under the Resource Conservation and Recovery Act (RCRA)[7] are appropriate for the treatment, prior to land disposal, of soils at CERCLA sites that are contaminated with restricted hazardouswastes.

The final rule also takes steps to provide greater structure to the CERCLA process, and thereby to promote consistency of process and result in remedy selection. This is accomplished through an organization of the nine remedy selection criteria into three functional categories, statements concerning the types of remedies that are "expected" to result from the process, and the placement of increased emphasis on protecting health and the environment through the use of treatment at sites. Significant revisions have also been made in the process of defining how CERCLA actions are to comply with the applicable or relevant and appropriate requirements (ARARs) of other laws, in the opportunities afforded for public participation (e.g., longer public comment periods, community interviews, and an administrative record process), and in the increased role of states as partners to EPA throughout the response action process.

However, *despite increases in detail and structure, the revised NCP remains a highly discretionary document, under which decisionmakers have the flexibility to balance relevant factors and to design remedies to meet the unique needs of specific sites.* Accordingly, many of the changes in the final rule may go further toward achieving "consistency in process" rather than "consistency in result."

This Article discusses the major changes from the 1988 proposed NCP and other significant issues in the final rule. However, to provide a clear context for the revisions, the Article first provides background on Superfund and the NCP, a summary of the major sections of the NCP, and a "road map" through the hazardous site response section of the NCP.

Background

Superfund

In 1980, Congress enacted CERCLA to provide authority for the cleanup of serious threats to public health and the environment resulting from releases of hazardous substances, pollutants, and contaminants into the environment.[8] CERCLA § 104[9] empowers EPA[10] to take response **[20 ELR 10226]** measures "consistent with the national contingency plan" to address such threats through direct funding under the Superfund (the Fund). EPA also has the authority, independent of Fund-financed response actions, to issue orders or seek judicial relief under CERCLA § 106[11] to require the abatement of releases that may be an imminent and substantial endangerment to public health, welfare, or the environment.

EPA response actions may consist of either "removal" or "remedial" actions.[12] Removal actions are generally immediate or interim measures taken to assess, evaluate, minimize, or mitigate danger to the public health or the environment.[13] In addition to including the actual removal of hazardous substance wastes, a removal action may consist of providing a temporary alternative water supply, building a fence, or conducting an investigation under § 104(b) (including a remedial investigation (RI)[14]). A remedial action is an action consistent with a long-term or "permanent" remedy at a site, such as the excavation or destruction of hazardous substances, or provision of a permanent alternative water supply.[15] The decision as to whether an action is a removal or a remedial action is not always obvious, because the definitions overlap to a significant degree. Removal and remedial actions must, "to the greatest extent possible, be in accordance with the provisions of the [NCP]."[16]

Where EPA determines that a state, political subdivision thereof, or Indian tribe has the capability to carry out a removal or remedial action under CERCLA § 104 (in accordance with the NCP) and adequate enforcement authority (under state/tribal law), the Agency may enter into a cooperative agreement or contract with the state, subdivision; or tribe to carry out specified actions at CERCLA sites.[17] The governmental entity with primary responsibility for carrying out the response action at a site is termed the "lead agency."[18]

The statute imposes liability for the costs of response actions on four classes of "responsible parties" described in

CERCLA § 107[19] — past owners and operators of the release site, present site owners/operators, certain generators of the released hazardous substances, and transporters of the hazardous substances. Pursuant to § 107(a)(4)(A),[20] the United States, states, and Indian tribes may recover all costs of removal or remedial action incurred in a manner "not inconsistent with the [NCP]." Similarly, "other necessary costs of response incurred by any other person consistent with the [NCP]" may be recovered from the four categories of liable parties.[21] The courts have generally found that liability under CERCLA is joint and several (if harm is indivisible).[22]

In addition to this basic structure, Congress added a substantial number of requirements and directions in SARA. For instance, new CERCLA § 121 sets out requirements for how remedial actions should be selected; a new § 117 provides specific opportunities for public participation in remedy selection; and subsections (h), (j), and (k) of Section 113 have been added concerning the timing and scope of judicial review and the requirement for an administrative record for all response actions.

The NCP

As noted above, many of CERCLA's requirements are tied to "compliance" or "consistency" with the NCP. The NCP has been the blueprint for governmental response actions since 1968, when it focused almost exclusively on responses to oil spills. With the enactment of CERCLA in 1980, Congress prescribed a greatly expanded role for the NCP, extending its applicability to releases of hazardous substances, pollutants, and contaminants.[23] The NCP has been revised several times, with the last major revision occurring in November 1985.[24]

With the passage of SARA in October 1986, EPA set about drafting revisions to the NCP.SARA § 105(b)[25] specifically required EPA to revise the NCP "to reflect the requirements" of SARA, and specifically to provide procedures and standards for remedial actions "which are consistent with the [SARA amendments] relating to the selection of remedial actions." The following are the major SARA requirements relating to remedy selection that the NCP was intended to incorporate:

* protect human health and the environment;[26]

* comply with ARARs under federal environmental or state environmental or facility siting laws (or justify a waiver);[27]

* select *cost-effective* remedies;[28]

[20 ELR 10227]

* utilize *permanent* solutions and alternative treatment technologies or resource recovery technologies *to the maximum extent practicable;*[29]

* address the preference for remedies in which *treatment* that tht *permanently* and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, and contaminants is a principal element;

* consider the short- and long-term potential for adverse human health effects from exposure in assessing the effectiveness of alternative remedial actions;[30]

* provide significant opportunities for *public participation;*[31] and

* provide for substantial and meaningful *state involvement* in the initiation and development of remedial actions.[32]

These diverse statutory requirements provided a complicated mandate for the Superfund program, due in large part to the inherent tension among some of the SARA requirements. EPA was directed to maximize treatment, yet ensure cost-effective remedies.[33] The Agency was also directed to take into account the preferences of both states and the public before selecting remedies, yet those preferences could lead to a departure from other statutory requirements (e.g., some communities might oppose an incineration alternative due to concerns over air emissions). In short, SARA pushed the Agency in several directions at one time, resulting in some difficulty in prescribing hard rules that should apply at all sites. As discussed in more detail below, EPA attempted to implement the multiple directions in the statute by incorporating a set of nine remedy selection criteria into the final NCP, which are to be applied on a site-specific basis.

The Agency's efforts to achieve consensus on how best to reconcile SARA directives were a major cause of the delay in the promulgation of the rule. In addition, the Agency took the opportunity provided by SARA to completely revise the 1985 NCP, and thus initiated many more changes than may have been contemplated by Congress when it set the statutory deadlines. In effect, the 1985 NCP is largely overhauled (especially the subparts dealing with hazardous substance response). Also, many provisions were added to reflect programmatic experience gained over the 10 years Superfund has been in operation, and other changes were made to clarify the response process and to make the NCP easier to follow. For instance, the sequence in which response activities is discussed was changed to better reflect the order in which they occur. Also, public participation requirements were integrated throughout the rule to be discussed with the activity to which they relate.

Due to these factors, the promulgation of the NCP was repeatedly delayed, and the statutory deadline[34] to promulgate a revised NCP by April 17, 1988, was not met. In the autumn of 1988, several environmental groups sued the Agency for failure to meet the statutory deadline, resulting in a timetable for final promulgation, enforceable by the U.S. District Court for the District of Columbia.[35] The revisions were proposed in the *Federal Register* on December 21, 1988,[36] and as agreed, the final revisions were delivered to the *Federal Register* on February 5, 1990, for publication. They appear in the March 8, 1990 issue of the *Federal Register.*[37]

Effective Date/Retroactivity

The 1990 revisions took effect on April 9, 1990. The rule will not be applied to actions completed before the effective date, but it will be applied to on-going actions.[38]

Ninety-Day Study of CERCLA

Several months after the proposal of the NCP in the *Federal Register,* EPA Administrator Reilly took office and began a 90-day review of the Superfund program.[39] This study was designed as an internal agency review, with a focus on the management of the Superfund program and implementation issues; it was not a review of the NCP or of the then-pending NCP rulemaking proposal. Although the two initiatives proceeded on separate tracks, they are generally consistent and do overlap (e.g., both emphasize treatment, public participation, and expedited response).

Overall Framework of the Final NCP

The 10 Subparts

The NCP is broken down into 10 subparts (and an 11th will be proposed). The following four subparts were substantially revised or added by the final rule and are critical to an understanding of the Superfund response process:

Subpart E (subpart F in the 1985 NCP), entitled "Hazardous Substance Response," is the key subpart of the NCP for Superfund responses. It sets out the elements for response to hazardous substance releases and describes the CERCLA process from site discovery through final cleanup. It is within this section that the procedure for remedy selection is discussed.[40]

Subpart F is a new subpart added to explain the role and responsibilities of states in CERCLA actions. CERCLA § 121(f)(1), added by SARA, directed EPA to promulgate regulations to provide for substantial and meaningful state involvement during response actions.[41]

Subpart H is a new subpart on participation by other persons in response actions and on the recovery of costs **[20 ELR 10228]** under CERCLA § 107(a)(4)(B). It consolidates and expands into a separate subpart the discussion of private party actions under CERCLA.[42]

Subpart I is a new subpart, added to implement the requirement in SARA (CERCLA § 113(k)) for the establishment of an administrative record.[43]

The remaining subparts relate either to oil discharges (which are generally exempt from response under CERCLA by statute[44]) or to administrative interactions among cooperating federal agencies; they are not discussed in detail in this article:

Subpart A is a general introductory section, although it also includes important definitions.[45]

Subpart B combines, without major change, Subparts B and C from the 1985 NCP and describes the interaction of executive branch agencies in responding to releases of hazardous substances or oil.[46]

Subpart C addresses preparedness activities, federal and regional contingency plans, and planning responsibilities of state and local agencies.[47]

Subpart D sets forth the phases of response to discharges of oil, and is substantially unchanged from the 1985 NCP; however, the subpart may take on increasing importance in light of the recent oil spills in Alaska and elsewhere.[48]

Subpart G designates,and sets out the responsibilities of, federal trustees who may act on behalf of the President to assess and restore damaged natural resources.[49]

Subpart J discusses the use of dispersants for oil spills; it is largely unchanged from Subpart K in the 1985 NCP.[50]

Subpart K has been reserved for a new subpart of regulations concerning federal facilities. EPA intends to propose, as an amendment to the NCP, a subpart that would act as a road map to the NCP requirements that apply to CERCLA response actions at federal facilities and would codify certain provisions of CERCLA § 120 that relate to federal facilities only.

Road Map to the CERCLA Site Response Process (Subpart E)

Site Discovery. The process begins with the discovery of a release by one of several possible mechanisms (e.g., notification requirements under CERCLA § 103(a) or (b) or under other laws, a petition from a citizen,[51] etc.)[52] In the case of an emergency (e.g., fire, explosion), a removal action will be taken to stabilize the site.

Removal Assessment. In nonemergency situations, the release is evaluated to determine if a removal action is appropriate based on a removal preliminary assessment (PA) and, if appropriate, a removal site inspection (SI).[53]

Removal Action. Where necessary to protect human health and the environment, the Agency may initiate a removal action to prevent, mitigate, or minimize the threat posed by the release. This may involve removal of surface drums, fencing of the site, the provision of temporary drinking water supplies, etc.[54] Removals may be emergency actions (taken within hours of discovery), time-critical actions, or non-time-critical actions.[55]

Remedial Site Evaluation. A remedial PA (and SI, where appropriate) is conducted on all sites in the CERCLA Information System database, CERCLIS, to see if the site is a priority for long-term remedial response.[56] These evaluations involve the collection of data for scoring the site under the hazard ranking system (HRS) model;[57] sites scoring above the threshold in the HRS[58] are placed on the national priorities list (NPL)[59] for further evaluation and possible remedial action.[60]

Remedial Priorities. The Agency evaluates releases for inclusion on the NPL based on the HRS score or one of the other methods for listing outlined in the NCP.[61] The Agency may spend Fund monies for *remedial* action only at those sites that are on the NPL. ("Fund-financed remedial action" does not include removal action or enforcement action.[62])

Remedial Investigation/Feasibilty Study. The Agency will undertake a remedial investigation and feasibility study (RI/FS) at sites that are, or appear to be, priorities for action (i.e., that are on, or are proposed for listing on, the NPL). The RI/FS, like any other investigation conducted pursuant to CERCLA § 104(b), is a removal action under CERCLA § 101(23), despite the word remedial in its name.

During the RI, the nature and extent of the threat posed by the contamination is studied; concurrently, alternative **[20 ELR 10229]** approaches are developed as part of the FS for responding to and managing the site problem.[63]

Preliminary Remediation Goal. The first step in developing alternatives during the FS is the establishment of a preliminary goal for the remediation of the site.[64] This goal is initially based on readily available information, such as a chemical-specific ARAR, or the "point of departure" in the range of acceptable risk.[65] Alternatives are then developed that are capable of attaining the preliminary remediation goal. (The goal may be modified as additional information is developed).

Screening of Remedial Alternatives. A broad list of alternatives is then reviewed and screened, with the more extreme, impracticable options being eliminated before the detailed analysis of alternatives begins. Alternatives may be eliminated during screening based on effectiveness, implementability, or "grossly excessive" cost.[66]

Analysis of Alternatives Using the Nine Criteria. The Agency then conducts a detailed analysis of the remaining alternatives (usually three-nine, depending on the complexity of the problem). The advantages and disadvantages of the alternatives are studied and compared using the following nine remedy selection criteria:[67]

* overall protection of human health and the environment;

* compliance with (or waiver of) the ARARs of other laws;

* long-term effectiveness and permanence;

* reduction of toxicity, mobility, or volume through treatment;

* short-term effectiveness;

* implementability;

* cost;

* state acceptance; and

* community acceptance.

Selection of Remedy.[68] Thenine criteria are then used to select the remedy by evaluating them in three functional categories (threshold, balancing, and modifying criteria), in order to reflect the nature and/or timing of their application. The first two criteria — protectiveness and compliance with ARARs — are identified as threshold criteria; only the alternatives that meet those criteria may be carried forward.[69]

Protective, ARAR-compliant alternatives are then "balanced" (i.e., used to evaluate tradeoffs) based on the middle five criteria (and the two modifying criteria, to the extent they are known). The Agency then attempts to select *the* remedial alternative that "utilizes permanent solutions and treatment . . . to the maximum extent practicable" and is "cost-effective" based on a comparison of the appropriate balancing or modifying criteria.[70] Alternatives are judged cost-effective if their costs are "in proportion" to their overall effectiveness; an alternative is found to achieve the maximum permanence and treatment practicable based on a balancing of the seven nonthreshold criteria, with an emphasis on the factors of "long-term effectiveness and permanence" and "reduction in mobility, toxicity or volume through treatment."[71]

EPA and the state then discuss the remedial options and issue a proposed plan, which sets out the lead agency's recommended alternative.[72] Consistent with CERCLA § 117, the public is afforded an opportunity to review and comment on the alternatives studied in the FS and the proposed plan.[73] After review of and response to public comments, and formal consideration of the two modifying criteria (state and community acceptance), the final remedy selection is documented in a record of decision (ROD).[74]

Remedial Design/Remedial Action and Operation and Maintenance. The lead agency then sets about designing, constructing, and implementing the selected remedy.[75] Often, the remedial action plan set out in the ROD will need to be modified in light of information developed during the design phase (e.g., the Agency may learn that more soil is contaminated and needs to excavated). If the remedial action to be taken differs "significantly" from the remedy selected in the ROD with respect to scope, performance, or cost, the lead agency will issue an explanation of significant differences (ESD).[76] If the action to be taken "fundamentally alters" the basic features of the remedy selected in the ROD, the lead agency will propose and take comment on a ROD amendment.[77]

Once the remedy is operational and functional (or later, for groundwater restoration remedies[78]), the state undertakes

responsibility for funding and carrying out operation and maintenance (O&M) of the remedy.[79]

Deletion From the NPL, Five-Year Review. Once EPA has determined that no further response action is appropriate, the site may be proposed for deletion, or recategorized on the NPL,[80] even where O&M is continuing. Sites at which hazardous substances remain above levels that allow for unlimited use and unrestricted exposure must be reviewed at least every five years after the initiation of the remedy (not merely after completion), consistent with CERCLA § 121(c).[81] As discussed in more detail below, the NCP discusses EPA's general policy not to delete a site at which hazardous substances remain until at least one five-year review has been performed after completion of the remedial action.

[20 ELR 10230]

Major Issues/Changes in the 1990 NCP

ARARs Issues

There were several major changes and statements in the final NCP revisions relating to ARARs, the "applicable" or "relevant and appropriate" requirements of other environmental laws. How CERCLA actions comply with ARARs often determines the cleanup standard at a site or certain parameters that the remedial approach must fulfill. Thus, a discussion of major ARARs issues is an important starting point in a review of the final NCP.

* *Background.* As defined in the final rule, "applicable" requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.[82]

A "relevant and appropriate" requirement is a *promulgated* standard that, while not applicable to the substance, location, or action, addresses problems or situations sufficiently similar to those encountered at a CERCLA site that its use is well suited to the particular site. One example is where a federal requirement has not been adopted by a state authorized to run the federal program. Such requirement may not be applicable in the state, but it could nevertheless be relevant and appropriate to management of the CERCLA waste at issue. In another example, RCRA waste management requirements may be relevant and appropriate to a CERCLA waste that is similar to a RCRA-listed hazardous waste but is not specifically listed in the RCRA regulations[83] (and thus to which RCRA would not independently "apply").

The concept of requiring remedies to attain relevant and appropriate standards (i.e., standards that do not independently apply as a matter of law) is unique to CERCLA and has generated controversy and confusion. (Indeed, it is somewhat counter-intuitive to be required to comply with requirements that do not apply as a matter of law.) To add some consistency to the process, the final rule offers several factors to consider in determining if a requirement is relevant and appropriate under the circumstances of the release (both findings must be made).[84] However, the notion of what standards are appropriate is, almost by definition, a matter of judgment, subject to case-by-case variations. Thus, the Agency retains considerable discretion in making the ultimate decision of what standards a CERCLA remedy should attain based on potential relevance and appropriateness. (Of course, the decision that a remedy must attain a certain standard may be questioned during the comment period of the ROD.) This discretion is even broader in that the Agency may decide that only certain portions of a requirement are relevant and appropriate.[85] The ability to find that a nonapplicable requirement is not appropriate has limited the instances in which statutory waivers[86] are necessary for relevant and appropriate requirements.

There are four conditions that must be met for a requirement to be considered a potential ARAR, based either on applicability or relevance and appropriateness. First, the requirement must be promulgated (i.e., "of general applicability and enforceable").[87] Second, it must be a substantive — rather than administrative — requirement; CERCLA actions are required to meet only the procedures set out in the NCP (additional procedures of other laws are met where appropriate, as a matter of policy).[88] Third, it must be a requirement of an "environmental" law, as provided in CERCLA § 121(d)(2)(A)(i) and (ii);[89] the requirements and procedures of nonenvironmental laws are simply complied with to the extent they apply — they are not considered as part of the ARARs review process under CERCLA.[90] Fourth, ARARs are limited to on-site actions, consistent with CERCLA § 121(d)(2)(A);[91] where EPA sends wastes off site, that waste transfer must comply with the substantive and administrative requirements of *applicable* law (there would be no relevant and appropriate determination, and no waiver option).[92]

Only those requirements that pertain to a specific action are ARARs for that action.[93] The clearest case for the application of this principle is where contaminated soil is being removed from the surface at a site as part of a removal action or a first operable unit ROD; groundwater cleanup standards for the contaminants found in the soil would not pertain to the surface cleanup action, and thus would not be ARARs for that action.

ARARs may be chemical-specific (e.g., an established level for a specific chemical in groundwater), action-specific (e.g., a land disposal restriction for RCRA hazardous wastes), or location-specific (e.g., a restriction on actions that adversely affect wetlands). Thus, the concept is much broader than that of a specific cleanup level for a site.

The idea of applying the ARARs of other *federal* laws to CERCLA actions was first introduced by the 1985 **[20 ELR 10231]** NCP.[94] SARA generally incorporated the idea into CERCLA § 121(d)(2) for remedial actions, and added the requirement to meet certain ARARs of *state* law, which the final rule picks up.[95] Although not required by SARA, the final NCP also continues the 1985 policy of requiring removal actions to comply with ARARs "to the extent practicable."[96]

* *Maximum Contaminant Levels and Maximum Contaminant Level Goals as ARARs.* In the preamble to the proposed NCP, the Agency had stated that the ARAR for the cleanup of groundwater that was an actual or potential source of drinking water would generally be the maximum contaminant level (MCL).[97] This approach was based largely on the view that MCLs, as the enforceable drinking water standards under the Safe Drinking Water Act (SDWA), are relevant and appropriate to the cleanup of CERCLA sites.[98] The option of generally requiring cleanup to health-based maximum contaminant level goals (MCLGs) was rejected, based on a determination that MCLs are protective of human health, and that it would not be appropriate to require groundwater at CERCLA sites to be cleaner than the levels required for the nation's water supply. Further, MCLGs are, by definition, unenforceable, aspirational goals under the SDWA.[99] According to the proposal, MCLGs would have been attained only in unusual cases (e.g., cases involving multiple contaminants or pathways where the attainment of enforceable MCLs would result in a risk greater than the acceptable risk range).[100]

A number of commenters criticized this approach, focusing on the direction in the statute to attain MCLGs "where relevant and appropriate." These commenters argued that EPA should attain even zero-level MCLGs because MCLGs are health-based standards — not standards based on what is feasible for drinking water systems (the case for MCLs) — and thus are the appropriate standard for CERCLA cleanups. They suggested that where such levels could not be physically attained, waivers should be used.

Although EPA continues to believe that the language in the statute gives the Agency considerable discretion to decide whether it is "appropriate" to apply standards more stringent than drinking water standards to groundwater, the Agency reevaluated the MCL/MCLG question during the comment review period and sought to give greater deference to the words of the statute while not requiring attainment of standards that would be generically inappropriate.

The preamble to the final rule notes, as a threshold matter, that in addition to giving the Agency discretion as to when compliance with MCLGs might be appropriate, the first sentence in CERCLA § 121(d)(2) sets out a somewhat competing mandate: It requires on-site CERCLA remedies to attain promulgated standards or levels of control established under the SDWA (i.e., MCLs), where they are applicable or relevant and appropriate.[101]

The final NCP deals with the potential applicability of both MCLs and MCLGs by providing that MCLGs that are greater than zero shall be attained where "relevant and appropriate under the circumstance of the release." (Thus, it is expected that MCLG's above zero will generally be the cleanup level for actual and potential drinking water sources.) However, where the MCLG is set at zero (as it is for carcinogens), the relevant MCL would be used as the cleanup standard, where relevant and appropriate.[102]

This revised approach is believed to better reflect the statutory intent of CERCLA § 121, while also recognizing the practical difficulties inherent in attaining MCLGs set at zero (indeed, the Agency concluded that it is not scientifically possible to detect whether a level of zero contamination has been attained). The NCP explains that the use of an unattainable, unmeasurably zero level is not appropriate in setting actual cleanup levels to be attained under

Superfund.[103] Further, CERCLA requires protective remedies, not the complete elimination of risk.[103]

The approach adopted in the final rule also recognizes the realities of present groundwater treatment technology. While some commenters may believe that zero levels are attainable, or that EPA should require cleanup down to the levels of detection, the empirical evidence suggests that such results are far from practical. Experience with the Superfund program has shown that groundwater treatment is very difficult.[104] While groundwater remediation is proving effective in containing plumes to prevent further migration and in achieving significant mass reduction of chemicals, it may not be possible in many cases to achieve MCLs throughout the aquifers, not to mention levels of zero.

The practical impact of the change from "generally MCLs" to "generally non-zero MCLGs" is small at present, because for noncarcinogens (the body of chemicals with MCLGs above zero), the MCLs are set at the same level as the corresponding MCLGs. However, in the future, the Agency may consider setting MCLGs that are more stringent than MCLs for certain noncarcinogens. Although such an action would have no legal effect on compliance under the SDWA, it would have a potential impact on CERCLA remedies; in effect, groundwater at some **[20 ELR 10232]** CERCLA sites may be driven to be cleaner than U.S. drinking water. Of course, where a more stringent MCLG level cannot be achieved, site-specific waivers would likely be used at CERCLA sites.

It is important to note that the preamble to the final rule strongly emphasizes the importance of MCLs/nonzero MCLGs as the primary standards for the cleanup of groundwater at CERCLA sites. Alternate concentration limits (ACLs)[105] are discussed as being appropriate only where it is not practicable to meet the MCL/nonzero MCLG;[106] similarly, water quality criteria (WQC)[107] are discussed as being generally appropriate only in limited cases involving surface water.[108]

* *Freezing ARARs.* A frequent ARARs issue is whether a requirement that is made part of a selected remedy (or that drives the choice of that remedy) must be revised when a new requirement is promulgated. In the preamble to the proposed NCP, EPA took the position that requirements promulgated after the initiation of the remedial action will not be attained unless necessary to ensure protectiveness.[109] This was intended to avoid the requirement to restart work already begun.

In the final rule, the Agency reconsidered and expanded this interpretation by providing that requirements promulgated or modified after the signing of the ROD — an earlier point in the process — must be attained (or waived) only when determined to be applicable or relevant and appropriate *and* necessary to ensure protectiveness.[110] That is to say, ARARs generally freeze at the time of ROD signature.

The Agency explained that this approach is both necessary and appropriate under the statute. A contrary requirement, to reexamine potential ARARs throughout the design and implementation phases of CERCLA remedies, would threaten to subject remedial actions to constant interruption and reevaluation, significantly disrupting the cleanup process. This would be inconsistent with Congress' intent that EPA conduct cleanups expeditiously[111] and would prevent the Agency from achieving finality in the remedy selection process.

This ARARs freezing policy will not compromise protection of human health and the environment. EPA will continue to review CERCLA remedies where hazardous substances are left on site at least every five years to ensure that the remedy remains protective.[112] Further, the Agency will evaluate standards promulgated after ROD signature, as appropriate, to ensure that the selected remedy is adequately protective.

The determination of whether a remedy remains protective is a complicated issue, and guidance is expected on the matter in the near future. However, it is likely that a five-year review of protectiveness would, at a minimum, include an assessment of whether the measures put in place by the ROD continue to provide effective management, within acceptable risk levels, of the hazardous substances remaining on site. Obviously, if monitoring wells showed new contamination, additional measures might be necessary. The more difficult issue during the five-year review — or earlier, if appropriate — will be whether the protectiveness of a remedy is called into question by the promulgation of a new standard since the time of ROD signature.

For example, a substance that had been considered nonhazardous at the time of remedy selection might subsequently be listed as a hazardous waste under RCRA. If the ROD had allowed that substance to be left in place without treatment or engineering controls, the newly applicable RCRA requirements might well result in a finding that the remedy is no longer protective and that additional response action (preceded by a ROD amendment or ESD) is required. By contrast, if the newly regulated substance had been contained using engineering controls along with other hazardous substances, the additional information concerning the substance's RCRA status might not result in a finding that the remedy is no longer protective. (Such a finding might need to reflect a reexamination of the risk assessment for the site in conjunction with the new information; if the risk posed by the site continued to be within acceptable levels, no modification of the remedy would be necessary.)

As for new remedial decisions made after ROD signature, the freezing ARARs policy applies as follows: Components of a remedy not described in the ROD must attain (or waive) requirements that are identified as applicable or relevant and appropriate *at the time* the ROD amendment or explanation of significant differences (ESD) describing the component is signed.[113]

* *Definition of Placement: Application of RCRA Land Disposal Restrictions.* One of the most controversial ARARs issues is the debate over how RCRA applies to CERCLA actions; the preambles to both the proposed and final NCP spend a significant amount of time on the question.[114] Perhaps the most contentious issue within that debate is how to apply the land disposal restrictions (LDR) that were added to RCRA § 3004[115] by the Hazardous and Solid Waste Amendments of 1984 (HSWA).[116]

[20 ELR 10233]

According to RCRA § 3004(k), "land disposal" is defined for the purposes of § 3004 and LDR as including the "placement" of a specified hazardous waste in a landfill, surface impoundment, waste pile, etc.[117] Thus, where a specified waste has been "placed" in a hazardous waste management unit, land disposal has occurred and the LDR requirements are triggered. The LDR requirements ban the disposal of most hazardous wastes after a given point in time, unless EPA promulgates treatment standards for those wastes. The Agency has promulgated (or plans to promulgate) regulations for all categories of LDR wastes,[118] and it has in general required treatment using the best demonstrated available technology (BDAT) prior to lawful land disposal. Although Congress appears to have contemplated that LDR standards would apply to wastes from CERCLA cleanups (even if not immediately),[119] many in the Agency and in the regulated community have found the standards difficult to implement in the context of CERCLA cleanup actions.

A number of parties have argued that BDAT standards were designed for specific chemicals or waste streams, and that such standards are poorly suited to CERCLA cleanup actions that typically involve complex mixtures of chemicals. Further, contamination at CERCLA sites generally involves contaminated soils that are difficult and costly to treat (especially by incineration, a common BDAT technology). Indeed, many inside and outside the Agency suggest that applying the LDR requirement to CERCLA cleanups has the perverse effect of encouraging no treatment at sites because it results in a choice of extremes: either treat the material to expensive BDAT levels (which in the case of combustion technologies results in large volumes of ash remaining for disposal) or leave the material in place, thereby avoiding LDR. Interim options, such as treating the contaminated soil to safe levels that are above BDAT and then placing it back in the unit of origin, would seem to be unavailable. The preamble to the proposed rule set out EPA's interpretation that LDR-restricted waste may not be placed in a unit without treatment to BDAT, even if the waste has been partially treated and is being re-placed in the unit.[120]

In response to the numerous comments on this point, the Agency issued a supplemental notice in October 1989, requesting comment on a possible reinterpretation of RCRA § 3004(k) to the effect that if soil were excavated, treated, and "re-placed" in the unit of origin, that unit would be improved and no new "placement" of waste would be said to have occurred (and the LDR requirements would not be triggered).[121]

The preamble to the final NCP retains the 1988 interpretation that placing waste back into the unit of origin constitutes "placement" for the purposes of RCRA § 3004 (and specifically, LDR), unless the waste was treated to BDAT (or to an approved variance level).[122] However, the preamble discussion recognizes the practical problem posed by the applicability of BDAT to contaminated soil at cleanup sites and sets out a series of actions to address this issue.

First, the Agency pledges to promulgate specific BDAT standards that would be appropriate for contaminated soil and debris (the existing BDAT standards are generally developed with defined waste streams in mind). Second, to give more immediate relief, the preamble sets out the Agency's view that the BDAT standards established for certain wastestreams are generally inappropriate for contaminated soil and debris, and thus decisionmakers can "presume" that a RCRA

treatability variance is available for such materials.[123] Because on-site CERCLA actions are not subject to permitting or administrative determination requirements of other laws,[124] a variance level may be set at CERCLA sites by the regional administrator as part of the ROD process. However, the variance level will still need to be justified in the ROD, and the presumption that a variance is appropriate may be rebutted on a site-specific basis, such as where the soil is saturated with high levels of combustible organic chemicals (as discussed in the preamble to the final rule).[125]

Finally, EPA is not taking final action at this time on the supplemental proposal to reinterpret "placement."[126]

* *Point of Compliance With ARARs in Groundwater.* In discussing ARARs, it is critical to define the physical point at which protective levels must be achieved. This is especially problematic in groundwater where no fixed contaminant boundaries exist. For instance, should compliance be required at the vertical line extending from the site owner's property boundary, at the existing boundary of the contamination itself, or at all points of contamination? In the preamble to the proposed rule, EPA stated that its general policy will be to clean up contaminated groundwater (that is being used, or is reasonably likely to be used, as drinking water) throughout the contaminated plume, or where waste is left in place on the surface, up to and beyond the edge of the waste unit boundary.[127]

The preamble to the final rule reaffirms this general policy of achieving an area of attainment but also discusses the possibility of setting alternative points of compliance in certain limited cases.[128] First, where a plume of groundwater contamination is caused by releases from several distinct sources that are in close geographical proximity, the preamble contemplates that the problem may appropriately **[20 ELR 10234]** be addressed as a whole rather than source by source. Thus, the point of compliance could be drawn to encompass the proximate sources, and the contaminated plume stemming from these sources could be pulled back to that line. This option is based on an assessment that it would be impracticable to, in effect, divide a contaminant plume such that it could be drawn back to sources at several different but nearby points. Drawing the plume back to the line surrounding those sources would make more practical sense, without a loss in protection.

Second, the preamble notes that where there is little likelihood of exposure due to the remoteness of the site, it may also be appropriate to consider an alternate point of compliance, provided that contamination in the aquifer is controlled from further migration.[129] The Agency did not give guidance on when a site is sufficiently "remote" to justify such an alternate point of compliance, but the limitation in the preamble to remote areas where there is little chance of exposure suggests that this possibility will be rarely used.

Any use of an alternate point of compliance would need to be justified on a case-by-case basis, considering the statutory requirements for remedies to be protective and to prefer treatment technologies, and the general goal of the statute to clean up — rather than to maintain the status quo — at contaminated sites.[130]

* *TBCs* (criteria or guidance "to be considered"). The issue of whether government policy statements or guidance documents are ARARs has frequently arisen at CERCLA sites. To address this point, the Agency developed the concept of "TBCs," nonbinding criteria, guidance, advisories, and the like that — unlike ARARs — are not required to be attained. TBCs may, however, contain information that may be helpful in the establishment of a cleanup standard.

The proposed rule suggested that TBCs, as well as ARARs, *must* be identified in the early stages of remedy selection.[131] A number of commenters were concerned that the rule, as proposed, would require the time-consuming identification of an undefined array of advisories and policy statements. In response, the final rule makes clear that the use and identification of TBCs are discretionary, not mandatory.[132]

The significance of this change is that the identification and use of TBCs are not routinely required during the remedial development process. At the same time, the Agency may still use TBCs to assist in determining what is protective or to otherwise help in designing Superfund remedies, where appropriate, as a complement to ARARs. For instance, where there is no binding requirement as to the safe level of a contaminant, but a health advisory or guidance document exists on the point, the Agency may refer to that document to support its decision on a cleanup standard. Such a decision would have to be justified on a site-specific basis, and the public (and potentially responsible parties (PRPs)) would have an opportunity during the comment period to comment on the appropriateness of using the levels in that TBC.

* *Substantive, Not Administrative, Requirements.* The Agency has consistently interpreted the concept of ARARs as including only the substantive, not administrative, requirements of other laws.[133] The preamble to the final rule

continues this interpretation and includes the concept in the definitions of "applicable" and "relevant and appropriate" requirements.[134] This interpretation was historically based on the position that CERCLA actions must be allowed to proceed expeditiously and that compliance with administrative and procedural provisions would slow down CERCLA actions.[135] Moreover, the NCP sets out a detailed set of procedures of its own that CERCLA actions must follow; these render unnecessary the procedures of other environmental programs.

In enacting SARA, Congress codified elements of this policy. CERCLA § 121(e)(1) expressly relieves EPA of any permitting requirement for on-site CERCLA actions. In addition, Congress crafted a new § 121(d)(2), which requires CERCLA actions to attain the "standards" and "levels of control" set by other environmental laws. This section too supports the position that CERCLA actions need not follow the procedures of other laws. The substantive/administrative distinction is also consistent with the Agency's view that the provisions of other environmental laws were impliedly repealed or preempted by CERCLA for on-site CERCLA actions.[136]

Although administrative provisions, such as those calling for consultation with other agencies or the reporting of certain information, are not required, it is EPA policy to generally engage in such consultation and provide needed information (e.g., discharge monitoring reports).[137]

[20 ELR 10235]

* *Compliance With ARARs During Response Actions.* The final rule requires CERCLA remedies to comply with ARARs *during* the design and implementation of the remedial action, as well as at its conclusion.[138] This point was the subject of significant comment, as several noted that the statute merely requires CERCLA remedies to attain ARARs "at the completion of the remedial action."[139] However, as the preamble to the final rule explains, compliance with ARARs during the remedial action makes sense for many of the same reasons that compliance with ARARs makes sense at completion: The requirements of other laws help define how the activity can be carried out in a manner that is protective of health and the environment.[140] For instance, if the conduct of a remedy involves the storage of hazardous waste pending construction of a final treatment unit, it would be short-sighted at best and irresponsible at worst to be concerned with applicable waste management standards only at the end of the project. Waste managed during the remedial action should also meet the substantive standards of other applicable or relevant and appropriate laws.

Similarly, EPA is continuing its policy of attaining ARARs *during* removal actions[141] (to the extent practicable, as discussed below in the section on Removal ARARs). This policy would apply to fieldwork conducted as part of an RI/FS, which comes within the definition of a removal action.[142] EPA has issued extensive guidance on how it will comply with the ARARs of the resource protection statutes — such as the Endangered Species Act[143] and the National Historic Preservation Act[144] — during the investigative and cleanup phases of CERCLA response.[145]

The policy of attaining ARARs during remedial and removal actions does not apply to chemical-specific ARARs, such as soil cleanup levels, which can only be met at the completion of the action.[146] In addition, a statutory waiver is available for interim actions that will attain the ARAR upon completion of the total response.[147]

* *Removal Actions — Compliance With ARARs.* Most of the foregoing discussion has focused on compliance with ARARs for CERCLA *remedial* actions; the rules for short-term actions, "removals," are different based on both the statute and long-standing practice. The 1985 NCP provided that because of their time-sensitive nature, removals need meet ARARs only to the "greatest extent practicable, considering the exigencies of the situation."[148] In SARA, the ARARs concept was applied only to remedial actions.[149] To some, the omission represented an implied finding that removals need not meet the requirements of other laws (although it could also be argued that the language of SARA impliedly affirmed the existing requirement that removals should meet ARARs to the extent practicable).

In the final rule, the Agency decided that it was sound policy for removal actions to attain ARARs "to the extent practicable," while at the same time recognizing that ARARs should not interfere with the mission of removals to quickly respond to and stabilize dangerous sites.[150] The preamble to the final rule explains in greater detail how and when removal actions should meet the requirements of other laws and still fulfill their statutory mission.[151]

First, the preamble makes clear that only requirements that pertain to the specific response actions being conducted are potential ARARs. For instance, if a removal action consisted of removing leaking drums, requirements relating to potential groundwater cleanup would not be ARAR for that removal action.

Second, once requirements are said to be potential ARARs for a removal, they must be complied with "to the extent practicable considering the exigencies of the situation."[152] The preamble attempts to give greater precision to this phrase. The notion of practicability is based on two factors: the urgency of the situation and the scope of the removal action.[153] The urgency factor is rather obvious — where the time-sensitive nature of the removal is such that compliance with (or even identification of) all potential ARARs is not possible, those requirements need not be met. This will often be the case where the Agency responds to fires, explosions, or serious spills.

The "scope of the removal action" factor is more complex. It reflects the narrow purpose of removals to mitigate or minimize harm, rather than to accomplish a permanent remedy. For example, where contaminated soil is discovered near a school yard, a removal action may be taken to fence off the contaminated area, remove the top two feet of contaminated soil, and cover the area with clean topsoil. This action would address the immediate problem of preventing exposure of the school children to the contamination. However, the removal would not attempt to address all contaminated soil on site (i.e., the contamination below two feet), and thus might arguably not meet a soil cleanup level for that contaminant.

One option for addressing this problem might have been to require the removal action to continue excavation until the soil cleanup ARAR was met. However, such an approach, if applied broadly, could substantially increase the cost and time required to perform the removal action, thereby exceeding the action's intended scope.[154] In effect, **[20 ELR 10236]** a policy of requiring removals to attain ultimate cleanup standards would convert removals into remedial actions, without the additional procedures required in the NCP.[155] It would also limit the number of removals that can be performed and would greatly reduce the ability of removals to respond quickly to site problems. To date, removals have been one part of the Superfund program that has been an unqualified success, due in large part to the ability of the program to function quickly.

An alternative approach, adopted by the Agency, is to recognize that a final cleanup standard would not be practicable to meet, given the limited scope and duration of a removal. Of course, the permanent remedy of attaining soil cleanup standards may be met by subsequent *remedial* actions carried out at the site.

The preamble also notes that the six statutory waivers[156] available for CERCLA remedial actions may also be used to waive ARARs during removals.[157]

* *State ARARs Issues.* The SARA amendments added the requirement that CERCLA remedial actions must comply with applicable or relevant and appropriate requirements of state environmental and facility siting laws (as well as federal environmental laws) where those requirements are promulgated, identified in a timely manner, and more stringent than those under federal law.[158] The final NCP extends this concept of attaining more stringent state ARARs to removal actions as a policy matter. (EPA has further stated, as a matter of policy, that promulgated Indian tribal requirements may be potential ARARs.[159])

From the beginning, there have been problems in the identification of ARARs from the support agency (most often, the states). Some states have provided mere "laundry lists" of state laws and/or regulations, without specific discussion of how, if at all, they relate to the site. This has resulted in delays and wasted resources. To avoid this problem in the future, the preamble to the final NCP directs states to provide "a list of requirements with specific citations to the section of law identified as a potential ARAR, and *a brief explanation of why that requirement is considered to be applicable or relevant and appropriate to the site.*"[160] In addition, the final rule requires the identification of state ARARs no later than the detailed analysis stage of the FS.[161] These new requirements may force agencies to make key decisions on cleanup standards earlier in the process.

One of the most difficult state ARARs issues is the determination of whether legislated goals (e.g., nondegradation standards under state law) constitute substantive requirements such that they should be considered ARARs. State laws setting general goals may be considered substantive ARARs if they are promulgated and enforceable, and "directive in intent," either on their face or through regulations.[162] For example, if a state statute prohibits the degradation of surface water below a defined level, it is directive in nature and may be an ARAR. If a state law sets forth an anti-degradation goal without regulations or direction as to how to achieve it, the Agency must decide whether the goal constitutes an ARAR (e.g., is it enforceable), and then may exercise flexibility in determining how to comply with the goal. In any case, even if a remedial response is found not to comply with a state anti-degradation ARAR during the response, an interim action waiver of the state standard may be appropriate if the ARAR will be satisfied upon completion of the total remedy for the site.[163]

Risk Assessment and Risk Range

The NCP contemplates the use of risk assessments as an integral part of the process for developing remedial alternatives that are protective of human health and the environment.

Risk analysis begins during the early stages of the RI, when a "baseline risk assessment" is performed to evaluate the risk posed by a site in the absence of any remedial action.[164] It is based on a comparison with this no-action risk level that the lead agency will target levels of risk that will be adequately protective of human health for a particular site. The baseline risk assessment also helps to provide justification for performing remedial action at the site.

Concurrently, the lead agency would begin to set a "preliminary remediation goal" as part of the FS. The preliminary remediation goal is an initial statement of the desired endpoint concentration or risk level, and alternatives are developed that are capable of meeting that goal.[166] It is based on readily available information, such as chemical-specific ARARs (e.g., a drinking water standard), concentrations associated with the reference doses or cancer potency factors, or the point of departure for the Agency's acceptable risk range, discussed below.[167] The preliminary remediation goal is modified during the site evaluation process as site-specific data (including information from the baseline risk assessment or newly identified ARARs) become available.[168]

[20 ELR 10237]

Where there is only one contaminant of concern and a chemical-specific ARAR (e.g., a drinking water standard) exists for that contaminant, the remediation goal will be set at the ARAR level, and achievement of that standard will generally be deemed to be protective.[169] However, an ARAR may not be available for the contaminant of concern (or for all of several contaminants at a site), or compliance with available ARARs may not be sufficiently protective due to additive or synergistic effects from multiple pathways of exposure or multiple contaminants.[170] Thus, risk assessments will often be necessary to determine the appropriate cleanup goal. (Compliance with the available ARARs would, of course, still be required, consistent with NCP § 300.430(f)(1)(i)(A).)

Where ARARs are not available or are not sufficiently protective, EPA sets remediation goals for noncarcinogens such that the cumulative risks from exposure will not result in adverse effects to human populations (including sensitive subgroups such as children) during a lifetime or part of a lifetime, incorporating an adequate margin of safety.[171] The risks associated with potential alternatives are assessed based on the "reasonable maximum exposure scenario," which is designed to include all exposures that can be *reasonably* expected to occur.[172] The analysis considers exposures under both current use conditions as well as potential future conditions,[173] but does not focus on worst-case exposure assumptions.[174]

Where environmental effects are observed, EPAsets remediation goals based on environmental ARARs (where they exist) and levels based on a site-specific assessment of what is protective of the environment. For carcinogens, the establishment of an acceptable level of risk in cases where ARARs do not exist (or are not sufficiently protective) is especially sensitive, because such contaminants arguably pose a risk at almost any level of exposure (although that risk may be large or small depending on the amount and duration of the exposure and the type of carcinogen involved). Under the NCP, when remedies cannot entirely eliminate potential exposure to a carcinogen, the Agency may achieve protection of human health by selecting remedies that pose very small risks, (i.e., that are within an acceptable range of risk) based on a review of reliable cancer potency information such as EPA's cancer potency factors.[175]

In the proposed NCP, the Agency had defined the acceptable risk range as being from 10<-4> to 10<-7>, meaning that when the excess risk to an individual of contracting cancer due to a lifetime exposure to a certain concentration of a carcinogen falls between approximately 1 in 10,000 and 1 in 10 million, it is judged to be an acceptable exposure.[176] As a measure of additional protection, the proposal provided that there should be a "point of departure" of 10<-6>, toward the more protective end of the scale, that should be used in setting preliminary remediation goals; if conditions warranted, the final remedy could achieve a level elsewhere within the range.[177]

The final rule maintained the point of departure of 10<-6>, but narrowed the risk range to 10<-4> through 10<-6>.[178] This action was taken in response to public comment and concerns that the Superfund range went below the accepted

de minimis level used by other EPA programs and those of other federal agencies. It also reflects the limits of available analytical techniques, which cannot effectively verify for many contaminants that concentration levels corresponding to a risk of 10<-7> have actually been attained.[179]

Although this change might appear to be a lessening of protection or a lessening of the Agency's commitment to protect, it is in fact likely to have minimal if any impact on the selection of remedies at Superfund sites for two reasons. First, no CERCLA remedies have selected 10<-7> as a cleanup level to date (although one or two may have achieved it due to the efficacy of the technology). Second, the Agency has retained the discretion to select a cleanup level outside the range in appropriate circumstances (e.g., where concerns about sensitive populations, synergistic effects among chemical mixtures, etc., suggest that the remedy should attain a level below 10<-6>).

The use of a *range* of acceptable risk is general practice for most government programs.[180] As discussed below in the section on role of cost, it affords the Agency the flexibility to take into account different situations, different kinds of threats, and different kinds of technical remedies. If a single risk level had been adopted, (e.g., at the more stringent end of the risk range), fewer alternatives would be expected to pass the protectiveness threshold and qualify for consideration in the balancing phase of the remedy selection process.

Remedy Selection — Added Structure

One of the major changes between the proposed and final NCP is the attempt in the final rule to build greater structure into the remedy selection process. The Superfund program has been criticized for having a process that was too vague and incapable of quality control or review; rather, remedies were said to be selected by an arbitrary assessment of any of the nine remedy selection criteria. The process was equated with juggling nine balls and picking one out of the air.

By making a number of structural modifications in the remedy selection process, EPA seeks to accomplish two goals: first, to increase consistency in both process and result during remedy selection, and second, to improve **[20 ELR 10238]** understanding of the process on the part of the public and PRPs.

* *Categorizing the Nine Criteria During Final Remedy Selection.* The first initiative was to group the nine criteria into three functional categories and to place those categories in the text of the rule.[181]

First, the rule establishes a category of two "threshold" criteria that all remedial alternatives must meet to be considered in the final balancing: (1) "overall protection of human health and the environment" and (2) "compliance with applicable or relevant and appropriate requirements of other environmental laws (unless a waiver is justified)." These requirements cannot be compromised.

Next, the rule establishes a category of five "balancing criteria" that are used to weigh the tradeoffs among the protective, ARAR-compliant[182] remedial alternatives:

* long-term effectiveness and permanence;

* reduction of toxicity, mobility, or volume through treatment;

* short-term effectiveness (e.g., environmental impacts during the cleanup itself);

* implementability (e.g., whether the technology being considered is available within the necessary timeframe); and

* cost.

Finally, two "modifying criteria" — state acceptance and community acceptance — are considered in altering otherwise viable approaches. These criteria are listed for consideration at the end of the process because they are generally not fully known until after the public comment period on the proposed plan; however, they may be considered part of the balancing process as soon as they are known.

These categories of criteria were discussed in the preamble to the proposed NCP, but they were intended to be used during the detailed analysis stage.[183] The final rule moves the criteria into the text of the rule itself and makes them applicable to the remedy selection decision itself, thereby assuring that the final decision gives the appropriate consideration to each factor.

Although the nine criteria do afford the Agency considerable flexibility, the remedy selection process is not as wide open as it may seem. In practice, most alternatives will not show dramatic differences in all nine criteria (remember that all must be protective and ARAR-compliant to get into the balancing stage). Tradeoffs on a site-specific basis are likely to focus on one or two criteria. For instance, where alternatives are similar in cost, the balancing will focus on differences in effectiveness or implementability; where two alternatives both accomplish treatment, the key factor may be cost or short-term effects. It is highly unlikely that all of the balancing and modifying factors will be at issue in the comparison of two alternatives.

Further, during the final balancing stage, when the Agency selects the alternative that "utilizes permanent solutions and treatment to the maximum extent practicable," the final rule places special emphasis on the factors of "long-term effectiveness and permanance" and "reduction in mobility, toxicity, or volume through treatment;"[184] these two criteria will be decisive when the alternatives perform similarly with respect to other balancing criteria.[185] Thus, where Alternative A is protective at a lower cost than Alternative B, but Alternative B would result in a greater reduction in the mobility of the waste, the rule would assign added "points" to the treatment alternative. Where alternatives provide similar long-term effectiveness and permanence and a similar reduction in mobility, toxicity, or volume, the other balancing criteria will serve to distinguish among the alternatives. This prioritizing of criteria adds some greater predictability to the process.

Thus, although the nine criteria have been retained, the discretion in evaluating them has been somewhat limited by structural changes in the final rule. Those changes should also help the decisionmakers — and the reviewing public — to better understand the process of selecting a remedy from among unequal options.

* *Emphasis on Treatment.* Another major change in the remedy selection process under the 1990 NCP is the increased emphasis on treatment in CERCLA remedies. EPA sets this tone at the outset by establishing a new program goal that EPA shall select remedies that are protective over time and "minimize untreated waste."[186] The rule then goes on to set out the "expectation" that the Agency will "use treatment to address the principal threats posed by a site, wherever practicable."[187] Treatment may represent the sole remedy, or it may be part of a combination of responses, as where "hot spot" areas are treated and immobile wastes and treatment residues are controlled using engineering controls. The preamble further establishes, as a guideline, that treatment as part of CERCLA remedies should generally achieve reductions of 90 to 99 percent in the concentration or mobility of contaminants of concern.[188]

Also, as noted above, the final rule emphasizes treatment during final remedy selection by requiring that the factors of long-term effectiveness and permanence and reduction in mobility, toxicity, or volume through treatment be emphasized in the final balancing process to determine which alternative offers the maximum permanence and treatment practicable.[189]

Another way in which the final rule has been revised to encourage the selection of more treatment remedies is through the addition of an expectation that innovative treatment technology alternatives should be developed where such technologies offer the potential for "comparable" performance;[190] an innovative technology need not be shown to be superior to more proven technologies to be chosen as part of a remedy.

These factors, taken together, suggest that more treatment **[20 ELR 10239]** remedies will be selected under the 1990 NCP than was the case previously.

* *"Expectations" in the Final Rule.* A third important change in the structure of the remedy selection process is the addition of remedial expectations into the rule section of the final NCP. EPA discussed in the preamble to the proposed rule the type of remedies that were "expected" to result from the remedy selection process;[191] to highlight this important guidance, the expectations were moved into the text of the final rule.[192] These statements are not intended to *require* the selection of any particular remedy at specific sites, or to substitute for the site-specific balancing of the nine criteria during remedy selection. Rather, they are intended to educate decisionmakers and the public as to the type of remedies that EPA has selected in certain situations, so that learning will not be unnecessarily repeated and an appropriate range of alternatives may be considered.[193]

For example, it is the Agency's experience and expectation that highly mobile wastes need to be treated, and that where

highly mobile contaminants exist, the lead agency should focus on the development of treatment alternatives. Thus, the rule states that "EPA expects to use treatment to address the principal threats posed by a site, wherever practicable."[194] Similarly, it is the Agency's experience and expectation that large volumes of low contamination wastes (e.g., large municipal landfills) are most appropriately contained; thus, a focus on the development of engineering control alternatives is recommended for such cases.[195]

The expectations also recognize that in many cases, the appropriate remedy may include a combination of treatment and containment, such as where the levels of contamination vary over a site. The Agency would expect in such cases to treat hot spots of high level, mobile contaminants, and certain areas oflow contamination.[196]

There may also be sites where the expectations will not prove useful under the circumstances of the release. In any case, as noted above,the expectations are not intended to avoid the full remedy selection analysis; each remedy must still be explained and justified in a proposed plan. The preamble to the final NCP makes clear that reliance on an expectation alone is not reason enough to select a particular remedy.

Similar to expectations in the final rule are a number of "management principles" to offer programmatic guidance for the remedy selection process.[197] One of the most frequently discussed is the principle that there should be a "bias for action" at Superfund sites. This means that actions should be taken as early as possible when necessary or appropriate to achieve significant risk reduction quickly.[198] This policy may be implemented by the initiation of operable units in phases or the use of removal actions to address immediate threats at NPL sites.[199]

A second fundamental management principle is that of "streamlining" the Superfund process. The site response program has been criticized for performing unnecessarily long studies and data collection. Streamlining is a concept of tailoring the data-collection needs, the evaluation of alternatives, and the documentation of the selected remedy to reflect the scope and complexity of the site-specific problems.[200] For example, the preamble to the final rule discusses the use of a focused or streamlined FS where site problems are straightforward such that it would be inappropriate to develop a full range of alternatives (or where a removal action has limited the amount of additional work necessary).[201]

The Agency believes that the addition of these expectations and principles to the remedy selection framework will help to expedite action and lead to similar remedies at similar sites. Here, as with much of the final rule, the test will be in the implementation.

* *Fund-Balancing Waiver.* EPA also sought to add structure to the remedy selection process by identifying a threshold at which a waiver of ARARs based on a balancing of demands on the Fund would be "routinely considered." Comment was specifically solicited on this issue.[202]

As noted above, CERCLA § 121(d)(4) sets out six limited circumstances in which an environmental standard that is applicable or relevant and appropriate may be waived by EPA foran on-site action. The sixth waiver, called the Fund-balancing waiver, is available only for remedial actions undertaken using Fund monies and only where the attainment of the standard "will not provide a balance" between the need for protection of public health and the environment and the availability of amounts from the Fund to respond to other seriously contaminated sites.[203] This waiver has been used sparingly to date.[204] After a review of the public comments submitted, the preamble to the final rule provides that the Agency will routinely consider the Fund-balancing waiver in cases where the cost of an operable unit is more than four times the average operable unit cost (the average operable unit cost is now approximately $ 15 million, resulting in a trigger of approximately $ 60 million for routine consideration of this waiver).[205]

It is difficult to predict the impact or significance of this change. Certainly, it means that the Fund-balancing waiver will be considered more often. However, this is only a policy, and the policy merely states that the regions should **[20 ELR 10240]** "consider" the waiver when the cost of an operable unit exceeds the threshold.

* *Role of Cost.* The role of cost in remedy selection has been one of the most hotly disputed issues in the Superfund program. Many PRP groups argue that cost must be a major factor in deciding on an appropriate remedy and note that the requirement to select "cost-effective" remedies appears in CERCLA § 121(a) and (b). Many environmentalists and some legislators have argued that cost is given too much emphasis in remedy selection and have posited that cost should be considered only in determining the cost-efficient method for implementing a selected remedy. In effect, they argue that the proper cleanup level for a site should be set, and then a remedy should be selected to attain that level,

without consideration of cost.[206]

In the preamble to the final rule, EPA discussed the role of cost at great length.[207] The Agency stated that it agrees that cost should not be considered in setting the protective level in situations where a specific ARAR defines the cleanup level that must be achieved at the site (e.g., where an MCLG above zero is available for contaminants in drinkable groundwater). However, where ARARs are not available for the specific contaminants of concern (or where ARARs are not sufficiently protective[208]), the Agency defines protectiveness in terms of the risk range, and several alternative remedial technologies may be capable of achieving protection within that range. Under such circumstances, cost may be one of the factors to consider in choosing among the available technologies.

It is important to note, however, that cost and other factors may be considered only to distinguish among alternatives that have been found to be protective of human health and the environment and in compliance with ARARs (or to have justified a waiver).

Cost is specifically considered during the final balancing process, as the Agency attempts to satisfy two statutory mandates of CERCLA § 121(b)(1) by identifying *the* remedial alternative that utilizes "permanent solutions and treatment . . . to the maximum extent practicable" while being cost-effective. These determinations are intended to be made simultaneously; however, for ease of analysis, they are discussed separately in the NCP.

Cost-Effectiveness. The determination whether a proposed remedial alternative is cost-effective is based on an evaluation of several of the nine criteria. First, overall effectiveness is assessed based on: long-term effectiveness and permanence; reduction of mobility, toxicity, or volume through treatment; and short-term effectiveness. The overall effectiveness is then compared to the cost of the alternative to determine if they are "in proportion" to one another[209] (i.e., does the approach represent a reasonable value for the money?[210]). In making this comparison, the decisionmaker is not directed by the NCP to place special emphasis on the factors of "reduction of toxicity, mobility or volume through treatment" and "long-term effectiveness and permanence," as is required during the assessment of permanence and treatment to the maximum extent practicable (as provided in NCP § 300.430(f)(1)(ii)(E)). However, because "effectiveness" is measured based on those two factors (plus short-term effectiveness), an alternative that is high in treatment and permanence will be considered more effective and thus can justify a relatively higher cost (high effectiveness and high cost would be in proportion). The comparison of cost to effectiveness is performed for each alternative individually and for all the alternatives in relation to one another.[211] This latter analysis allows the Agency to identify alternatives that produce an incremental increase in effectiveness for a reasonable increase in cost, based on a comparison of corresponding increases for other alternatives. Several alternatives may be found to be cost-effective.[212]

Although the statute requires EPA to select cost-effective remedies, EPA has decided not to consider cost-effectiveness as a threshold criterion on a par with protectiveness and compliance with ARARs. This is based in part on the fact that unlike the "protectiveness" and "compliance with ARARs" determinations, which can be reached for each alternative individually, the cost-effectiveness finding requires a comparison of each alternative in relation to other alternatives and the consideration of several factors during a balancing phase. (The same comment is true of the statutory mandate to utilize permanent solutions and treatment to the maximum extent practicable.) In addition, the preamble to the final rule suggests that reliable information on cost will not be generally available as early in the process as is information on a remedial technology's protectiveness, and thus cost should not be used too early in the final balancing process to eliminate viable alternatives.[213]

Cost and Practicability. The statutory requirement to select *the* alternative (there is only one) that utilizes permanence and treatment to the maximum extent practicable[214] is fulfilled by selecting the protective, ARAR-compliant alternative that provides the best balance of tradeoffs among alternatives based on a review of all the balancing and modifying criteria (if the latter are known).[215] It is a subjective judgment, but the NCP sets out some parameters to help assure consistency in its application. Specifically, the NCP requires that during the balancing process, the factors of long-term effectiveness and permanence and reduction in toxicity, mobility, or volume should be emphasized, and that the "preference for treatment as a principal element" and the "bias against off-site land disposal of untreated wastes" must be considered.[216] **[20 ELR 10241]** This statutory determination is the final step in the process before a remedy is recommended in the proposed plan.

Although cost, as one of the nine criteria, is considered in making this determination, it is not expected to play a major role. The importance of almost every other criterion to this determination is emphasized by the NCP. First, the two

threshold criteria must already have been met for any alternative considered during the final balancing. Second, the rule places special emphasis on the treatment and effectiveness factors during this determination; those criteria will be "the most important, decisive factors in remedy selection when the alternatives perform similarly with respect to other balancing criteria."[217] Third, the NCP highlights the two modifying criteria[218] and "implementability"[219] as important considerations in fulfilling this statutory requirement. Thus, cost is one of only two of the nine criteria the use of which is not stressed for this determination. It is also noteworthy that cost will not always be a differentiating factor between remedial alternatives; the final remedy selection will generally focus on tradeoffs based on only one or two criteria.

Cost as a Screen. Cost may also be considered during one other aspect of the remedy selection process: screening, when alternatives that are deemed not to be viable are eliminated from more thorough consideration. The use of cost at this early stage has also been the subject of considerable comment. Many were concerned that cost would be used to screen out appropriate remedial technologies early in the process before they were given a fair evaluation and without the benefit of public review and comment.

The final NCP has been revised to narrow the circumstances under which cost may be considered when screening alternatives at the start of the evaluation process. Specifically, the final rule provides that a given alternative may be eliminated during screening if it is determined that the cost of the alternative is "grossly excessive" compared with its effectiveness.[220] This provision will allow the Agency to avoid the need to conduct resource-intensive analyses of extreme and unrealistic options, while at the same time not allowing cost to compromise consideration of viable options that may simply be more expensive than other alternatives.[221]

* *Definition of "On-site" and Application to Noncontiguous facilities.* Critical to both the type and extent of remedies that may be selected is the definition of the CERCLA site. The site definition is important because "[n]o Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted *entirely onsite* . . . ."[222] Further, the process of meeting ARARs — and the substantive versus administrative distinction — only applies to on-site actions.[223] However, the term "on-site" is undefined in the statute.

In the proposed NCP, EPA took comment on several possible interpretations of "on-site" and suggested defining the term in a manner consistent with statutory intent and the practical realities of site response.[224] Specifically, the Agency sought to address situations in which a treatment plant needs to be located on uncontaminated property over a plume of contamination, or a sludge stabilization tank needs to be located next to, but not in, a sludge pit; thus, the proposal suggested defining "on-site" as the actual contamination plus limited surrounding areas.

After reviewing public comments, the Agency adopted the approach recommended in the proposal and defined "on-site" as consisting of "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action."[225] By defining the site to include contaminated areas plus those areas in "very close proximity" and "necessary" to implementation of the response, the Agency sought to give pragmatic effect to the statutory provision that on-site CERCLA remedies should not be required to obtain a permit, while not unduly expanding the commonsense concept of what actions are "entirely onsite."[226]

The exemption from permit requirements for on-site actions has even greater implications when considered in conjunction with EPA's power to address releases at noncontiguous facilities. CERCLA § 104(d)(4) allows the Agency broad discretion to treat noncontiguous facilities as one site for the purpose of taking response action.[227] The only limitations prescribed by the statute are that the facilities be reasonably related either "on the basis of geography" *or* "on the basis of the threat, or potential threat to the public health or welfare or the environment." Once the decision is made to treat two or more facilities as one site, no permit will be required for the management of waste transferred from one part of the aggregated site to the other.

[20 ELR 10242]

The preamble to the final rule recognizes the significant impact such aggregations could have, because in theory one Superfund site could come to be treated as the disposal site for many Superfund sites. Such a result could be of concern to communities, affected states, and PRPs. Thus, the Agency set out a number of factors that should be considered in deciding whether it makes sense under CERCLA to treat two or more contamination problems as one.[228]

First, the decisionmaker would look into whether the wastes from the noncontiguous facilities are appropriate for similar treatment or disposal. Second, the possible transportation risks would be evaluated (e.g., the risks might be significant where the wastes are highly volatile or the transfer would take place through heavily populated areas). Third, the views and consent of the affected state(s) and public should be solicited. And fourth, the cost-effectiveness of the aggregated response should be evaluated (including the incremental cost of transportation).[229] The Agency rejected the idea that a specific distance could be defined for saying when aggregation would or would not be appropriate. Rather, the final rule contemplates a case-by-case evaluation of all factors as part of the ROD process, with opportunity for comment by all interested parties.

During the NCP comment period, a number of PRPs raised the concern that they could face increased liability if two or more Superfund sites were treated as one.[230] Such issues could be raised during comments on the site-specific aggregation decision. Of course, liability issues potentially arise from every response action, whether waste is left on site, sent to an off-site disposal facility, or sent to a treatment or disposal facility that is part of a remedy at a noncontiguous Superfund facility. It is not obvious that the third option, with its inherent EPA oversight, poses a greater risk of liability than the first two.

State Issues

* *NPL Deferral*. Of all the issues in the proposed NCP, the one that received the most public comments was whether EPA should defer the listing of sites on the NPL based on the availability of "some" response authority under other federal or state laws. (A deferral policy already existed, and continues, for most private sites that are subject to federal or state-authorized RCRA programs, and for sites that are regulated under licenses issued by the Nuclear Regulatory Commission.[231]) Although many states argued that they have the capability to clean up sites as well as or better than the federal government, the idea of state deferral was "deferred" in the final rule.[232] Congressional staff have indicated that the concept of deferring sites from the NPL may be reviewed by Congress during CERCLA reauthorization; a possibly limited deferral for "CERCLA-quality" state programs may be considered at that time.[233]

* *Role of States in Response Actions*. The role of states in the CERCLA response process was a major part of the NCP revisions. In line with the mandate of CERCLA § 121(f), the Agency sought to spell out the opportunities and methods for state involvement throughout the site evaluation and response process; this initiative resulted in a new Subpart F to the NCP. It is meant to establish a "partnership" between the federal and state governments at CERCLA sites.

Perhaps most significantly, the final revisions set out an expanded role for states in the remedy selection portion of the process. For Fund-financed sites, a state may be designated as the lead agency where it demonstrates certain capabilities, and thereby performs the RI/FS, drafts the proposed plan and ROD, and conducts the remedial design/remedial action (RD/RA) phases of the response. This affords the states a major role over remedy selection: by drafting recommended alternatives and proposing the remedy, the state recommendations can be expected to strongly influence the final decision in many cases. (The deference accorded to a state recommendation will likely be greatest where the state has a proven track record of cleaning up sites.) At the same time, the final rule provides that for Fund-financed actions, a state may not publish a proposed plan that EPA has not approved,[234] and where the state does prepare the ROD, it must seek EPA's concurrence and adoption of the remedy specified therein.[235]

For EPA-lead sites, the states also have considerable power. First, the NCP specifically requires EPA to seek state concurrence on its remedies,[236] and in extreme cases where the state disagrees with a proposed Fund-financed remedy, it may withhold the required state assurances under CERCLA § 104(c)(3). (At EPA-lead enforcement sites, the states may challenge the waiver of ARARs under CERCLA § 121(f)(2).) The final rule also discusses dispute resolution procedures to work out state/federal conflicts.[237]

Alternatively, the state may take a non-Fund-financed, state-lead enforcement action at a site under state law (this is likely where a solvent PRP is available). EPA concurrence is not required for such actions, although it may be requested.[238] The availability of EPA concurrence on state-lead enforcement sites is significant in that it may help states to achieve settlements with PRPs.[239]

Some states — those that have implemented aggressive cleanup programs — may argue that EPA has not gone far **[20 ELR 10243]** enough in turning over remedy selection authority to the states, and indeed, this sentiment was reflected in several comments on the NCP. However, EPA specifically declined to delegate the ultimate CERCLA remedy selection power to states in the final rule.[240] The preamble explains the Agency's view that delegation of final decisionmaking

authority on remedy selection is not appropriate, and that although an expanded state role is required under CERCLA § 121(f), EPA should retainprimary responsibility for the federal Superfund program. (Indeed, the role carved out for states in § 121(f) may be argued to imply that EPA should retain final decisionmaking authority.) There is also a general concern about the propriety of allowing states to commit Fund dollars without EPA oversight. The issue of state remedy selection, like the issue of deferral to states of potential NPL sites, may be the subject of congressional attention during the reauthorization of CERCLA.[241]

* *Enhancement of Remedies*. The issue of whether a state may "enhance" an EPA-selected remedy, and under what conditions, has generated a significant amount of interest and controversy. Different people mean different things when they discuss "enhancement," and in fact, the term is often misused. Historically, the term has been used to include diverse types of potential state actions, from seeking to increase the level of cleanup, to building a larger treatment plant that may be used by the state after the CERCLA action is completed, to insisting on requirements that EPA believes are inappropriate or that could conflict with the EPA-selected remedy.

The final rule separates consideration of state-proposed actions that are (1) necessary to the selected action (those would be handled by ROD amendment or ESD); (2) not necessary to the selected action, but not inconsistent with the CERCLA remedy (these would be allowed in the Agency's discretion if the state assumed financial and oversight responsibility for the change); and (3) in conflict with EPA decisions.[242]

The preamble notes, as a threshold matter, that states already have significant opportunities during the RI/FS process leading up to remedy selection to suggest to EPA that state standards should be considered ARARs and thus attained, or that the proposed remedy should be expanded in scope. In most cases, these issues should be worked out prior to remedy selection and they are more properly viewed as remedy selection issues, not enhancement.[243] The issue of enhancing or supplementing the selected remedy is more often an issue in the context of post-ROD suggestions for change.

Where, after the ROD, the state asks EPA to change or expand the selected remedy and EPA agrees that the state's suggestions are appropriate and necessary to protect human health and the environment, the Agency may include the changes in the Fund-financed remedy through a ROD amendment or ESD (consistent with final rule § 300.435(c)(2)), in which case the Agency would share in the costs of the modified or additional activity. If the Agency concludes that the state-suggested changes or expansions are not necessary to the selected remedial action, the Agency will not modify the ROD or pay for the additional action; however, the Agency may still decide to allow the additional action to proceed concurrent with the EPA-selected remedy.

Where EPA finds that the proposed change[244] or expansion is not necessary to the EPA-selected remedy, but would not conflict or be inconsistent with it, the Agency may agree to integrate the proposed change or expansion into the planned CERCLA remedial work, but only if the state agrees to fund and oversee the necessary changes or additions. For example, the state may want a groundwater system to run longer than planned in order to attain water quality levels beyond those required under CERCLA, or the state may want to extend a water line outside the Superfund site in anticipation of expected residential or industrial development in the area. Such changes or expansions that would not conflict or be inconsistent with the EPA-selected remedy would generally be accommodated, on the condition that the state fund and supervise the change or expansion.

In instances where the state requests, and pays for, an incremental increase in the cleanup level, a lively debate can be expected between the state and any PRPs over whether the costs of such enhancements may be recovered in a cost recovery action. The state would be expected to argue that even if the cleanup is more than the minimum required under the NCP, it is "not inconsistent with the NCP" for purposes of cost recovery under CERCLA § 107(a)(4)(A). Interestingly, while CERCLA § 107(a)(4)(B) allows private parties to recover only "necessary" costs consistent with the NCP, the word "necessary" is absent from the cost recovery provision of CERCLA § 107(a)(4)(A), which applies to states.

Finally, where a state-proposed change or expansion would conflict or be inconsistent with the EPA-selected remedy, it would not be appropriate to allow the state to proceed without EPA approval.[245] Indeed, to do so would be tantamount to giving the states a veto power over EPA remedial action decisions.

* *Superfund Memorandum of Agreement*. A major step in facilitating an EPA/state partnership under the NCP is

expected to be the development of the Superfund **[20 ELR 10244]** Memorandum of Agreement (SMOA). SMOAs are voluntary, general agreements (not site-specific) that may be used to establish the general framework for the EPA/state working relationship, to define the roles of the lead and support agencies, and to provide for EPA oversight. They are the recommended method for working out the interrelationship between state and federal authorities.

In the proposed rule, EPA had suggested making SMOAs prerequisites to certain actions under CERCLA (e.g., the designation of a state as lead agency for a non-Fund financed action).[246] However, a number of states strongly opposed a "requirement" to enter into a SMOA, and the final rule makes clear that SMOAs are not required as a condition for the state acting as lead agency. Instead, the final NCP provides that a number of issues — including annual EPA/state consultations, review by the support agency, timetables for the identification of ARARs, and dispute resolution — "may" be agreed to by the state and region in a SMOA. Where there is no SMOA, the rule sets out minimum requirements that would apply.[247]

* *State Cost Share for O&M.* One of the most sensitive issues for states in the final NCP has been the extent of state responsibility to pay O&M costs for CERCLA remedial actions. For remedial actions, the federal and state governments share costs according to the formula in CERCLA § 104(c)(3), generally 90 percent federal, 10 percent state.[248] Once the remedy has been constructed and is operational, the costs and responsibility for operating and maintaining the remedy transfer to the state. The final rule provides that states are responsible for assuring the "operation and maintenance of implemented remedial actions for the expected life of those actions."[249] The preamble explains that this position is consistent with the statute and long-standing EPA policy.[250]

SARA added to CERCLA a new § 104(c)(6), providing that for the purposes of CERCLA § 104(c)(3) — which includes the cost share provision — treatment or other measures necessary to restore ground or surface water quality would be considered remedial action as compared with O&M until protective levels are attained or for 10 years, whichever is earlier. By virtue of being included in the term "remedial action," restoration measures would qualify for the federal cost share.

A number of states commented that this section should be read expansively to include any measures that contribute to full restoration (e.g., the maintenance of caps and leachate collection systems). They argued that if such measures are not maintained, water quality could degrade and restoration would not occur. The final NCP takes the position that "treatment or other measures *necessary* to restore ground and surface water" do not include source control maintenance measures (like landfill cap maintenance or leachate collection systems) or measures whose primary purpose is to provide drinking water.[251] Although EPA recognized that a failure to maintain source control maintenance measures could result in some additional contamination of ground or surface water, those measures are not appropriately considered "necessary for restoration" and therefore "remedial actions" under CERCLA § 104(c)(6). Rather, they fall within the category of normal operation and maintenance activities.

The legislative history cited in the preamble to the final rule suggests that Congress sought, through § 104(c)(6), to correct an imbalance in the manner in which water body contamination was treated as compared with surface contamination.[252] In the case of surface cleanup, an action would be considered remedial — and subject to a cost share — throughout construction of engineering controls, excavation of the contaminated area, or until protective levels were otherwise achieved. However, for ground and surface water, actions were considered remedial only up to the point where the treatment plant was built and operational, regardless of remaining contaminant levels in the water. The solution adopted was to include within the definition of "remedial action" those ground and surface water restoration efforts taken up to the point that protective levels were achieved, or for 10 years, if earlier. The 10-year time limitation was added out of the recognition that groundwater remedies will generally take many years to complete and would be a major drain on the Superfund program if EPA were required to fund them.[253]

In the preamble to the final rule, EPA explained that the states' view would lead to results that are inconsistent with the intent of Congress and with common sense. If source control maintenance and other O&M activities are necessary for restoration, restoration can never be considered complete as long as O&M is required. This is clearly not the intent of Congress, since § 104(c)(6) contemplates that restoration may be considered complete when protective levels are achieved if in less than 10 years, even if O&M continues. The states' interpretation would also lead to a situation where virtually all on-site O&M activities could be characterized as remedial action under § 104(c)(6), on the theory that if they were not maintained, they might degrade the ground/surface water; such a result would appear to exceed the limited intent of Congress.

The final NCP also takes notice of the fact that groundwater pump-and-treat technologies may reach a point at which restoration activities no longer result in significant reductions in contaminant concentrations. Thus, the rule provides that restoration may be considered complete for the purposes of CERCLA § 104(c)(6) when protective levels are achieved, in 10 years, *or* when such a steady-state situation is reached.[254]

Finally, the preamble to the final rule states that EPA will consider funding O&M for "temporary or interim measures" to control or prevent further releases, where no final remedy for a unit has yet been selected (e.g., maintenanceof a *temporary* landfill cap).[255] The rationale **[20 ELR 10245]** behind this policy is that interim measures may be necessary to stabilize a site while EPA is deciding on a final remedy; such measures are, in effect, part of the remedy. However, if EPA selects a final solution for an operable unit (e.g., a final cap on a contaminant source), the maintenance of that unit would be considered normal O&M for which the state would be responsible.

Administrative Record Issues (Subpart I)

This subpart implements CERCLA § 113(k) by setting out the rules for establishing an administrative record file and by explaining what material may be included in, or excluded from, the administrative record.

* *Purposes of a Record.* The administrative record for a site serves two basic purposes. First, it constitutes the record for judicial review. CERCLA § 113(j) specifically provides that judicial review of the adequacy of any CERCLA response will generally be limited to the record assembled by the Agency (rather than allowing for *de novo* review), although courts may go beyond the record and allow for the introduction of supplementary materials in limited cases. The public and PRPs have opportunities throughout the process to add materials to the administrative record file, particularly during the formal public comment period. All response decisions not dictated by CERCLA or the NCP should be justified in the administrative record.

The second fundamental purpose of establishing a record (and file) is to provide interested parties an opportunity to review the response actions proposed for a site, so that they may meaningfully participate in the response selection process.

* *Administrative Record File vs. Administrative Record.* The rule makes a distinction between the administrative record "file" and the administrative record. This is because typically, the formal record for judicial review is not compiled until after EPA selects a response action;[256] the administrative record file is the mechanism for compiling the formal record, and making it publicly available, as early in the process as possible. Further, the Agency encourages the placement of even potentially relevant materials into the administrative record file, leaving the process of reviewing documents for relevance until the later compilation of the formal record.

The administrative record file should not be confused with the information repository for a site. Although some of the same documents may be contained in both files, and both provide the public with relevant information, they are fundamentally different. The information repository contains *general* documents that relate to a Superfund site and to the Superfund program, including background information and policy guides. By contrast, the administrative record file contains site-specific data, comments, and other documents used in the selection of a *particular* response action.[257]

For remedial actions, the administrative record file will be established after the start of the RI;[258] for removal actions with a planning period of at least six months, the record file will be established when the engineering evaluation/cost analysis is made available;[259] and for removals with a planning period of less than six months, the administrative record file will be made available no later than 60 days after initiation of the action.[260] Except for emergency removals completed within 30 days of initiation, the administrative record file must be located at or near the site and at another central location for public review.[261]

* *What Is In/Out of the Administrative Record.* The formal administrative record is compiled based on a review of the administrative record file and will include those documents that "form the basis for the selection of a response action,"[262] consistent with the mandate in CERCLA § 113(k) for the establishment of "an administrative record upon which the President [or his delegate, EPA] shall base the selection of a response action." The record will typically include factual information/data; analyses of factual information; policy and guidance documents; public participation documents, including public comments; decision documents throughout the process; orders; and responses to comments.[263]

At the same time, irrelevant, duplicative, and certain predecisional documents (e.g., staff-level options papers and drafts of final documents) would not necessarily be included in the administrative record, unless such documents contain information that forms the basis of selection of the response action and the information is not otherwise included in the administrative record.[264] A contrary policy of including deliberative and predecisional documents in the record could have a chilling effect on the free exchange of ideas within EPA. Privileged information that formed the basis for a response action decision will be included in a confidential section of the administrative record.[265]

Although some commenters expressed the concern during the rulemaking that the final administrative record may not include all appropriate materials, the preamble to the final rule emphasizes that the record will include appropriate information even if it does not support the selected remedy. For example, comments submitted during the formal public comment period must be considered by the Agency and will be included in the record, even if they are ultimately rejected.[266] In addition, as a matter of policy, EPA will attempt to consider significant comment submitted prior to the comment period. However, to the extent a party wishes to ensure that its comments will be considered by the Agency and made part of the record, **[20 ELR 10246]** those comments should be submitted (or resubmitted during the formal public comment period on the proposed plan).[267]

Interested persons may also submit technical studies or other information to EPA throughout the process leading up to final remedy selection,[268] and the Agency will generally consider such information, if relevant and timely submitted. Such studies would then be placed in the administrative record file. Agency consideration of such studies will usually be reflected in subsequent documents or analyses performed by the Agency and included in the record file. Subject to the qualifications discussed above, information placed in the record file for a proposed response action and relevant to the selection of that response action, whether in support of or in opposition to the selected response action, will become part of the final administrative record for the response selection decision.[269] Again, if there are questions as to whether all or part of a study was considered by the Agency or whether it will be a part of the final record, parties may wish to refer to the studies during the public comment period.

* *Adding Documents Post-ROD.* After the ROD is signed, certain classes of documents may be added to the administrative record files, including documents relating to remedy selection issues that the ROD reserves or does not address; ESD notices; documents relating to ROD amendments; and certain public comments that substantially support the need to significantly alter the response action.[270] EPA may also establish separate comment periods on issues or documents of concern, and such documents — and the comments on them — will be made a part of the administrative record.[271]

The need to add documents to the record after remedy selection is a logical reflection of the fact that the ROD does not resolve or even contemplate all issues concerning the response action; indeed, as noted above, the ROD may specifically reserve certain issues. In addition, it is common, if not inevitable, for issues to arise during the design and implementation phases of the remedy, requiring the Agency to refine, modify, or clarify aspects of the response action. Documents relating to these activities are necessary components of the record for reviewing the Agency's action.

Public Participation

The new administrative record provisions are an important component of the Agency's efforts to increase public involvement and awareness of CERCLA actions. In addition to those provisions, the final NCP also incorporates new community relations requirements, in response to the mandate in CERCLA § 117. Unlike the 1985 NCP, in which community relations requirements were addressed separately in one section,[272] the 1990 revisions incorporate community relations requirements into each of the sections relating to the different phases of response (i.e., removal actions, RI/FSs, selection of remedy, and RD/RA).[273]

During Removal Actions. The amount of public participation required by the NCP during removal actions has been greatly expanded from the simple requirements in the 1985 NCP to designate a spokesman and to develop a formal community relations plan for removal actions extending beyond 45 days. The NCP now includes requirements regarding the preparation and availability of an administrative record file, a comment period, and interviews with local officials and interested persons.[274] However, the timing and extent of the public participation required vary depending on whether the removal is considered an emergency, time-critical, or non-time-critical action.[275] The extent of public participation also depends, to a large degree, on the needs and wishes of the public. NCP sets out the basic community relations requirements that EPA has found through experience to be necessary and allows for greater involvement

where public interest is high.[276] For example, the final rule allows for an extended comment period upon request.[277]

During the RI/FS. The final rule also increased the opportunities for public participation during the investigatory and alternatives assessment stages of the process. The revisions expand the use of the community relations plan (CRP) to provide greater opportunities for public participation in decisionmaking, require information repositories as well as administrative record files, more prominently discuss the availability of technical assistance grants (TAGs),[278] and provide for interviews of members of the local community to better assess the views of affected residents, officials and other interested parties.[279]

During Remedial Actions. Similarly, the 1990 NCP revisions increase community relations and participation efforts during remedial actions. The revisions implement CERCLA § 117 by requiring the preparation and publication of a proposed plan, describing the remedial alternatives analyzed, and proposing a recommended alternative.[280] In a change from the proposed rule, the final revisions allow the public 30 days to comment on the proposed plan, plus at least an additional 30 days upon simple request.[281]

Under the final rule, the Agency will respond to significant comments received during the formal public comment period on the proposed plan for remedial response, as required under CERCLA § 117. In addition, the final rule **[20 ELR 10247]** "encourages" the lead agency to respond to significant comments submitted *prior* to the public comment period.[282]

Post-ROD. After the ROD has been signed and the design phase begins, the CRP will be reviewed and, where appropriate, revised to describe public involvement opportunities during RD/RA.[284]

There are several possible opportunities for public comment and involvement during implementation of the remedy. If the Agency decides to amend the ROD, a new proposed plan/public comment period will be established.[285] This would generally occur where the Agency changes the remedy in a fundamental way, such as deciding that incineration instead of containment should be performed due to new information on the levels of organic constituents in the waste. In effect, such a change constitutes a new remedy selection, and the public would have a strong interest in providing views to the Agency. On the other hand, if the Agency changes the remedy in a significant but nonfundamental fashion, an ESD notice may be issued, consistent with CERCLA § 117(c).[286]

Neither the statute nor the NCP revisions require a new public comment period in the event that an ESD notice is issued. This is based in large part on the recognition that design and implementation will, in almost all cases, result in some refinements or modifications of the selected remedy. It would be very disruptive to require a new formal public comment and response to comment for alterations in the scope or cost of an already reviewed remedy (e.g., where 25 percent more soil needs to be excavated and treated, or where several more monitoring wells need to be installed). Further, additional comment is arguably unnecessary because the Agency will already have received the public's views of the basic remedial approach. Again, if the changes rise to the level of a *fundamental* change in the remedy, a formal ROD amendment would be required. (In any case, the Agency has the ability to provide additional public comment periods in appropriate cases,[287] and may well do so where ESDs relate to contentious issues.)

Moreover, the public is not without an avenue to voice concerns where EPA issues an ESD notice. The ESD will be made available to the public, and concerned parties may submit comments to the Agency. The final rule specifically provides that the lead agency "is required" to consider comments submitted by interested persons after the close of the public comment period if the comments contain "significant" new information that could not have been submitted during the public comment period and which "substantially support the need to significantly alter the response action."[288]

Admittedly, this is not an invitation to frequent public comment after the remedy has started, but it is consistent with the need for the Agency to get on with the business of accomplishing cleanups. If public comments — including PRP comments — could, by right, require formal response and a halt in Agency action, the program would be subject to endless delays. Such a result would be inconsistent with both the intent in CERCLA to accomplish cleanups expeditiously and the express provision in CERCLA § 113(h) that no judicial review of CERCLA response actions may be obtained prior to enforcement or completion of the response action. The provision does, however, give the public (and PRPs) the opportunity to raise significant issues to EPA at any point in the RD/RA process.

PRP Issues

Several specific issues not already discussed may hold special interest for PRPs.

Private Party Cost Recovery Actions ("Consistency With the NCP"). One of the most important issues to private parties is the ability to recover their cleanup costs under CERCLA's cost recovery provision (§ 107). CERCLA § 107(a)(4)(B) provides that parties other than the federal government, states, or Indian tribes may recover necessary costs of response that are incurred consistent with the NCP.[289] The issue of when a private party action is "consistent with the NCP" has long been a contentious one, both in and out of the courts.[290] EPA addressed this issue in a new Subpart H;[291] the approach taken in the final rule represents a dramatic change from both the proposed rule and from the 1985 NCP.

The proposed rule provided that any person may undertake a response action to reduce or eliminate a release of a hazardous substance. It also set out a list of those NCP provisions for which compliance would be required for a private party response action to be considered consistent with the NCP for purposes of cost recovery actions under CERCLA § 107.[292]

In the final rule, EPA defines "consistency with the NCP" as whether a private party cleanup has, *when evaluated as a whole*, achieved "substantial compliance" with potentially applicable NCP requirements and resulted in a CERCLA-quality cleanup.[293] (CERCLA § 107(a)(4)(B) **[20 ELR 10248]** also requires that the private party show that the costs incurred were "necessary" cleanup costs.)

This is a major change. The 1985 and the proposed NCP had required provision-by-provision comparisons between the elements of private actions and specific requirements in the NCP. This approach had allowed (if not encouraged) the parties that were responsible for the pollution to attempt to pick apart basically sound remedies, and thereby avoid paying their share of the cleanup costs. The revised approach calls for a less technical determination of whether a cleanup, when evaluated as a whole, appears to be along the lines contemplated by CERCLA (i.e., whether it is in "substantial compliance" with specified NCP requirements and has resulted in a CERCLA-quality cleanup). The rule specifically states that cost recovery actions should not be defeated based on immaterial or insubstantial deviations from the detailed set of NCP provisions (whether federal or private).[294]

The final rule does retain the list of potentially relevant NCP provisions that has appeared in prior rules,[295] but as guidance, not as a list of fixed requirements.[296] The retention of this list is intended to help parties who are uncertain as to what portions of the NCP might apply to them.[297] It also provides some standard against which the substantial compliance test can be applied. (A private party can eliminate any uncertainty about achieving substantial compliance by meeting the full set of requirements identified by EPA as potentially relevant to private actions.)

A new element in the rule is the requirements for "CERCLA-quality cleanups." This determination is to be made based on a comparison of the action with the principal mandates of SARA: the basic remedy selection requirements of CERCLA § 121(b)(1) (i.e., the remedial action must be "protective of human health and the environment," utilize "permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable," and be "cost-effective"); the requirement to attain ARARs in § 121(d)(2); and the requirement to provide for meaningful public participation in § 117.[298]

EPA set this less restrictive test for cost recovery actions based on a belief that it is important to encourage private parties to perform voluntary cleanups of sites, and to remove unnecessary obstacles to their ability to recover their costs from the parties that are liable for the contamination. As noted above, many voluntary cleanups are being contested based on allegations that cleanups failed to meet the letter of the NCP, even if the spirit of the regulation was satisfied. The Agency concluded that such hyper-technical challenges were not in the best interest of environmental protection. At the same time, the new standard reflects the Agency's view that it is also important to encourage only environmentally sound cleanups, not any cleanup. The requirement for "CERCLA-quality cleanups" was intended to achieve this goal.

The NCP recognizes that in the final analysis, the courts will decide, on a case-by-case basis, whether cleanup actions are consistent with the NCP.[299] However, the establishment of which requirements apply to private actions and to what extent they must be met (literally or substantially) appear to be within the Agency's authority (CERCLA § 105(a) and

(b) authorize EPA to develop NCP procedures and requirements). Thus, the final rule attempts to set out a more lenient standard for review than that contained in previous rules.

* *Enforcement Issues.* The NCP sets out few enforcement-specific requirements. This is largely because of the need to maintain discretion in CERCLA's enforcement program. However, there are a number of enforcement issues addressed in the NCP that will be of interest to PRPs.

Perhaps the foremost enforcement issue is the perceived problem of dual enforcement under federal and state law. In effect, responsible parties want greater certainty that when they carry out a remedy under CERCLA, or under state law (in a non-Fund-financed, state-lead enforcement action), the cleanup will not be second-guessed by the other authority. The NCP has attempted to address this concern in part through the provisions of Subpart F.[300]

The major thrust of Subpart F is to set up a partnership between EPA and the states from the beginning to the end of a CERCLA action. The rule describes a formal process for concurrence between EPA and the states on remedies, and even provides for the availability of EPA concurrence on a non-Fund-financed, state-lead enforcement remedy.[301] (This latter possibility may help the states in concluding consent agreements with PRPs.) At EPA-lead enforcement sites, the NCP specifically requires EPA to notify the state of negotiations and to allow the state to participate.[302] When disagreements arise, the NCP contemplates the use of a dispute resolution process, preferably set out in a SMOA.[303] (The SMOA is hoped to be an important tool in minimizing inconsistencies between EPA and the state.) Thus, the new procedures and policies outlined in the NCP are intended to result in greater coordination of EPA and state efforts and enforcement strategies. Where irreconcilable conflicts occur despite these procedures, issues of federal preemption and interpretations of CERCLA § 122(e)(6) may become important.[304]

A related question raised by some commenters is whether **[20 ELR 10249]** a state may require a PRP to do more than EPA has ordered. To a large extent, the coordination steps outlined above are intended to avoid such a situation. However, the state may in some cases want EPA to go beyond its selected remedy; that issue is addressed above in the discussion on state issues and enhancement of remedies.

Another enforcement-related point is the Agency's position on whether a PRP may obtain access to a site to perform its own sampling as a basis for commenting on the EPA (or state-lead) action. The NCP preamble states that EPA opposes "unrestricted" access to a site by PRPs, on the grounds that unrestricted access, sampling, and testing could present a health threat to those residing on or near the site;[305] it could also jeopardize the efficient completion of the CERCLA action. PRPs do have the opportunity to perform the RI/FS under CERCLA § 104(a)(1);[306] if they decline, they may be deemed to have given up the right to be on-site at all times. (This may serve as an incentive for PRPs to get involved in the CERCLA process at the earliest stages.)

This is not to say that the PRPs have no opportunity for access where they decline to perform the RI/FS. The lead agency may be receptive, in appropriate cases, to PRP requests for limited access under supervision, to the same extent that the agency would allow access to community groups that are monitoring CERCLA actions under TAGs. Even where the PRPs do not have physical access to the site, they do have the opportunity to review government data and studies through the administrative record file, and the lead agency has a significant interest in assuring that the file is complete. EPA and the state will ultimately be able to recover their investigative and cleanup costs only if their actions are adequately justified in the administrative record. PRPs will have the opportunity to comment on information in the administrative record file during the comment period on the proposed plan.

* *Effect of Final Rule on Ongoing Actions.* Also of interest to PRPs will be the effect of the new revisions on ongoing actions. It is important to note that, starting on the effective date (April 9, 1990), the NCP applies to all CERCLA actions, even those that commenced prior to that date under the 1985 NCP.[307] (The exception is made for administrative record requirements, which apply to ongoingactions only "to the extent practicable."[308]) The preamble explains that this should not pose a hardship to ongoing actions, because most of the revisions were already common practice or are easily accommodated. Specifically, the final rule does not differ dramatically from the December 1988 proposed rule, which has been treated as guidance by the Agency. Further, the major changes from the 1985 NCP were those mandated by SARA, and those changes are (or should be) already reflected in ongoing actions. In addition, some of the more obvious problems of changing from an old system to a new one have been avoided by the provision on freezing ARARs — only standards that were identified as applicable or relevant and appropriate at the time of ROD signature must be attained even if new requirements are promulgated, except to the extent the new requirements call into

question the protectiveness of the selected remedy.[309]

A contrary decision — to grandfather ongoing actions — could inappropriately open the way for many actions to avoid important requirements. The preamble notes that many Superfund actions, especially groundwater restoration efforts, are long-term in nature (generally taking from 10 to 30 years), and even RI/FSs can take from one to two years to complete;[310] the mere fact that such actions have already been started does not justify a permanent waiver of new requirements.

* *Deletion From the NPL.* Historically, the first question asked by parties when they learn that their site has become a target of attention under CERCLA is, "How do we get off the National Priorities List?" The answer has always been limited: finish the cleanup of the site or show that no cleanup is necessary. The final NCP gives some indication that the process may be even more difficult in the future, or at least, slower.

EPA has indicated that the number of sites deleted from the NPL should not be viewed as the measure of success of the Superfund program. This is due in large part to the fact that although many NPL sites have been substantially cleaned up, they require long periods of time before remediation can be formally completed (such that deletion is appropriate). This is typically the case for sites where groundwater contamination is involved: The sources of the contamination (e.g., drums, lagoons, waste piles) have been removed or controlled, but groundwater treatment continues. NPL deletion is also an inappropriate barometer of the program's success because it ignores the success of the removal program, which has resulted in addressing immediate threats at hundreds of sites.

To better communicate the information on the number of sites that have been "substantially" cleaned up, the final rule establishes a new "Construction Completion" category for remedies that have been implemented and are operating properly, including sites awaiting deletion; sites awaiting five-year review and/or deletion; and sites undergoing long-term remedial action to achieve cleanup levels identified in the ROD (e.g., pumping and treating of groundwater).[311]

The language in the preamble to the final rule suggests that PRPs should not look for rapid deletion of sites subject to five-year review (i.e., sites where hazardous substances remain as part of the remedy).[312] EPA has stated through policy, and now has reaffirmed in the preamble to the NCP, that the Agency does not intend to delete sites from the NPL where hazardous substances remain until at least one five-year review has been conducted **[20 ELR 10250]** under CERCLA § 121(c) after completion of the remedial action.[313] The Administrator's Management Review of Superfund specifically suggested this approach.[314]

Although it may appear to be a major shift in the rules of the game (i.e., how to get out of Superfund) it is too early to evaluate the effect of this policy. First, the regulations, even in 1985, gave EPA the discretion to delete *or recategorize* NPL sites "where no further response is appropriate,"[315] and in that sense the new policy was always a potential approach. Second, it is unclear that the policy will be used to severely delay the deletion of sites that have been cleaned up to EPA's specifications. For instance, the requirement that a "five-year review" be conducted before deletion does not necessarily mean that five years must go by after remedy completion before a site may be deleted under the policy. The statute requires a review "no less often than each 5 years," and thus in appropriate cases, a review may follow the previous one by less than five-years (note that the first five-year review at a site must begin after the "initiation" — not completion — of the remedial action).[316]

Even after a site is deleted from the NPL, the Agency has authority to take further action at the site in appropriate cases, without the need to go through a new HRS scoring.[317]

* *No Expanded NPL Deferral Policy.* The issue of an expanded deferral policy is also of considerable interest to private parties. To some, the option of deferring NPL sites to states offered PRPs the possibility of working out reasonable cleanups with state officials in a less public, less expensive, and often less cumbersome, process than under CERCLA. Similarly, deferral to other federal programs could have allowed PRPs to work out cleanups under the standards and procedures of other laws.[318]

As discussed above, the Administrator decided to "defer" the idea of expanding the NPL deferral policy to include deferral to other federal authorities, state authorities, and enforcement orders.[319] It is expected that the concept will be reviewed by Congress during CERCLA reauthorization, and there are some indications that a limited deferral for

"CERCLA-quality" programs may be considered at that time.

Federal Agency Issues

Federal agencies wear several hats under CERCLA. They can be the lead agency for cleanup, acting as the delegate of the President; they can be the designated trustee for certain natural resources; and they can serve as an expert agency, providing guidance to the lead agency on appropriate ways to handle specific waste types.[320] The NCP discusses each of these roles.

* *Applicability of the NCP.* Facilities owned or operated by federal agencies or departments are subject to the requirements of the NCP in the same manner and to the extent they are applicable to private parties, except for those requirements that apply only to Fund-financed activities.[321]

In addition, there are certain requirements imposed by statute that apply specifically and separately to federal facility sites. For instance, the final NCP specifically codifies the provision in CERCLA § 120(e)(4) that remedies for federal facility sites that are on the NPL should be selected jointly by EPA and the federal agency that owns or operates the facility, except that in the case of disagreement, the EPA Administrator selects the remedy.[322] However, most requirements that are specific to federal sites will be discussed in a new Subpart K to the NCP, discussed below.

* *Subpart K Proposal.* The Agency plans to propose a new subpart to the NCP to create a "road map" for how the requirements of the NCP apply to federal agencies, which may be both the PRP and the cleanup authority (as the delegate of the President) at their own sites. Subpart K may also codify certain provisions of CERCLA § 120 that apply uniquely to federal facilities.

The issue that is expected to be of most concern in Subpart K is how cleanup requirements will apply at federal facility sites that are not on the NPL (at which EPA has no formal role in the selection of remedial actions[323]). The role of the states at non-NPL federal facilities could, if addressed in Subpart K, be a contentious issue.[324] Of course, the public will be afforded an opportunity to comment on Subpart K when it is proposed in the *Federal Register.*

* *Natural Resource Trustees.* Subpart G to the NCP discusses the role of certain federal agencies as trustees for natural resources.[325] Upon notification of actual or **[20 ELR 10251]** threatened injury to natural resources, the trustee may conduct resource surveys and assessments, seek the restoration of the resource, or take other actions.[326]

CERCLA authorizes the use of the Fund to clean up releases, but SARA § 517 restricts the use of Fund monies for the *restoration* or rehabilitation of natural resources. The task of restoring resources is left to the natural resource trustee, who under CERCLA § 107(f) has the authority to sue PRPs for such damages and to restore affected resources with such monies. However, the statute and the NCP do provide for extensive coordination between the primary CERCLA cleanup action and any restoration activity that may be deemed necessary by the trustee.[327]

* *Expertise and Support for EPA Cleanups.* Finally, the NCP provides a major role for other federal agencies in providing expertise to the lead agency to facilitate response actions under CERCLA.[328] Subpart B of the NCP also groups certain federal agencies into a National Response Team, which is responsible for national response and preparedness planning,[329] and the NCP establishes Regional Response Teams of federal, state, and local agencies, which are responsible for regional preparedness and planning as well as for providing advice and support to response site managers.[330]

Separate NCP Rulemakings

There are several rulemakings that are planned or in progress to further revise the NCP.

Revised Hazard Ranking System

On December 23, 1988, EPA proposed to revise the HRS, Appendix A to the NCP. The HRS is the model by which releases are assigned a numerical score for use in placing priority releases on the CERCLA NPL.[331] CERCLA § 105(c) had called for revisions by April 17, 1988.

CERCLA "Off-site" Transfer Rule

On November 29, 1988, EPA proposed to add § 300.440 to the NCP setting out requirements for the transfer of wastes from CERCLA sites.[332] The proposed rule would implement the requirements of CERCLA § 121(d)(3) and the "revised off-site policy," which currently provides that wastes from CERCLA-funded or authorized actions may only be transferred to properly permitted off-site facilities that are in compliance with applicable law and do not have uncontrolled releases of hazardous substances.[333] Regulations on this issue were suggested in the Conference Report on SARA, but not by the language of the statute.

Subpart K to the NCP

As discussed above, the Agency intends to propose a new Subpart K to the NCP relating to CERCLA actions at federal facility sites.

Conclusions

The task of revising the rules of operation for the nation's Superfund program has been a formidable one for EPA. The Agency has had to reconcile competing mandates in fulfilling its responsibilities. For instance, the statute calls for the accomplishment of expeditious remedies, yet it requires substantial involvement of the public and the states, detailed administrative records, and a long study and alternatives-assessment process prior to remedy selection. The statute also calls for a maximum use of costly treatment technologies, while at the same time requiring selected remedies to be cost-effective.

By one measure, the NCP is an unqualified success: It contains "something for everyone." States can be expected to be happy with an expanded partnership role throughout the process; PRPs can be happy with the less restrictive private cost recovery standard, and with some more realistic expectations and principles for more streamlined decisionmaking; environmentalists should be heartened by the increased emphasis placed on selecting treatment-oriented remedies under this rule; community groups should be encouraged by the increased opportunities for participation in the process; and the interested public overall should be pleased by efforts to add some structure and predictability to a process that has historically been viewed as wide open.

At the same time, each of these constituencies is likely to be dissatisfied with parts of the final rule (indeed, in some cases precisely the part that pleased some other interest group). Such a reaction would not be unexpected from a process that seeks consensus, and a statute that includes a separate provision for each of several competing constituencies; indeed, such a reaction may be an indication that the Agency has charted a proper middle course.

However, the real measure of the NCP's success, and of the success of the Superfund program more broadly, will be in the implementation — not the words — of the final rule. Implementation is especially critical in this program because so many issues are addressed in guidance, rather than in binding rules. As noted earlier, although detail and structure have been added to the remedy selection process, the NCP remains a highly discretionary document, affording significant flexibility to the site-specific decision-maker. It is too early to tell how consistently those rules and policy statements will be applied.

Whether the new NCP is given a fair test in the field may depend, to a large degree, on Congress. The shadow on the horizon is the up-coming reauthorization of CERCLA. It would be unfortunate if Congress sought too quickly to try to remedy perceived problems before giving the new NCP regulatory framework some time to be understood and put to work. Perhaps the last thing the Superfund needs is another ambitious set of mandates and deadlines, like those in SARA, that would again turn Agency energies to rewriting the rules, rather than applying them in the field.

The final NCP has been long in coming. Only time will tell if it was worth the wait.

1. "Superfund" (the Fund) is the commonly used name for the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. §§ 9601-9675, ELR STAT. CERCLA 001-075. The name stems from the fund established by CERCLA that may be used to directly finance cleanup actions. The Fund was originally established under CERCLA § 221, 42 U.S.C. § 9631 (1982), but was modified in 1986 by SARA § 517, and recodified at § 9507 Chapter 98 of the Internal Revenue Code.

2. 55 Fed. Reg. 8666-8865 (Mar. 8, 1990) (to be codified at 40 C.F.R. § 300).

The 1990 National Contingency Plan -- More Detail And More Structure, ... file:///H:/Mission Bay/Research/article_2011_10_20.10222.htm

3. Pub. L. No. 99-499, 100 Stat. 1613 (Oct. 17, 1986). On the 1986 amendments generally, see Atkeson et al., *An Annotated Legislative History of the Superfund Amendments and Reauthorization Act of 1986 (SARA)*, 16 ELR 10360 (Dec. 1986).

4. 53 Fed. Reg. 51394 (Dec. 21, 1988). Virtually every section of the 1985 NCP relating to hazardous site response was revised or reorganized in the proposed NCP revisions, and most of those changes have been finalized in the 1990 revisions.

5. 42 U.S.C. §§ 9601-9675, ELR STAT. CERCLA 001-075.

6. Courageous readers will note that the bulk of the preamble consists of responses to public comment or lengthy discussions of policy issues that are not necessarily included in the rule. This reflects the practice of the Superfund program to give guidance in the preamble to its rulemakings; the Agency believed that most of the responses to comment were important enough to be included in the published package (which can then be easily cited), rather than included in a support document that is available only from the Superfund docket.

7. 42 U.S.C. §§ 6901-6992K, ELR STAT. RCRA 001-050.

8. The term "hazardous substance" is defined in CERCLA § 101(14), 42 U.S.C. § 9601(14), ELR STAT. CERCLA 007, to include any substance listed as hazardous under a number of other environmental statutes, including the Clean Air Act, the Clean Water Act, and RCRA. The term "pollutant or contaminant" is defined in § 101(33), 42 U.S.C. § 9601(33), ELR STAT. CERCLA 009, and generally includes any substance capable of endangering the health of humans or other organisms.

9. 42 U.S.C. § 9604, ELR STAT. CERCLA 012.

10. Although Congress placed the authority for administering CERCLA with the President, most of that authority was delegated to the Administrator of EPA (for nonfederal sites). Exec. Order No. 12580, 52 Fed. Reg. 2923, ELR ADMIN. MATERIALS 45031 (Jan. 29, 1987).

11. 42 U.S.C. § 9606, ELR STAT. CERCLA 024.

12. CERCLA § 101(25), 42 U.S.C. § 9601(25), ELR STAT. CERCLA 009.

13. *Id.* § 101(23), 42 U.S.C. § 9601(23), ELR STAT. CERCLA 008.

14. 55 Fed. Reg. at 8698 (Mar. 8, 1990); 54 Fed. Reg. 13298 (Mar. 31, 1989); 52 Fed. Reg. 27622 (July 22, 1987).

15. CERCLA § 101(24), 42 U.S.C. § 9601(24), ELR STAT. CERCLA 009.

16. *Id.* § 105(a), 42 U.S.C. § 9605(a), ELR STAT. CERCLA 021.

17. *Id.* § 104(d)(1)(A), 42 U.S.C. § 9604(d)(1)(A), ELR STAT. CERCLA 052.

18. NCP § 300.5; 40 C.F.R. § 300.6 (1985). Under the NCP, states cannot be the lead agency for all purposes. For example, only EPA may make the final remedy selection decision for a Fund-financed cleanup. *See* NCP § 300.515(e)(1); note 72 *infra*. For purposes of this Article, references will generally be to "EPA" action under CERCLA, even though in many cases, the state may assume the lead for actions at particular sites.

19. 42 U.S.C. § 9607, ELR STAT. CERCLA 024.

20. *Id.* § 9607(a)(4)(A), ELR STAT. CERCLA 024.

21. CERCLA § 107(a)(4)(B), 42 U.S.C. § 9607(a)(4)(B), ELR STAT. CERCLA 024.

22. *See, e.g.*, O'Neil v. Picillo, 883 F.2d 176, 20 ELR 20115 (1st Cir. 1989); United States v. Chem-Dyne Corp., 572 F. Supp. 802, 13 ELR 20986 (S.D. Ohio 1983).

23. The history and development of the NCP is discussed in detail in Freedman, *Proposed Amendments to the National Contingency Plan: Explanation and Analysis,* 19 ELR 10103 (Mar. 1989).

24. 50 Fed. Reg. 47912 (Nov. 20, 1985).

25. Codified at CERCLA § 105(b), 42 U.S.C. § 9605(b), ELR STAT. CERCLA 022.

26. *Id.* § 121(b), 42 U.S.C. § 9621(b), ELR STAT. CERCLA 051.

27. *Id.* § 121(d)(2), (d)(4), 42 U.S.C. § 9621(d)(2), (d)(4), ELR STAT. CERCLA 052. The statute provides for the waiver of an ARAR under six limited circumstances: (1) where the action is an *interim* measure, and the ARAR will be met upon completion; (2) where compliance with the ARAR would pose a *greater risk* to health and the environment than noncompliance; (3) where it is *technically impracticable* to meet the ARAR; (4) where the standard of performance of an ARAR can be met by an *equivalent method;* (5) where a state standard has *not been consistently applied* elsewhere; and (6) where compliance would not provide a balance between the protection achieved and *demands on the Fund* for other sites.

28. *Id.* § 121(a), (b)(1), 42 U.S.C. § 9621(a),(b)(1), ELR STAT. CERCLA 051.

29. *Id.* § 121(b)(1), 42 U.S.C. § 9621(b)(1), ELR STAT. CERCLA 051.

30. *Id.*

31. *Id.* §§ 117, 113(k), 42 U.S.C. §§ 9617, 9613(k), ELR STAT. CERCLA 042, 040.

32. *Id.* § 121(f), 42 U.S.C. § 9621(f), ELR STAT. CERCLA 053.

33. The requirement to select cost-effective remedies is stated in § 121(a) and (b)(1).

34. CERCLA § 105(b), 42 U.S.C. § 9605(b), ELR STAT. CERCLA 022.

35. Natural Resources Defense Council v. Reilly, No. 88-3199 (D.D.C. consent decree filed June 14, 1989).

36. 53 Fed. Reg. 51394 (Dec. 21, 1988).

37. 55 Fed. Reg. 8666-8865 (Mar. 8, 1990).

38. *Id.* at 8795. CERCLA's administrative record requirements apply to ongoing actions "to the extent practicable." CERCLA § 113(k)(2)(C), 42 U.S.C. § 9613(k)(2)(C), ELR STAT. CERCLA 040; *see also* NCP § 300.800(d),.800(e). This issue is discussed in more detail *infra* at text accompanying notes 307-10.

39. Reilly, *A Management Review of the Superfund Program* (June 1989).

40. 55 Fed. Reg. at 8839 (to be codified at 40 C.F.R. § 300.400-.440). Hereinafter sections of the final rule will be referred to as "NCP § 300. "; finalrule sections from the 1985 NCP will be referred to as "40 C.F.R. § 300. (1985)."

41. NCP § 300.500-.525.

42. NCP § 300.700-.825.

43. NCP § 300.800-.825.

44. CERCLA § 101(14) defines a "hazardous substance" to generally exclude "petroleum, including crude oil or any fraction thereof," as well as natural gas and natural gas liquids. However, where a hazardous substance is intermingled with a petroleum product, or where a petroleum product is specifically listed under one of the statutes in § 101(14), response authority under CERCLA is available. *See* Memorandum from Francis S. Blake, General Counsel, to J. Winston Porter, Assistant Administrator for Solid Waste and Emergency Response, Scope of the CERCLA Petroleum Exclusion Under Sections 101(14) and 104(a)(2) (July 31, 1987).

The 1990 National Contingency Plan -- More Detail And More Structure, ... file:///H:/Mission Bay/Research/article_2011_10_20.10222.htm

45. NCP § 300.1-.7.

46. NCP § 300.100-.185. This subpart deals with federal agencies as arms of the executive branch, offering their expertise on matters relevant to releases (e.g., the Nuclear Regulatory Commission with respect to waste containing radioactive elements, or the Fish and Wildlife Service regarding threatened species). This should be distinguished from planned Subpart K, which will set out the responsibilities of federal agencies when taking cleanup actions at their own facilities.

47. NCP § 300.200-.220.

48. NCP § 300.300-.335.

49. NCP § 300.600-.615.

50. NCP § 300.900-.920.

51. CERCLA § 105(d), 42 U.S.C. § 9605(d), ELR STAT. CERCLA 023.

52. NCP § 300.405.

53. NCP § 300.410.

54. NCP § 300.415.

55. Time-critical removal actions commence in fewer than six months after discovery of the release, while non-time-critical removal actions commence after a planning period of more than six months. 53 Fed. Reg. at 51409. Very few CERCLA removal actions fall into the non-time-critical category.

56. NCP § 300.420.

57. 40 C.F.R. pt. 300, app. A.

58. A rulemaking is presently under way to revise the HRS, consistent with CERCLA § 105(c), 42 U.S.C. § 9605(c), ELR STAT. CERCLA 023. *See* 53 Fed. Reg. 51962 (Dec. 23, 1988).

59. 40 C.F.R. pt. 300,app. B.

60. Monies from the Fund may be spent only for remedial actions at those releases listed on the NPL. *See* 40 C.F.R. § 300.66(c)(2), .68(a) (1985); NCP § 300.425(b)(1).

61. NCP § 300.425.

62. *See* NCP § 300.425(b)(1), .425(b)(2); 55 Fed. Reg. 8698 (Mar. 8, 1990); 54 Fed. Reg. 13298 (Mar. 31, 1989); 54 Fed. Reg. 10522 (Mar. 13, 1989).

63. NCP § 300.430(a)(2), .430(d), .430(e).

64. NCP § 300.430(e)(2)(i).

65. 55 Fed. Reg. 8712-13 (Mar. 8, 1990); *see infra* text accompanying notes 164-80.

66. NCP § 300.430(e)(7).

67. NCP § 300.430(e)(9).

68. NCP § 300.430(f).

69. NCP § 300.430(f)(1)(i).

70. CERCLA § 121(b)(1), NCP § 300.430(f)(1)(ii)(D) and (E).

71. NCP § 300.430(f)(1)(ii)(E).

72. If the state is the lead agency but EPA does not agree with the proposed plan, EPA may take back the lead on the project. *See* NCP § 300.515(e)(1).

73. NCP § 300.430(f)(2).

74. NCP § 300.430(f)(5). For a list of all CERCLA RODs, see ELR ADMIN. MATERIALS 30003:3.

75. NCP § 300.435.

76. CERCLA § 117(c), 42 U.S.C. § 9617(c), ELR STAT. CERCLA 043; NCP § 300.435(c)(2)(i).

77. NCP § 300.435(c)(2)(ii). The different circumstances warranting an ESD as compared with a ROD amendment are discussed below at text accompanying notes 284-88.

78. *See* NCP § 300.435(f)(3), and discussion below on state cost share for O&M.

79. CERCLA § 104(c)(3), 42 U.S.C. § 9604(c)(3), ELR STAT. CERCLA 013; NCP § 300.510(c)(1).

80. NCP § 300.425.

81. NCP § 300.430(f)(4)(ii).

82. NCP § 300.5.

83. 40 C.F.R. § 261.31-.33.

84. NCP § 300.400(g)(2)(i)-.400(g)(2)(viii).

85. The Agency has specifically discussed this interpretation with respect to the standards for closure of hazardous waste management units under RCRA. *See* 53 Fed. Reg. 51445-46 (Dec. 21, 1988).

86. CERCLA § 121(d)(4), 42 U.S.C. § 9621(d)(4), ELR STAT. CERCLA 052. There are six limited circumstances under which an ARAR may be waived. *See supra* note 27, and 55 Fed. Reg. 8747-50 (Mar. 8, 1990). Although waivers have been used rarely to date, the Agency is considering their more frequent application in the future. *See, e.g.,* the discussion below in the section "Remedy Selection — Fund Balancing Waiver."

87. NCP § 300.400(g)(4).

88. 55 Fed. Reg. 8756-57 (Mar. 8, 1990). This issue is discussed in more detail below, in the section "ARARs Issues — Substantive, Not Administrative, Requirements."

89. 42 U.S.C. § 9621(d)(2)(A)(i) and (ii), ELR STAT. CERCLA 052.

90. Thus, they will not be considered potentially relevant and appropriate requirements, and they cannot be waived under CERCLA § 121(d)(4), 42 U.S.C. § 9621(d)(4), ELR STAT. CERCLA 052. One advantage of being considered a potential ARAR is that the requirement is on a list that is routinely considered by site managers (*see* 55 Fed. Reg. at 8764-66). Thus, the likelihood of early attention to the requirement is high.

91. 42 U.S.C. § 9621(d)(2)(A), ELR STAT. CERCLA 052.

92. Off-site transfers must also comply with EPA's off-site policy (EPA/OSWER Directive No. 9834.11, Nov. 13, 1987) and CERCLA § 121(d)(3), 42 U.S.C. § 9621(d)(3), ELR STAT. CERCLA 052. A new section of the NCP has been proposed to codify the off-site requirements in that policy and section of the statute. *See* 53 Fed. Reg. 48218 (Nov. 29, 1988).

93. 55 Fed. Reg. 8695-96 (Mar. 21, 1990).

94. 40 C.F.R. § 300.68(i)(1) (1985). Note, however, that under 40 C.F.R. § 300.65(f) and .68(i) (1985), remedies were required to meet the ARARs of federal environmental and public health laws; the statute and the final NCP limit ARARs to environmental laws.

95. NCP § 300.400(g)(4); *see* discussion below in "State ARARs Issues."

96. NCP § 300.415(i); *see also* 40 C.F.R. § 300.65(f) (1985).

97. 53 Fed. Reg. at 51441.

98. MCLs are independently applicable only to public drinking water systems. SDWA § 1401(1), 42 U.S.C. § 300f(1), ELR STAT. SDWA 002; 50 Fed. Reg. 46880 (Nov. 13, 1985). Hence, their use as potential ARARs for contaminated groundwater is based on an analysis that under CERCLA § 121(d)(2)(A)(i), they may be relevant and appropriate requirements in determining groundwater restoration levels. Similarly, MCLGs are not independently applicable (they are unenforceable goals). However, the statute requires the attainment of MCLGs where "relevant and appropriate under the circumstances of the release." CERCLA § 121(d)(2)(A), 42 U.S.C. § 9621(d)(2)(A), ELR STAT. CERCLA 052.

99. *See* NRDC v. EPA, 812 F.2d 721, 723, 17 ELR 20418 (D.C. Cir. 1987); SDWA § 1412, 42 U.S.C. § 300g-1, ELR STAT. SDWA 002; 50 Fed. Reg. 46880-81 (Nov. 13, 1985); 49 Fed. Reg. 2437 (June 12, 1984).

100. 53 Fed. Reg. 51441 (Dec. 21, 1988).

101. 55 Fed. Reg. 8751-52 (Mar. 8, 1990). ARARs are defined as the "promulgated" (i.e., enforceable) requirements of other laws. NCP § 300.400(g)(4). MCLs are the enforceable requirements of the SDWA. 50 Fed. Reg. 46881 (Nov. 13, 1985).

102. NCP § 300.430(e)(2)(i)(B), (C).

103. 55 Fed. Reg. 8751-52 (Mar. 8, 1990).

104. *See* Memorandum of Jonathan Z. Cannon, Acting Assistant Administrator for Solid Waste and Emergency Response, *Considerations in Ground Water Remediation at Superfund Sites*, EPA/OSWER Directive No. 9355.4-03 (Oct. 18, 1989).

105. CERCLA § 121(d)(2)(B)(ii), 42 U.S.C. § 9621(d)(2)(B)(ii), ELR STAT. CERCLA 052.

106. 55 Fed. Reg. 8754 (Mar. 8, 1990).

107. CERCLA § 121(d)(2)(B)(i), 42 U.S.C. § 9621(d)(2)(B)(i), ELR STAT. CERCLA 052.

108. 55 Fed. Reg. 8754-55 (Mar. 8, 1990).

109. 53 Fed. Reg. 51440 (Dec. 21, 1988).

110. NCP § 300.430(f)(1)(ii)(B); 55 Fed. Reg. 8757 (Mar. 8, 1990).

111. *See* S. REP. NO. 848, 96th Cong., 2d Sess. 56 (1980), *reprinted in* 1 SENATE COMM. ON ENVIRONMENT & PUBLIC WORKS, 97th Cong. 2d Sess., *A Legislative History of the Comprehensive Environmental Response, Compensation and Liability Act of 1980*, at 363 (Comm. Print 1983):

The paramount purpose of this section [104] is the protection of public health, welfare and the environment. It is recognized that government response will often be necessary prior to receipt of evidence which conclusively establishes the substances or materials released or the origin of their release, discharge or disposal. Because delay will often exacerbate an already serious situation, the bill authorizes the President to respond when a substantial threat of release may exist.

Courts have also recognized the congressional intent to promote the "prompt cleanup of hazardous waste sites." Dickerson v. EPA, 834 F.2d 974, 978, 18 ELR 20305, 20306 (11th Cir. 1987); J. V. Peters & Co. v. EPA, 767 F.2d 263, 264, 15 ELR 20646 (6th Cir. 1985).

112. CERCLA § 121(c), 42 U.S.C. § 9621(c), ELR STAT. CERCLA 051; 40 C.F.R. § 300.430(f)(4)(ii); 53 Fed. Reg. 51430, 51507 (Dec. 21, 1988).

113. NCP § 300.430(f)(1)(ii)(B)(2).

114. *See* 53 Fed. Reg. 51443-47 (Dec. 21, 1988); 55 Fed. Reg. 8759-62 (Mar. 8, 1990).

115. 42 U.S.C. § 6924, ELR STAT. RCRA 012.

116. Pub. L. No. 98-616, 88 Stat. 3221.

117. 42 U.S.C. § 6924(k), ELR STAT. RCRA 013.

118. *See, e.g.*, 53 Fed. Reg. 31138 (Aug. 17, 1988) (standards for first-third wastes issued); 54 Fed. Reg. 26594 (June 23, 1989) (standards for second-third wastes issued); 54 Fed. Reg. 48372 (Nov. 11, 1989) (standards for third-third wastes proposed).

119. *See, e.g.*, RCRA § 3004(d)(3), which provides that for four years after the effective date of the HSWA, the restrictions in subsection (d) would not apply to "any disposal of contaminated soil or debris resulting from a response action taken under § 104 or 106 of [CERCLA] or a corrective action under this title." 42 U.S.C. § 6924(d)(3), ELR STAT. RCRA 013.

120. 53 Fed. Reg. 51444 (Dec. 21, 1988). However, movement of hazardous waste entirely within a unit would not constitute placement or "land disposal" under RCRA Subtitle C. *Id.*

121. 54 Fed. Reg. 41566 (Oct. 10, 1989).

122. 55 Fed. Reg. 8759-60 (Mar. 8, 1990).

123. *Id.* at 8760-61. Variances from BDAT are available under RCRA where the treatment technology is deemed not to be "appropriate" to the waste. 40 C.F.R. § 268.44.

124. *See* CERCLA § 121(e)(1), (d)(2); discussion at 53 Fed. Reg. 51443 (Dec. 21, 1988).

125. 55 Fed. Reg. 8762 (Mar. 8, 1990). EPA has issued detailed guidance on treatability variance levels for specific types of contaminants. *See* Superfund LDR Guidance No. 6A, *Obtaining a Soil and Debris Treatability Variance for Remedial Actions*, EPA/OSWER Directive No. 9347.3-06FS (July 1989).

126. 55 Fed. Reg. 8762 (Mar. 8, 1990).

127. 53 Fed. Reg. 51426 (Dec. 21, 1988).

128. 55 Fed. Reg. 8753 (Mar. 8, 1990).

129. *Id.* at 8734.

130. CERCLA § 121(b), 42 U.S.C. § 9621(b), ELR STAT. CERCLA 051. CERCLA also appears to contemplate the restoration of groundwater. CERCLA § 104(c)(6), 42 U.S.C. § 9604(c)(6), ELR STAT. CERCLA 013.

131. *See, e.g.*, proposed § 300.430(b)(7), 53 Fed. Reg. 51504 (Dec. 21, 1988).

132. *See, e.g.*, NCP § 300.400(g)(3), .415(i), .430(b)(9); 55 Fed. Reg. 8744-45 (Mar. 8, 1990).

133. *See* discussion in the preamble to the proposed rule at 53 Fed. Reg. 51443 (Dec. 21, 1988), and in *CERCLA Compliance With Other Laws Manual*, EPA/OSWER Directive No. 9234.1-01, at p. 1-11 (Interim Final Guidance, Aug. 8, 1988).

134. NCP § 300.5; 55 Fed. Reg. 8756 (Mar. 8, 1990).

135. *See supra* note 111. In addition to enacting an express permit waiver in CERCLA § 121(e)(1), discussed below, Congress recognized the need to allow cleanups to move forward without delay by enacting § 113(h), which delays judicial review of CERCLA response actions until EPA takes an enforcement or cost recovery action, until the action has been completed, or until an action has been filed under CERCLA § 106(b).

136. *See* 50 Fed. Reg. 47910-18 (Nov. 20, 1985); 50 Fed. Reg. 5865 (Feb. 12, 1985); Memorandum of Francis S. Blake, General Counsel, to Lee M. Thomas, Administrator, "CERCLA Compliance With Other Environmental Laws" Opinion (Nov. 22, 1985). The implied repeal theory is based in large part on the existence of the ARARs process under CERCLA § 121(d)(2) and (d)(4), which defines how and to what extent the requirements of federal and state environmental laws should apply to on-site CERCLA remedial actions. Based on these provisions, CERCLA remedies will incorporate (or waive) the standards of other environmental laws, as appropriate under CERCLA. Thus, although other environmental laws do not independently apply to CERCLA response actions, the substantive requirements of such laws will be applied to such actions, consistent with CERCLA § 121(d) and NCP § 300.400(g).

137. *See, e.g.*, *CERCLA Compliance With Other Laws Manual: Part II*, EPA/OSWER Directive No. 9234.1-02, at p. 4-1 (Interim Final Guidance, Aug. 1989):

While EPA interprets CERCLA § 121(e) to exempt lead agencies . . . from complying with the administrative requirements for on-site remedial activities, it is strongly recommended that lead agencies, nonetheless, consult as specified with administering agencies for on-site actions. The administering agencies have the expertise to determine the impacts of a remedial action on particular aspects of the environment and what steps should be taken to avoid and mitigate adverse impacts.

138. NCP § 300.435(b)(2).

139. CERCLA § 121(d)(2)(A), 42 U.S.C. § 9621(d)(2)(A), ELR STAT. CERCLA 052.

140. 55 Fed. Reg. 8755 (Mar. 8, 1990).

141. *Id.* at 8695.

142. CERCLA §§ 101(23), 104(b); 42 U.S.C. §§ 9601(23), 9604(b); ELR STAT. CERCLA 052.

143. 16 U.S.C. §§ 1531-1544, ELR STAT. ESA 001-027.

144. *Id.* §§ 470-470w-6.

145. *See* EPA/OSWER Directive No. 9234.1-02,*supra* note 137, at ch. 4.

146. 55 Fed. Reg. 8755 (Mar. 8, 1990).

147. CERCLA § 121(d)(4)(A), 42 U.S.C. § 9621(d)(4)(A), ELR STAT. CERCLA 052; NCP § 300.430(f)(1)(ii)(C)*(1)*.

148. 40 C.F.R. § 300.65(f) (1985).

149. *See* CERCLA § 121(d)(2), 42 U.S.C. § 9621(d)(2), ELR STAT. CERCLA 052.

150. NCP § 300.415(i).

151. 55 Fed. Reg. 8695-96 (Mar. 8, 1990).

152. NCP § 300.415(i).

153. NCP § 300.415(i)(A) and (B).

154. "Removal" actions are defined in CERCLA § 101(23) as actions to "prevent, minimize or mitigate damage" or to conduct investigations, whereas "remedial" actions are defined in CERCLA § 101(24) as actions consistent with a "permanent" remedy at the site. Further, CERCLA § 104(c)(1) provides that Fund-financed removal actions may not continue after $ 2 million have been obligated or 12 months have elapsed, except under limited circumstances spelled out in that section. Both sections of the statute suggest that removals are generally intended to be short-term, nonpermanent actions. (Although in some cases, a removal action may result in a permanent solution to a contamination problem.)

155. For instance, as discussed below, there are additional public participation requirements associated with remedial actions.

156. CERCLA § 121(d)(4), 42 U.S.C. § 9621(d)(4), ELR STAT. CERCLA 052; NCP § 300.430(f)(1)(ii)(C).

157. 55 Fed. Reg. 8695; 8747 (Mar. 8, 1990).

158. CERCLA § 121(d)(2)(A)(ii), 42 U.S.C. § 9621(d)(2)(A)(ii), ELR STAT. CERCLA 052; NCP § 300.400(g)(4). (Note that "promulgated" is defined in the rule as being "of general applicability and legally enforceable." *Id.*) Under the 1985 NCP, state requirements were merely considered TBCs. 40 C.F.R. § 300.68(i)(4) (1985).

159. 55 Fed. Reg. 8741-42 (Mar. 8, 1990).

160. *Id.* at 8746; *see* NCP § 300.400(g)(5).

161. NCP § 300.515(d)(1).

162. *See* discussion at 53 Fed. Reg. 51438 (Dec. 21, 1988); 55 Fed. Reg. 8746 (Mar. 8, 1990).

163. CERCLA § 121(d)(4)(A), 42 U.S.C. § 9621(d)(4)(A), ELR STAT. CERCLA 052; NCP § 300.430(f)(1)(ii)(C)(*1*).

164. NCP § 300.430(d)(1).

165. 55 Fed. Reg. 8709 (Mar. 8, 1990). The baseline risk assessment consists of an exposure assessment component and a toxicity assessment component. It has superseded the "endangerment assessment," because the two have the same goal, function, and methodology. *Id.*

166. *Id.* at 8713.

167. NCP § 300.430(e)(2)(i), .430(e)(2)(i)(A)(2); 55 Fed. Reg. 8713 (Mar. 8, 1990).

168. 55 Fed. Reg. 8712 (Mar. 8, 1990).

169. This is in deference to the determination of another environmental protection program that the ARAR level is protective. (Cleanup to a level more stringent than the single ARAR might be appropriate to assure protectiveness where the Agency finds, for example, on a site-specific basis, that the contaminant poses a risk over more than one pathway of exposure. *Id.* at 8713.)

170. *Id.*

171. *Id.* at 8712-13. These levels are set based on reliable toxicity information, such as EPA's reference doses.

172. *Id.* at 8712.

173. NCP § 300.430(d)(4); 55 Fed. Reg. 8709-11 (Mar. 8, 1990). In effect, cleanups will be based on "likely" residential, industrial, or other uses. The Superfund program is in the process of developing generic exposure assumptions for such use categories.

174. 55 Fed. Reg. 8713 (Mar. 8, 1990).

175. *Id.*

176. 53 Fed. Reg. 51425-26 (Dec. 21, 1988).

177. Exposure factors, uncertainty factors, and technical factors may determine where to set remedial action goals within the risk range. *See* 55 Fed. Reg. 51426 (Mar. 8, 1990).

178. NCP § 300.430(e)(2)(i)(A)(*2*).

179. 55 Fed. Reg. 8716-17 (Mar. 8, 1990).

180. *See, e.g. id.* at 8717 n.9.

181. NCP § 300.420(f)(1)(i)(A)-(C); 55 Fed. Reg. 8724 (Mar. 8, 1990).

182. The analysis of compliance with ARARs does not necessarily resolve the issue of how stringent the remedy must be. As discussed below in the section on the "role of cost," where chemical-specific ARARs are not available to define the protective cleanup level for the relevant contaminants, the Agency will select among the alternative technologies that will result in remedies within the acceptable risk range; the balancing criteria aid in selecting among such viable, protective alternatives.

183. *See* 53 Fed. Reg. 51428-29 (Dec. 21, 1988).

184. NCP § 300.430(f)(1)(ii)(E).

185. 55 Fed. Reg. 8725 (Mar. 8, 1990).

186. NCP§ 300.430(a)(1)(i).

187. NCP § 300.430(f)(1)(iii)(A).

188. 55 Fed. Reg. 8721 (Mar. 8, 1990).

189. NCP §§ 300.430(f)(1)(ii)(E).

190. NCP § 300.430(a)(1)(iii)(E).

191. *See* 53 Fed. Reg. 51422 (Dec. 21, 1988).

192. NCP § 300.430(a)(1)(iii).

193. 55 Fed. Reg. 8702-03 (Mar. 8, 1990).

194. NCP § 300.430(f)(1)(iii)(A). "Principal threats" include liquids as well as highly toxic or highly mobile contamination.

195. NCP § 300.430(f)(1)(iii)(B).

196. NCP § 300.430(a)(1)(iii)(C). The rule also sets out expectations concerning the development of innovative technologies; the use of institutional controls, primarily a supplement to more active measures; and the restoration of groundwater to its beneficial uses, wherever practicable. NCP § 300.430(a)(1)(iii)(D)-(F).

197. NCP § 300.430(a)(1)(ii); 55 Fed. Reg. 8703 (Mar. 8, 1990).

198. NCP § 30.430(a)(1)(ii)(A).

199. *See, e.g.*, Memorandum from Don R. Clay, Assistant Administrator for Solid Waste and Emergency Response, *Interim Guidance on Addressing Immediate Threats at NPL Sites* (Superfund Management Review: Recommendation No. 22), EPA/OSWER Directive No. 9200.2-03 (Jan. 30, 1990).

200. NCP § 30.430(a)(1)(ii)(C).

201. 55 Fed. Reg. 8712, 8714 (Mar. 8, 1990).

202. 53 Fed. Reg. 51440 (Dec. 21, 1988).

203. CERCLA § 121(d)(4)(f); NCP § 300.430(f)(1)(ii)(C)(*6*).

204. The Fund-balancing waiver has been invoked in only one case and considered in another. *See* Freedman, *supra* note 23, at 10132 n.261.

205. 55 Fed. Reg. 8749-50 (Mar. 8, 1990).

206. *See, e.g.*, Senate Subcomm. on Superfund, Ocean, and Water Protection, *Lautenberg-Durenberger Report on Superfund Implementation: Cleaning Up the Nation's Cleanup Program*, 57-64 (May 1989).

207. 55 Fed. Reg. 8726-30 (Mar. 8, 1990).

208. *See* discussion above in "Risk Assessment and Risk Range."

209. NCP § 300.430(f)(1)(ii)(D); 55 Fed. Reg. 8728 (Mar. 8, 1990).

210. 55 Fed. Reg. 8728 (Mar. 8, 1990); *see also* 53 Fed. Reg. 51422 (Dec. 21, 1988).

211. 55 Fed. Reg. 8728 (Mar. 8, 1990); 53 Fed. Reg. 51427-28 (Dec. 21, 1988).

212. Alternatives with grossly excessive costs will be eliminated during screening, as discussed below.

213. 55 Fed. Reg. 8728 (Mar. 8, 1990). This decision not to use cost as a major factor in eliminating "viable" options prior to balancing is not necessarily inconsistent with the Agency's use of cost during screening, discussed below, to eliminate extreme (nonviable) options with "grossly" excessive cost.

214. CERCLA § 121(b)(1), 42 U.S.C. § 9621(b)(1), ELR STAT. CERCLA 052.

215. NCP § 300.430(f)(1)(ii)(e); 55 Fed. Reg. 8729 (Mar. 8, 1990).

216. The "permanence" offered by a remedy is an important element of this determination. The preamble to the final NCP notes that the maximum permanence practicable is judged along a continuum, based on the degree of long-term effectiveness and permanence afforded by a remedy. 55 Fed. Reg. 8720 (Mar. 8, 1990).

217. *Id.* at 8725.

218. *Id.*

219. *Id.* at 8729.

220. NCP § 300.430(e)(7)(iii); 55 Fed. Reg. 8714-15 (Mar. 8, 1990).

221. Cost may also be used to screen out an alternative that uses a similar technology and provides similar effectiveness and implementability to another alternative, but at a greater cost. In effect, this avoids the need to carry variations of the same technology through the detailed analysis phase.

222. CERCLA § 121(e)(1), 42 U.S.C. § 9621(e)(1), ELR STAT. CERCLA 053.

223. CERCLA § 121(d)(2)(A), 42 U.S.C. § 9621(d)(2)(A), ELR STAT. CERCLA 052 ("With respect to any hazardous substance, pollutant or contaminant that will remain onsite . . .").

224. 53 Fed. Reg. 51406-08 (Dec. 21, 1988); *see also* discussion in Freedman, *supra* note 23, at 10125-26.

225. NCP § 300.400(e).

226. 55 Fed. Reg. 8688-89 (Mar. 8, 1990). This definition of "on-site" in the NCP is also significant in that it defines, by extension, the term "off-site," and thus affects the scope of CERCLA policy on the transfer of CERCLA wastes off site. Currently, such transfers are regulated under the revised off-site policy, EPA/OSWER Directive No. 9834.11 (Nov. 13, 1987), and CERCLA § 121(d)(3), which provide generally that wastes from CERCLA-funded or authorized actions may only be transferred to properly permitted off-site facilities that are in compliance with applicable law, and do not have uncontrolled releases of hazardous substances. Regulations to implement the off-site policy and § 121(d)(3) have been proposed (53 Fed. Reg. 48219 (Nov. 29, 1988)).

227. As noted in CERCLA § 104(d)(4), "where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat, or potential threat to the public health or welfare or the environment, the President may, in his discretion, treat these related facilities as one for the purposes of this section." 42 U.S.C. § 9604(d)(4), ELR STAT. CERCLA 015.

228. 55 Fed. Reg. 8690 (Mar. 8, 1990).

229. As a matter of policy, and as part of the hazard ranking system process for site evaluation, EPA applies more restrictive criteria to potential site aggregations at the NPL listing stage than it does at the remedial response stage. *See* 48 Fed. Reg. 40663 (Sept. 8, 1983).

230. 55 Fed. Reg. 8691 (Mar. 8, 1990).

231. *See, e.g.*, 53 Fed. Reg. 51416 (Dec. 21, 1988) (proposed NCP); 53 Fed. Reg. 23978 (June 24, 1988); 48 Fed. Reg. 40658 (Sept. 8, 1983).

232. 55 Fed. Reg. 8667 (Dec. 21, 1988).

233. A recent report by GAO on the capability of State response programs revealed disparities in the abilities of states to clean up sites, but recognized that many states have well-developed response programs. *See* GAO REP. NO. GAO/RCED-89-164, HAZARDOUS WASTE SITES: STATE CLEANUP STATUS AND ITS IMPLICATIONS FOR FEDERAL POLICY (Aug. 1989).

234. NCP § 300.515(e)(1).

235. NCP § 300.515(e)(2)(i); 55 Fed. Reg. 8782 (Mar. 8, 1990).

236. NCP § 300.515(e)(2)(i).

237. 55 Fed. Reg. 8781-82 (Mar. 8, 1990).

238. NCP § 300.515(e)(2)(ii).

239. However, there are limitations on the ability of a state to take independent actions. If EPA undertakes (or has already begun) an RI/FS at a site, CERCLA § 122(e)(6) would not allow a PRP to take remedial action at the site without the prior authorization of EPA, and on its face, that section would also appear to proscribe PRP remedial actions ordered by a state. Further, where EPA does not concur on a state remedy, EPA will not be deemed to have approved the state decision, resulting in less certainty for the PRPs. NCP § 300.515(e)(2)(ii). A state may also be limited in its ability to carry out an independent state-ordered action if that action physically conflicts with an action ordered by EPA, under general principles of federal supremacy.

240. 55 Fed. Reg. 8783 (Mar. 8, 1990). Several commenters suggested that CERCLA § 104(d)(1) may be read in

conjunction with CERCLA § 104(c)(4) (relating to the selection of remedial actions) to allow EPA to authorize states to select remedies at specific sites through cooperative agreements or Superfund contracts.

241. During the original passage of CERCLA in 1980, Congress rejected the idea of establishing a program of federal grants to states as the means of cleaning up hazardous waste sites. *See* Freedman, *supra* note 23, at 10134 & n.274.

242. NCP § 300.515(f); 55 Fed. Reg. 8783-85 (Mar. 8, 1990).

243. As noted above, where EPA and the state disagree on a remedy selection, a state has the option of withholding its CERCLA § 104 assurances,thereby preventing the remedy from proceeding as a Fund-financed action (although EPA could initiate an enforcement action), and for EPA enforcement actions, a process is available for states to challenge a decision by EPA to waive an ARAR (CERCLA § 121(f)(2)(B)). These are, however, extreme measures, and the Agency's goal is to reach agreement with states through the normal remedy selection process. The final rule specifically sets out a procedure for dispute resolution with the states in order to foster agreement on ARARs. NCP § 300.515(d)(3), .515(d)(4); 55 Fed. Reg. 8781-82 (Mar. 8, 1990).

244. These proposed "changes" could include the attainment of a particular state standard that EPA found not to be an ARAR, or waived.

245. As noted above, a state's ability to proceed unilaterally where EPA is undertaking a CERCLA response action may be limited. *See supra* note 239.

246. Proposed NCP § 300.515(a)(3), 53 Fed. Reg. 51511 (Dec 21, 1988).

247. *E.g.*, NCP § 300.505(d)(4); *see* 55 Fed. Reg. 8776-77 (Mar. 8, 1990).

248. The exception to this formula is where the State operated the site, at the time of disposal, in which case the state's cost share may be 50 percent or greater. CERCLA § 104(c)(3)(C)(ii), 42 U.S.C. § 9604(c)(3)(C)(ii), ELR STAT. CERCLA 013.

249. NCP § 300.510(c)(1).

250. CERCLA § 104(c)(3), 42 U.S.C. § 9604(c)(3), ELR STAT. CERCLA 013; 55 Fed. Reg. 8778 (Mar. 8, 1990).

251. NCP § 300.435(f)(4).

252. 55 Fed. Reg. 8737 (Mar. 8, 1990).

253. S. REP. NO. 11, 99th Cong., 1st Sess. 20-21 (1985); S. REP. NO. 631, 98th Cong., 2d Sess. (1984); *see* discussion at 55 Fed. Reg. 8737 (Mar. 8, 1990).

254. NCP § 300.435(f)(3)(ii).

255. 55 Fed. Reg. 8738-39 (Mar. 8, 1990).

256. *Id.* at 8800. Of course, even after the remedy is selected, certain types of documents may still be added to the record, as discussed below.

257. *Id.*

258. NCP § 300.815(a).

259. NCP § 300.820(a)(1).

260. NCP § 300.800(b)(1).

261. NCP § 300.805(a). However, certain classes of documents need not be located at or near the site (e.g., general guidance documents, published references, chain of custody forms). *See* NCP § 300.805(a)(1)-.805(a)(6).

262. NCP § 300.800(a).

263. NCP § 300.810(a)(1)-.810(a)(5); 55 Fed. Reg. 8800-01 (Mar. 8, 1990).

264. NCP § 300.810(b); 55 Fed. Reg. 8801, 8805 (Mar. 8, 1990).

265. NCP § 300.800(c) and (d).

266. 55 Fed. Reg. at 8800.

267. *Id.* at 8802.

268. *Id.* at 8800.

269. *Id.* at 8805.

270. NCP § 300.825(a) and (c); 55 Fed. Reg. 8807-08 (Mar. 8, 1990).

271. NCP § 300.825(b).

272. 40 C.F.R. § 300.67 (1985).

273. 55 Fed. Reg. 8766-67 (Mar. 8, 1990).

274. NCP § 300.415(m).

275. The distinctions between these types of removal actions are discussed above at *supra* note 55. *See also* 53 Fed. Reg. 51409 (Dec. 21, 1988).

276. 55 Fed. Reg. 8767 (Mar. 8, 1990).

277. NCP § 300.415(m)(4)(iii).

278. NCP § 300.430(c)(2)(iv); 55 Fed. Reg. 8769 (Mar. 8, 1990). *See generally* CERCLA § 117(e), 42 U.S.C. § 9617(e), ELR STAT. CERCLA 043; 54 Fed. Reg. 49848 (Dec. 1, 1989); 53 Fed. Reg. 9736 (Mar. 24, 1988).

279. NCP § 300.430(c).

280. NCP § 300.430(f)(3).

281. NCP §§ 300.430(f)(3)(i)(C); 55 Fed. Reg. 8770 (Mar. 8, 1990).

282. NCP § 300.820(b)(2).

If EPAdecides to adopt a final ROD that differs significantly from the proposed plan and those changes could not have been reasonably anticipated based on existing information, additional comment will be solicited on a revised proposed plan.[283]

283. NCP § 300.430(f)(3)(ii)(B).

284. NCP § 300.435(c)(1).

285. NCP § 300.435(c)(2)(ii).

286. NCP § 300.435(c)(2)(i). Both the preamble to the final rule and the preamble to the proposed rule discuss when an ESD, as compared with a ROD amendment, would be appropriate. *See* 55 Fed. Reg. 8772-73 (Mar. 8, 1990); 53 Fed. Reg. 51451-52 (Dec. 21, 1988); *see also Interim Final Guidance on preparing Superfund Decision Documents,* EPA/OSWER Directive No. 9355.3-02 (May 1989).

287. NCP § 300.825(b).

288. NCP § 300.825(c); 55 Fed. Reg. 8773 (Mar. 8, 1990).

289. The issue of whether a local government comes within CERCLA § 107(a)(4)(A) or (B) was not decided by the NCP, but rather was left to the courts. *See* 55 Fed. Reg. 8799 (Mar. 8, 1990).

290. District courts have issued interpretations at both ends of the spectrum on this issue. *Compare* General Elec. Co. v. Litton Bus. Sys., 715 F. Supp. 949, 962, 19 ELR 21433, 21438 (W.D. Mo. 1989) (holding that consistency with the NCP "does not necessitate strict compliance with its provisions") *and* Amland Properties Corp. v. Aluminum Co. of Am., 711 F. Supp. 784, 796, 19 ELR 21180, 21184 (D.N.J. 1989) (rejecting arguments that "substantial compliance" with the NCP is sufficient). The split in the courts on this issue was also discussed in the preamble to the proposed rule; 53 Fed. Reg. 51462 (Dec. 21, 1988).

291. NCP § 300.700.

292. 53 Fed. Reg. 51461 (Dec. 21, 1988).

293. NCP § 300.700(c)(3).

294. NCP § 300.700(c)(4).

295. NCP § 300.700(c)(5)-.700(c)(7).

296. 55 Fed. Reg. 8792-93 (Mar. 8, 1990).

297. There are a number of NCP requirements that do not make sense for private parties, such as the requirements for state assurances (§ 300.510), or other provisions related to use of the Fund. Similarly, there are self-imposed restrictions on governmental actions that are not relevant to private actions, such as the requirement that a site be listed on the NPL before Fund-financed remedial action may be taken (300.425(b)(1)).

298. 55 Fed. Reg. 8793 (Mar. 8, 1990). Note that compliance with these mandates was already necessary under the proposed rule, which required private parties to strictly comply with the detailed provisions of the NCP, including provisions codifying these statutory mandates. *See* proposed rule § 300.430(f)(3)(ii) (protectiveness and ARARs); .430(f)(3)(iii) (cost-effectiveness and permanence/treatment); and .430(f)(2) (public participation).

299. 55 Fed. Reg. 8794 (Mar. 8, 1990).

300. *See id.* at 8785-86.

301. NCP § 300.515(e)(2)(i) and (ii). However, the rule maintains the Agency's long-standing position that EPA silence on a state-conducted remedy cannot be construed as EPA concurrence. 55 Fed. Reg. 8786 (Mar. 8, 1990); 53 Fed. Reg. 51458 (Dec. 21, 1988).

302. NCP § 300.520.

303. NCP § 300.515(d)(3)-.515(d)(4); 55 Fed. Reg. 8781-82 (Mar. 8, 1990).

304. 42 U.S.C. § 9622(e)(6); ELR STAT. CERCLA 052; *see* 55 Fed. Reg. 8783 (Mar. 8, 1990); 54 Fed. Reg. at 10523-24 (Mar. 13, 1989).

305. 55 Fed. Reg. 8688 (Mar. 8, 1990). The rule states that a PRP may be designated as EPA's representative for the purpose of access only where that PRP has agreed to conduct response activities pursuant to an administrative order or consent decree. NCP § 300.400(d)(3).

306. 42 U.S.C. § 9604(a)(1); ELR STAT. CERCLA 052; *see* 55 Fed. Reg. 8688 (Mar. 8, 1990). CERCLA § 104(a)(1) sets out certain preconditions before a PRP may conduct an RI/FS. The PRP must show that it will carry out the work

promptly and properly, and it must agree to reimburse the Fund for any oversight costs.

307. 55 Fed. Reg. 8795 (Mar. 8, 1990).

308. CERCLA § 113(k)(2)(C), 42 U.S.C. § 9613(k)(2)(C), ELR STAT. CERCLA 052; NCP § 300.800(d), (e).

309. NCP § 300.430(f)(1)(ii)(B).

310. 55 Fed. Reg. 8795 (Mar. 8, 1990).

311. NCP § 300.425(d)(6); 55 Fed. Reg. 8699-8700 (Mar. 8, 1990).

312. 55 Fed. Reg. 8699-8700 (Mar. 8, 1990).

313. *See* Memorandum of Jonathan Z. Cannon, Acting Assistant Administrator for Solid Waste and Emergency Response, Performance of Five-Year Reviews and Their Relationship to the Deletion of Sites From the National Priorities List (NPL) (Superfund Management Review: Recommendation No. 2) (Oct. 30, 1989); Memorandum from Henry L. Longest II, Director, Office of Emergency and Remedial Response, Update to "Procedures for Completion and Deletion of National Priorities List Sites" — Guidance Document Regarding the Performance of Five-Year Reviews (Superfund Management Review: Recommendation No. 2), EPA/OSWER Directive No. 9320.2-3B (Dec. 29, 1989).

314. Reilly, *supra* note 39, at 7, 1-11.

315. 40 C.F.R. § 300.66(c)(7) (1985); NCP § 300.425(e).

316. CERCLA § 121(c), 42 U.S.C. § 9621(c), ELR STAT. CERCLA 051.

317. *See, e.g.*, CERCLA §§ 105(e), 121(c), 42 U.S.C. §§ 9605(e), 9621(c), ELR STAT. CERCLA 023, 051; 40 C.F.R. § 300.66(c)(8) (1985); NCP § 300.425(e)(3).

318. However, under at least one of the deferral options, all cleanups would have to have been of "CERCLA-quality." 53 Fed. Reg. 51417-18, 51419 (Dec. 21, 1988).

319. 55 Fed. Reg. 8667 (Mar. 8, 1990).

320. Where a federal agency sent wastes to a facility for treatment, storage, or disposal, the agency also may be identified as a PRP under CERCLA.

321. CERCLA § 120(a)(2), 42 U.S.C. § 9620(a)(2), ELR STAT. CERCLA 048. Federal facility cleanups may not be financed by the Fund. *See* CERCLA § 111(e)(3); Exec. Order No. 12580, § 9(i), 52 Fed. Reg. 2923, ELR ADMIN. MATERIALS 45031 (Jan. 29, 1987).

322. NCP § 300.430(f)(4)(iii), 52 Fed. Reg. 2923 (Jan. 29, 1987), ELR ADMIN. MATERIALS 45031.

323. *See* Exec. Order No. 12580, § 2(d)-(e), 52 Fed. Reg. 2923 (Jan. 29, 1987), ELR ADMIN. MATERIALS 45031.

324. CERCLA § 120(a)(4) provides: "State laws concerning removal and remedial action, including State laws regarding enforcement, shall apply to removal and remedial action at facilities owned and operated by a department, agency, or instrumentality of the United States when such facilities are not included on the National Priorities List." 42 U.S.C. § 9620(a)(4), ELR STAT. CERCLA 048.

325. NCP § 300.600.

326. NCP § 300.615(c)-(e).

327. CERCLA § 104(b)(2), 42 U.S.C. § 9604(b)(2), ELR STAT. CERCLA 013; NCP § 300.615(c)(2), (d)(2), (d)(3), (e).

328. NCP § 300.175.

329. NCP § 300.105(c)(1), .110.

330. NCP § 300.105(c)(2), .115.

331. 53 Fed. Reg. 51962 (Dec. 23, 1988).

332. 53 Fed. Reg. 48218 (Dec. 21, 1988).

333. The revised off-site policy appears in EPA/OSWER Directive No. 9834.11 (Nov. 13, 1987).

EXHIBIT 4

DRAFT ENVIRONMENTAL IMPACT REPORT

5M Project

PLANNING DEPARTMENT
CASE NO. 2011.0409E

STATE CLEARINGHOUSE NO. 2013011055

Draft EIR Publication Date:	OCTOBER 15, 2014
Draft EIR Public Hearing Date:	NOVEMBER 20, 2014
Draft EIR Public Comment Period:	OCTOBER 15, 2014 - DECEMBER 1, 2014

SAN FRANCISCO PLANNING DEPARTMENT

Written comments should be sent to:
Sarah Jones, Environmental Review Officer | 1650 Mission Street, Suite 400 | San Francisco, CA 94103
or sarah.b.jones@sfgov.org

Approach to Analysis. In general, the proposed project could result in two types of air quality impacts. First, the project could result in air pollution through increased generation of air pollutants, due to increased vehicle travel, new stationary sources (i.e., four new diesel emergency generators, four emergency fire pumps, and one additional relocated diesel emergency generator), and construction activity. Second, the project site could increase the sensitive receptors in proximity to existing or new sources of air pollution, increasing air pollution exposure and hazard. This section describes the methodology used to evaluate project impacts related to consistency with the clean air plan, criteria pollutants, and local health risks and hazards.

Air Quality Plan. The applicable air quality plan is the BAAQMD's 2010 Clean Air Plan, which identifies measures to reduce emissions and reduce ambient concentrations of air pollutants; safeguard public health by reducing exposure to air pollutants that pose the greatest health risk, with an emphasis on protecting the communities most heavily affected by air pollution; and reduce greenhouse gas emissions to protect the climate. Consistency with the Clean Air Plan can be determined if the project supports the goals of the Clean Air Plan, includes applicable control measures from the Clean Air Plan, and if the project would not disrupt or hinder implementation of any control measures from the Clean Air Plan. Consistency with this plan is the basis for determining whether the proposed project would conflict with or obstruct implementation of an applicable air quality plan.

Criteria Air Pollutants. As described above under Regulatory Framework, the SFBAAB experiences low concentrations of most pollutants when compared to federal or State standards and is designated as either in attainment or unclassified for most criteria pollutants with the exception of ozone, $PM_{2.5}$, and PM_{10}, for which these pollutants are designated as non-attainment for either the State or Federal standards. By its very nature regional air pollution is largely a cumulative impact in that no single project is sufficient in size to, by itself, result in non-attainment of air quality standards. Instead, a project's individual emissions contribute to existing cumulative air quality impacts. If a project's contribution to cumulative air quality impacts is considerable, then the project's impact on air quality would be considered significant.[28]

Land use projects may contribute to regional criteria air pollutants during the construction and operational phases of a project. **Table IV.F-5** identifies criteria air pollutant significance thresholds followed by a discussion of each threshold. Projects that would result in criteria pollutant emissions below these significance thresholds would not violate an air quality standard, contribute substantially to an air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants within the SFBAAB.

Table IV.F-5: Criteria Air Pollutant Significance Thresholds

Pollutant	Construction Thresholds Average Daily Emissions (pounds per day)	Operational Thresholds Average Daily Emissions (pounds per day)	Operational Thresholds Annual Average Emissions (tons per year)
ROG[a]	54	54	10
NOx	54	54	10
PM_{10}	82 (exhaust)	82	15
$PM_{2.5}$	54 (exhaust)	54	10
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not applicable	

[a] Reactive organic gas

Source: Bay Area Air Quality Management District, 2011.

The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants that may contribute to an existing or projected air quality violation is based on the State and federal Clean Air Acts emissions limits for stationary sources. To ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors ROG and NO_x, the offset emissions level is an annual average of 10 tons per year (or 54 pounds (lbs.) per day).[29] These levels represent emissions by

[28] Bay Area Air Quality Management District, *CEQA Air Quality Guidelines*, May 2011.

[29] Bay Area Air Quality Management District, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance*, page 17, October 2009.

EXHIBIT 5

DRAFT ENVIRONMENTAL IMPACT REPORT

San Francisco Museum of Modern Art Expansion / Fire Station Relocation and Housing Project

PLANNING DEPARTMENT
CASE NOS. 2009.0291E and 2010.0275E

STATE CLEARINGHOUSE NO. 2010102047

Draft EIR Publication Date:	JULY 11, 2011
Draft EIR Public Hearing Date:	AUGUST 11, 2011
Draft EIR Public Comment Period:	JULY 11, 2011 - AUGUST 25, 2011

SAN FRANCISCO
PLANNING
DEPARTMENT

Written comments should be sent to:
Environmental Review Officer | 1650 Mission Street, Suite 400 | San Francisco, CA 94103

Impacts

This section analyzes the impacts related to air quality that could result from implementation of the proposed projects. The section begins with the significance criteria, which establish the thresholds for determining whether an impact is significant. The latter part of this section presents the impacts associated with the proposed projects. Project and cumulative impacts are considered, and mitigation measures are identified, as appropriate. The potential for the projects to expose persons to odors was addressed in the Initial Study (see page 97 of the Initial Study, included as Appendix A), and therefore is not discussed in this section.

Significance Criteria. Implementation of the SFMOMA Expansion and Fire Station Relocation and Housing Project would have a significant effect on air quality if it would:

- Conflict with or obstruct implementation of the applicable air quality plan.
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal, State, or regional ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).
- Expose sensitive receptors to substantial pollutant concentrations.
- Result in a cumulative air quality impact in combination with past, present and reasonably foreseeable future projects in the vicinity.

The BAAQMD provides various quantitative thresholds that can be used to better define the above criteria. For ROG,[16] NO_x[17] or $PM_{2.5}$ an operational net increase of 54 pounds per day (or 10 tons per year) would be considered significant, while a net increase of PM_{10} of 82 pounds per day (or 15 tons

[16] Reactive Organic Gases (ROG) are classes of organic compounds that transform with heat and sunlight to form smog or ozone. The criteria air pollutant SO_2 is a reactive organic gas.

[17] Nitrogen Oxide (NO_x) refers to NO and NO_2. NO_2 is the indicator of the larger form of nitrogen oxides.

per year) would be significant. The BAAQMD also has construction related CEQA thresholds, including maximum average daily emissions for ROG and NO_x of 54 pounds per day, maximum PM_{10} exhaust emissions of 82 pounds per day and maximum $PM_{2.5}$ emissions of 54 pounds per day. (Implementation of the BAAQMD's best management practices are required to reduce fugitive dust PM_{10} and $PM_{2.5}$ emissions during construction to a less-than-significant level.) CO concentrations would be significant if the project leads to or contributes to CO concentrations exceeding the State Ambient Air Quality Standard of 9 ppm averaged over 8 hours and 20 ppm for 1 hour (i.e., if it creates a "hot spot"). Generally, if a project results in an increase in ROG, NO_x, or PM that exceeds the significance criteria, then it would also be considered to contribute considerably to a significant cumulative effect. For projects that would not lead to a significant increase of ROG, NO_x, or PM emissions, the cumulative effect is evaluated based on a determination of the consistency of the project with the regional Clean Air Plan.

For health risks and hazards resulting from emissions of TACs, the BAAQMD recommends either that a project be found to be in compliance with a "qualified community risk reduction plan," or that significance thresholds be used for both construction and operational emissions based on commonly-used standards employed in health risk assessment. The thresholds for project-specific impacts are an increase in lifetime cancer risk of 10 chances in one million, an increase in the non-cancer risk equivalent to a chronic or acute "hazard index" greater than 1.0, or an increase in the annual average concentration of $PM_{2.5}$ in excess of 0.3 $\mu g/m^3$. The City of San Francisco's threshold is more restrictive at 0.2 $\mu g/m^3$. The BAAQMD also recommends cumulative thresholds for cancer risk of 100 in one million, a hazard index greater than 10.0, and a $PM_{2.5}$ concentration greater than 0.8 $\mu g/m^3$. Unlike the volume-based thresholds for criteria pollutants noted above, the toxic air contaminant thresholds are used for specific receptor locations when a risk analysis is required for specific project components, such as stationary sources (common in industrial operations) or the use of diesel-powered equipment, including construction equipment.

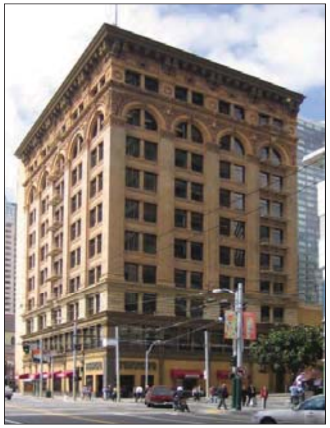
It should be noted that the emission thresholds were established based on the attainment status of the air basin in regard to air quality standards for specific criteria pollutants. Because the concentration standards were set at a level that protects public health with an adequate margin of safety according to

EXHIBIT 6

DRAFT ENVIRONMENTAL IMPACT REPORT

706 MISSION STREET - THE MEXICAN MUSEUM AND RESIDENTIAL TOWER PROJECT

VOLUME 1 - CHAPTERS I-VIII



CITY AND COUNTY OF SAN FRANCISCO
PLANNING DEPARTMENT: CASE NO. 2008.1084E

STATE CLEARINGHOUSE NO. 2011042035

DRAFT EIR PUBLICATION DATE: JUNE 27, 2012

DRAFT EIR PUBLIC HEARING DATE: AUGUST 2, 2012

DRAFT EIR PUBLIC COMMENT PERIOD: JUNE 28, 2012 - AUGUST 13, 2012

Written comments should be sent to:

Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

SAN FRANCISCO
PLANNING
DEPARTMENT

The engine would likely be located in the basement with vents for exhaust and intake being oriented toward the north property line at or above the first floor. Development of the proposed project would introduce additional vehicular traffic in the project vicinity.

APPROACH TO ANALYSIS

This section discusses the thresholds for determining whether a project would result in a significant air quality impact. Table IV.G.4: Air Quality Significance Thresholds, below, summarizes the air quality thresholds of significance. The table is followed by a discussion of each threshold.

Table IV.G.4: Air Quality Significance Thresholds

	Construction Thresholds	Operational Thresholds	
Pollutant	**Average Daily Emissions (lb/day)**	**Average Daily Emissions (lb/day)**	**Annual Average Emissions (tons/year)**
Criteria Air Pollutants			
ROG	54	54	10
NOx	54	54	10
PM_{10}	82	82	15
$PM_{2.5}$	54	54	10
CO	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	
Health Risks and Hazards for New Sources			
Excess Cancer Risk	10 per one million		
Chronic or Acute Hazard Index	1.0		
Incremental annual average $PM_{2.5}$	0.3 µg/m^3		
Health Risks and Hazards for Sensitive Receptors (Cumulative from Sources within 1,000-foot zone of influence) and Cumulative Thresholds for New Sources			
Excess Cancer Risk	100 per one million		
Chronic Hazard Index	10.0		
Annual Average $PM_{2.5}$	0.8 µg/m^3		

Although BAAQMD's adoption of significance thresholds in 2010 and 2011 are the subject of recent judicial actions, the Planning Department has determined that Appendix D of the BAAQMD *CEQA Air Quality Guidelines*,[26] in combination with BAAQMD's *Revised Draft*

[26] BAAQMD *Guidelines*, Appendix D.

EXHIBIT 7

DRAFT ENVIRONMENTAL IMPACT REPORT

8 WASHINGTON STREET / SEAWALL LOT 351 PROJECT

CITY AND COUNTY OF SAN FRANCISCO PLANNING DEPARTMENT:
CASE NO. 2007.0030E

STATE CLEARINGHOUSE NO. 2007122027

DRAFT EIR PUBLICATION DATE: JUNE 15, 2011

DRAFT EIR PUBLIC HEARING DATE: JULY 21, 2011

DRAFT EIR PUBLIC COMMENT PERIOD:
JUNE 15, 2011 TO AUGUST 15, 2011

Written comments should be sent to:

Bill Wycko, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

concentrations of $PM_{2.5}$ from roadway sources within 500 feet of a project site would exceed a concentration of 0.2 micrograms per cubic meter (µg/m^3) (annual average).[3] This action level (of 0.2 µg/m^3) represents about 8 percent to 10 percent of the range of ambient $PM_{2.5}$ concentrations in San Francisco based on monitoring data, and is based on epidemiological research that indicates that such a increase in concentration can result in an approximately 0.28 percent increase in non-injury mortality, or an increased mortality rate of approximately 20 "excess deaths" per year per one million population in San Francisco.[4,5] If this standard is exceeded, Article 38 requires that the project applicant design the project to minimize air pollutants indoors or install a filtered air supply system, with high-efficiency filters.

The project site, at 8 Washington Street, is located within the Potential Roadway Exposure Zone, as mapped by DPH. In consultation with DPH, an Air Quality Assessment was prepared for the proposed project. Results of the assessment indicate that the project site does not exceed a $PM_{2.5}$ concentration greater than 0.2 micrograms per cubic meter.[6] Thus, the proposed project is not required to install a filtered air supply system as per the Health Code.

IMPACTS

SIGNIFICANCE THRESHOLDS

The Planning Department Initial Study Checklist, which incorporates Appendix G of the state CEQA Guidelines, provides a framework of topics to be considered in evaluating potential impacts under CEQA.

Implementation of a project could have a potentially significant impact related to air quality if the project were to:

[3] For purposes of evaluation of potential effects of $PM_{2.5}$ exposure, DPH also recommends analysis where there are more than 50,000 daily vehicles within 330 feet (100 meters) of the site, or more than 10,000 daily vehicles within 165 feet (50 meters). These latter two conditions are included to capture equivalent impacts from lesser concentrations of traffic in smaller areas than the ARB-recommended standard of 100,000 daily vehicles within 500 feet (150 meters) (CARB, *Air Quality and Land Use Handbook: A Community Health Perspective*, 2005).

[4] "Excess deaths" (also referred to as premature mortality) refer to deaths that occur sooner than otherwise expected, absent the specific condition under evaluation; in this case, exposure to $PM_{2.5}$.

[5] San Francisco Department of Public Health, Occupational and Environmental Health Section, Program on Health, Equity, and Sustainability, "Assessment and Mitigation of Air Pollutant Health Effects from Intra-urban Roadways: Guidance for Land Use Planning and Environmental Review," May 6, 2008. Twenty excess deaths per million based on non-injury, non-homicide, non-suicide mortality rate of approximately 714 per 100,000. Although San Francisco's population is less than one million, the presentation of excess deaths is commonly given as a rate per million population.

[6] Patrick Fosdahl, MS, REHS, San Francisco Department of Public Health, Letter to Paul Osmundson re: 8 Washington Street Air Quality Assessment, April 28, 2009. A copy of this letter is on file as part of Case No. 2007.0030E and available for public review at the Planning Department, 1650 Mission Street, Suite 400.

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable Federal or State ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- Expose sensitive receptors to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people.

For project-level impact analysis, the BAAQMD recommends various thresholds and tests of significance. BAAQMD significance thresholds are summarized in Table IV.E-3. However, on December 15, 2010, the District's Board of Directors revised the effective date for the risk thresholds for new receptors from January 1, 2011 to May 1, 2011. All other CEQA thresholds of significance adopted by the Board of Directors on June 2, 2010 remain effective as of June 2, 2010. In addition, BAAQMD Resolution No. 2010-06, which was approved by the BAAQMD Board of Directors on June 2, 2010, clarifies that it is BAAQMD's policy that the revised significance thresholds be applied to those of projects whose notices of preparation are issued (and environmental analyses begun) after June 2, 2010.[7] The following analysis of air quality impacts from the 8 Washington Street project is based on BAAQMD's most recent thresholds of significance and the BAAQMD CEQA Air Quality Guidelines, May 2011.

IMPACT EVALUATION

Project-related air quality impacts fall into two categories: short-term impacts due to construction, and long-term impacts due to project operation. First, during project construction, the project would affect local particulate concentrations primarily due to fugitive dust sources, as well as construction equipment exhaust. Over the long term, the project would result in an increase in emissions primarily due to increased motor vehicle trips and an emergency back up generator as required per the fire code. On-site stationary sources (such as natural gas boilers for water and space heating) and area sources (such as landscaping and use of consumer products) would result

[7] It is BAAQMD's policy that the risk and hazards thresholds for siting new receptors be applied to projects whose NOP was prepared after May 1, 2011.

Table IV.E-3: BAAQMD Air Quality Project-Level Thresholds of Significance

Pollutant	Construction-Related	Operational-Related	
Criteria Air Pollutants and Precursors (Regional)	Average Daily Emissions (lbs/day)	Average Daily Emissions (lbs/day)	Maximum Annual Emissions (tons/year)
ROG	54	54	10
NO_x	54	54	10
PM_{10} (Exhaust)	82	82	15
$PM_{2.5}$ (Exhaust)	54	54	10
PM_{10}/$PM_{2.5}$ (Fugitive Dust)	Best Management Practices	None	
Local CO	None	9.0 ppm (8-hour average), 20.0 ppm (1-hour average)	
Risks and Hazards (Individual Projects)	Same as Operational Thresholds	Compliance with a Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million OR Increased non-cancer risk of >1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase > 0.3 µg/m^3 annual average	
Risks and Hazards (Cumulative Threshold)	Same as Operational Thresholds	Compliance with a Qualified Community Risk Reduction Plan OR Cancer: > 100 in a million (from all local sources) Non-cancer: >10.0 Hazard Index)from all local sources) $PM_{2.5}$ > 0.8 µg/m^3 annual average (from all local sources)	
Odors	None	5 confirmed complaints per year averaged over 3 years	

Notes: CO = carbon monoxide; lb/day = pounds per day; NO_X = oxides of nitrogen; $PM_{2.5}$= fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ppm = parts per million; ROG = reactive organic gases.

Source: Bay Area Air Quality Management District, *CEQA Air Quality Guidelines*, May 2011.

in lesser quantities of pollutant emissions. This section addresses both project-specific impacts, and whether the project will make a cumulatively considerable contribution to cumulative air quality impacts; in each instance, the text makes clear whether the analysis addressed project-specific or cumulative impacts. .

The proposed project would include residential and retail uses not typically associated with noxious odors. Therefore, the proposed project would not create objectionable odors affecting a substantial number of people, and odors are not discussed further in this section.

Impact AQ-1: Construction of the proposed project would not violate an air quality standard or contribute to an existing or projected air quality violation, either individually or cumulatively. *(Less than Significant)*

Demolition, grading, and new construction activities would temporarily affect local air quality during project construction, causing temporary increases in criteria pollutants. These include emissions generated from construction activities, combustion emissions of criteria air pollutants (reactive organic gases [ROG], nitrogen oxides [NOx], carbon monoxide [CO], sulfur oxides [SOx], and PM_{10} and $PM_{2.5}$) primarily from operation of construction equipment and worker vehicles, and evaporative emissions (ROG) from asphalt paving and architectural coating applications.

Construction-related emissions of criteria air pollutants and precursors were modeled in accordance with BAAQMD-recommended methodologies. Emissions of criteria air pollutants and precursors were modeled based on California Emissions Estimator Model (CalEEMod) defaults for construction equipment and the anticipated schedule for construction of the proposed project. The project applicant provided outlines of construction phasing and scheduling which were used to run CalEEMod. Construction would involve demolition of 4,900 sq. ft. of existing structures and construction of 165 residential units along with 41,900 sq. ft. of commercial/retail space and 185,000 sq. ft. of parking garage. Demolition and construction would occur over a 28-month period assumed to occur between January 1, 2012 and May 1, 2014.

Table IV.E-4 summarizes the modeled construction-related emissions of each criteria air pollutant and precursor. As shown in the table, construction-related emissions would be below the BAAQMD thresholds of significance. Thus, construction of the proposed project would have a less-than-significant effect on air quality standards.

Table IV.E-4: Estimated Average Daily Construction Emissions

	Projected Emissions (Pounds per Day)[1]			
	ROG	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Average Daily Emissions	35.63	47.63	2.01	2.01
BAAQMD Threshold	54	54	82	54

Note:
[1] Emission factors were generated by the URBEMIS 2007 (v. 9.2.4) model for San Francisco County for summer conditions.

Source: Donald Ballanti, *Criteria Air Pollutant Impact Report for the 8 Washington Street Project, San Francisco*, April 2011.

Project emissions would not exceed the BAAQMD construction criteria air pollutant thresholds of significance. BAAQMD CEQA guidance provides that, if a project results in an increase in ROG, NOx, $PM_{2.5}$, or PM_{10} of more than their respective daily or annual mass thresholds, then it would also be considered to contribute considerably to a significant cumulative air quality impact. Since construction of the project would not exceed the daily mass emissions thresholds, the project would not contribute considerably to a significant cumulative effect with respect to construction-related criteria pollutant emissions, and cumulative construction criteria air pollutant impacts would be less than significant.

Impact AQ-2: The proposed project would not result in significant impacts related to fugitive dust resulting from project construction activities. *(Less than Significant)*

Project-related demolition, excavation, grading and other construction activities may cause wind-blown dust that could contribute particulate matter into the local atmosphere. Dust can cause watering eyes or irritation to the lungs, nose, and throat. Demolition, excavation, grading and

EXHIBIT 8

DRAFT ENVIRONMENTAL IMPACT REPORT

801 Brannan and One Henry Adams Streets Project

PLANNING DEPARTMENT CASE NO. 2000.618E

STATE CLEARINGHOUSE NO. 2003112070

Draft EIR Publication Date:	**June 22, 2011**
Draft EIR Public Hearing Date:	**July 28, 2011**
Draft EIR Public Comment Period:	**June 23, 2011 – August 8, 2011**

SAN FRANCISCO PLANNING DEPARTMENT

Written comments should be sent to:
Environmental Review Officer | 1650 Mission Street, Suite 400 | San Francisco, CA 94103

Plan represents the Bay Area's most recent triennial assessment of the region's strategy to attain the state one-hour ozone standard.

AIR RESOURCE BOARD (ARB) IDLING REGULATIONS

In 2005, the ARB approved a regulatory measure to reduce emissions of toxic and criteria air pollutants by limiting the idling of new heavy-duty diesel vehicles. The regulations generally limit idling of commercial motor vehicles (including buses and trucks) within 100 feet of a school or residential area for more than five consecutive minutes or periods aggregating more than five minutes in any one hour.[155] Buses or vehicles also must turn off their engines upon stopping at a school and must not start their engines more than 30 seconds before beginning to depart from a school. In addition, state law SB 351 (adopted in 2003) prohibits locating public schools within 500 feet of a freeway or busy traffic corridor.

Regional and Local Air Quality Planning

BAY AREA AIR QUALITY MANAGEMENT DISTRICT (BAAQMD)

The BAAQMD is the regional agency with jurisdiction for regulating air quality within the nine-county Bay Area Air Basin. ABAG, MTC, county transportation agencies, cities and counties, and various non-governmental organizations also join in the efforts to improve air quality through a variety of programs. These programs include the adoption of regulations and policies, as well as implementation of extensive education and public outreach programs.

BAAQMD is responsible for managing region-wide emissions to meet federal and State air quality standards in the Bay Area Air Basin. Specifically, BAAQMD has the responsibility to monitor ambient air pollutant levels throughout the Air Basin and to develop and implement strategies to attain the applicable federal and State standards. As mentioned above, the BAAQMD, in cooperation with the MTC and Association of Bay Area Governments (ABAG), adopted the 2010 Clean Air Plan on September 15, 2010, to replace the Bay Area 2005 Ozone Strategy.

In 1999, BAAQMD adopted its *CEQA Guidelines* as a guidance document to provide lead government agencies, consultants, and project proponents with uniform procedures for assessing air quality impacts

[155] There are 12 exceptions to this requirement (e.g., emergency situations, military, adverse weather conditions, etc.), including: when a vehicle's power takeoff is being used to run pumps, blowers, or other equipment; when a vehicle is stuck in traffic, stopped at a light, or under direction of a police officer; when a vehicle is queuing beyond 100 feet from any restricted area; or when an engine is being tested, serviced, or repaired.

and preparing the air quality sections of environmental documents for projects subject to CEQA. In June 2010, BAAQMD board adopted revised thresholds of significance for air quality impacts. BAAQMD is the regional agency for air quality. Therefore, the Air District's guidelines and thresholds are commonly used in CEQA analysis, and are normally relied upon by the Planning Department for its significance determinations.

SAN FRANCISCO GENERAL PLAN AIR QUALITY ELEMENT

The San Francisco *General Plan* (*General Plan*) includes the 1997 Air Quality Element. The objectives specified by the City include the following:

- ***Objective 1:*** Adhere to state and federal air quality standards and regional programs.
- ***Objective 2:*** Reduce mobile sources of air pollution through implementation of the Transportation Element of the *General Plan*
- ***Objective 3:*** Decrease the air quality impacts of development by coordination of land use and transportation decisions.
- ***Objective 4:*** Minimize particulate matter emissions from road and construction sites.
- ***Objective 5:*** Link the positive effects of energy conservation and waste management to emission reductions.

SAN FRANCISCO DUST CONTROL ORDINANCE

The San Francisco Health Code Article 22B and San Francisco Building Code Section 106.A.3.2.6 collectively constitute the Construction Dust Control Ordinance. The Ordinance requires that all site preparation work, demolition, or other construction activities within San Francisco comply with specified dust control measures. This requirement applies to all site preparation work that has the potential to create dust or to expose or disturb more than 10 cubic yards or 500 square feet of soil whether or not the activity requires a permit from the Department of Building Inspection (DBI).

Dust suppression activities may include (1) watering all active construction areas sufficiently to prevent dust from becoming airborne and (2) more frequent watering when wind speeds exceed 15 miles per hour. Reclaimed water must be used if required by Article 21, Section 1100 et seq. of the San Francisco Public Works Code. If not required, reclaimed water should be used whenever possible. Contractors shall provide as much water as necessary to control dust (without creating run-off in any area of land clearing, and/or earth movement). During excavation and dirt-moving activities, contractors shall wet sweep or vacuum the streets, sidewalks, paths, and intersections where work is in progress at the end of the workday. Inactive stockpiles (where no disturbance occurs for more than seven days) greater than 10 cubic yards or 500 square feet of excavated materials, backfill material, import material, gravel, sand, road base, and soil shall be covered with a 10 millimeter (0.01 inch) polyethylene plastic (or equivalent) tarp, braced down, or use other equivalent soil stabilization techniques.

For project sites greater than one half-acre in size, the Ordinance requires that the project sponsor submit a Dust Control Plan for approval by the San Francisco Health Department. Interior-only tenant improvements, even if over one-half acre, that will not produce exterior visible dust are exempt from the site-specific Dust Control Plan requirement. As both project sites are greater than one-half acre, this requirement would apply to the proposed project, or either variant.[156]

SAN FRANCISCO HEALTH CODE PROVISIONS REGARDING ROADWAY GENERATED POLLUTANTS

Article 38 of the San Francisco Health Code requires an Air Quality Assessment be prepared for new residential projects of 10 or more units located in proximity to high-traffic roadways, as mapped by DPH, in order to determine whether residents would be exposed to potentially unhealthful levels of PM2.5. Consistent with CARB guidance, the San Francisco Department of Public Health (DPH) has identified that a potential public health hazard for sensitive land uses exists when such uses are located within a 150-meter (approximately 500-foot) radius of any roadway that experiences 100,000 vehicles per day. If a proposed project's air quality assessment shows that annual average concentration of PM2.5 from roadway sources would exceed a concentration of 0.2 micrograms per cubic meter (annual average), then the project sponsor must install a filtered air supply system, with high-efficiency filters, designed to remove at least 80 percent of ambient PM2.5 from habitable areas of residential units.

The project sites are located within the Roadway Exposure Zone, and is therefore subject to Article 38. Accordingly, DPH conducted an exposure analysis for PM2.5, which found that both project sites exceeded the current action level of 0.2 ug/m3. The highest level at 801 Brannan was 0.57 ug/m3 and the highest level at One Henry Adams was 0.39 ug/m3. Based on these results, the proposed project, or either variant, is required to incorporate filtration into the building design as discussed above (see also Mitigation Measure M-AQ-8, page 284).[157]

[156] The 801 Brannan site is approximately 5.21 acres. The One Henry Adams site is approximately 1.65 acres.

[157] Thomas Rivard, San Francisco Department of Public Health, Toxic Air Contaminant Exposure Analysis for the 801 and One Henry Adams Streets Project, Letter from Thomas Rivard to Stu During, December 23, 2008.This letter is on file and available for public review at the San Francisco Planning Department, 1650 Mission Street, Fourth Floor, San Francisco, as part of Case File 2000.618E.

IMPACTS

Air quality impacts from land development projects result from project construction and operation. Construction emissions, primarily dust generated by earthmoving activities and criteria air pollutants emitted by construction vehicles, would have a short-term effect on air quality. Operational emissions, generated by project-related traffic and by combustion of natural gas for building space and water heating, would continue to affect air quality throughout the lifetime of the project.

Significance Criteria

A project would have a significant air quality effect on the environment if it were to:

- Conflict with or obstruct implementation of the applicable air quality plan.
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
- Result in a cumulatively considerable net increase of any criteria air pollutant for which the project region is non-attainment under an applicable federal, state, or regional ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors).
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

As stated above, in 2010 BAAQMD adopted new significance thresholds for air quality for CEQA analysis. Under the new BAAQMD *CEQA Air Quality Guidelines* and thresholds,[158] the significance thresholds for criteria air pollutant emissions from project construction and operations have generally been lowered. The new thresholds are as follows: for ROG, NOx, and PM2.5, a net increase of 54 pounds per day or 10 tons per year (tpy) would be considered significant, while for PM10, a net increase of 82 pounds per day or 15 tpy would be considered significant. For CO, an increase would be considered significant if it leads to or contributes to CO concentrations exceeding the State Ambient Air Quality Standard (SAAQS). Quantification of the CO concentrations would not be required if a project is consistent with the local congestion management program and plans, and if traffic volumes at affected intersections are below 44,000 vehicles per hour, or below 24,000 vehicles per year in tunnel-like conditions. For construction-period impacts, the same thresholds apply for ROG, NOx, PM2.5, and PM10, except that the thresholds for PM2.5 and PM10 apply only to exhaust emissions. There are no quantitative thresholds for construction dust emissions; instead, impacts are considered less than significant if the

[158] BAAQMD, *California Environmental Quality Act (CEQA) Air Quality Guidelines*, June 2010; and adopted Thresholds of Significance, June 2010. Available online at http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Updated-CEQA-Guidelines.aspx, accessed May 2, 2011.

BAAQMD Best Management Practices are employed to control dust during construction activities, including demolition and excavation.

BAAQMD considers projects that exceed these criteria air pollutant standards also to result in a cumulatively considerable air quality impact upon the region. According to BAAQMD, no further cumulative analysis should be required beyond the analysis of whether a proposed project's impacts would contribute considerably to ambient levels of pollutants or GHGs,[159] with the exception of the following cumulative risk and hazard analysis for toxic air contaminants.

For health risks and hazards resulting from emissions of toxic air contaminants, BAAQMD recommends either that a project be found to be in compliance with a "qualified community risk reduction plan," or that significance thresholds be used for both construction and operational emissions based on commonly used standards employed in health risk assessment. The following are thresholds for project-specific impacts: (1) an increase in lifetime cancer risk of 10 chances in one million, (2) an increase in the non-cancer risk equivalent to a chronic or acute "Hazard Index" greater than 1.0,[160] or (3) an increase in the annual average concentration of PM2.5 in excess of 0.3 micrograms per cubic meter. BAAQMD also recommends cumulative thresholds of 100-in-one-million cancer risk, a Hazard Index greater than 10.0, and a PM2.5 concentration greater than 0.8 micrograms per cubic meter. Unlike the volume-based thresholds for criteria air pollutants noted above, the toxic air contaminant thresholds are used for specific receptor locations when a risk analysis is required for specific project components, such as stationary sources (common in industrial operations) or the use of diesel-powered equipment, including construction equipment.

Approach to Analysis

The URBEMIS model was used to determine the proposed project's criteria air pollutant emissions as well as those from the two variants. A Health Risk Assessment was also conducted to determine if the proposed project would expose sensitive receptors to substantial levels of pollution. The results of these analyses are presented in an Air Quality Technical Report for this project (AQTR).[161] This methodology section summarizes the approaches, while more detail is provided in the impact analysis.

[159] *Ibid.*

[160] Hazard Index represents the ratio of expected exposure levels to an acceptable reference exposure levels.

[161] Donald Ballanti, Certified Consulting Meteorologist, *Air Quality Impact Report and Health Risk Assessment for the 801 Brannan and One Henry Adams Project* (AQTR), San Francisco, March 4, 2011, p. 4-5. This analysis is available for public review at the San Francisco Planning Department, 1650 Mission Street, Fourth Floor, San Francisco as part of Case File 2000.618E.

- Pave, apply water at a minimum three times daily in dry weather, or apply non-toxic soil stabilizers to all unpaved access roads, parking areas, and staging areas;
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas;
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public street areas;
- Hydroseed or apply non-toxic soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more);
- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.);
- Limit traffic speeds on unpaved roads to 15 miles per hour;
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways;
- Replant vegetation in disturbed areas as quickly as possible;
- Install wheel washers for all exiting trucks, or wash off the tires of all trucks and equipment prior to leaving the site;
- Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction areas;
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph; and
- Limit the area subject to excavation, grading, and other construction activity at any one time.
- Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond shall respond and take corrective action within 48 hours. The Air District's phone number shall be visible to ensure compliance with applicable regulations.

Therefore, compliance with the Dust Control Ordinance would reduce construction dust that the proposed project, or either variant, would generate to a less-than-significant level.

The proposed project, or either variant, must also comply with California Occupational Safety and Health Administration (Cal/OSHA) regulations, standards and procedures and California Department of Health Services (DHS) Lead Work Practice Standards. These regulations are designed to minimize worker and general public exposure to hazardous building materials.

The above regulations and procedures, already established and enforced as part of the permit review process, would ensure that any potential air emissions impacts due to dust, asbestos, lead, PM10, PM2.5, or other hazardous materials associated with construction of the proposed project, or either variant, would be ***less than significant***.

Impact AQ-2: Construction emissions under the proposed project, or either variant, would not violate an air quality standard or contribute significantly to an existing or projected air quality violation. (Less than Significant)

The air quality technical report prepared for this project provides the results of construction criteria air pollutant emissions modeling conducted for the proposed project, or either variant, and these results are summarized below. Construction phasing and scheduling information obtained from the project sponsor was used to run the construction module of the URBEMIS-2007 model. The construction phasing for the 801 Brannan and One Henry Adams sites are different, so a separate construction analysis was performed for each site. Construction at the 801 Brannan site would involve demolition of a 137,000 square foot building and construction of 585 residential units along with 30,417 square feet of commercial space. Demolition and construction would occur over a 24-month period assumed to occur between fall 2012 and fall 2014. Construction at the One Henry Adams site would involve demolition of three buildings totaling 29,164 square feet and construction of 239 residential units along with 9,070 square feet of commercial space. Demolition and construction would occur over an 18-month period assumed to occur between fall 2012 and summer 2014. Construction phasing and activity under either variant would not differ substantially, if at all, from that of the proposed project.

The volume of construction debris for each phase was estimated based on the square footage and height of buildings. Default values in the URBEMIS Program for truck capacity and trip length were utilized. URBEMIS default values were also used for equipment types and numbers during each phase of construction. As directed by current BAAQMD CEQA guidance, a surrogate five percent reduction in off-road exhaust emissions of NOx, PM10, and PM2.5 was used to account for standard mitigation measures required of all projects.[166] The URBEMIS-2007 program calculated annual emissions for each year of construction. The totals for each site were added, and the maximum annual emissions was divided by the number of construction days (22 days per month, 260 per year) for the year to obtain the average daily construction emission in pounds per day. The volume of construction debris under either variant would be the same as under the proposed project.

Table 19 on the following page shows that the highest estimated average daily construction emissions of criteria air pollutants (ROG, NOx, PM10, PM2.5) in pounds per day over the three phases of construction would not exceed the project-level BAAQMD thresholds of significance, either singly or cumulatively. Therefore, construction emissions of criteria air pollutants under the proposed project, or either variant, would be ***less than significant***.

[166] BAAQMD, *CEQA Air Quality Guidelines*, June 2010, *op. cit*. Table 8-4, page 8-6 and Appendix B, page B-11.

Table 19
Average Daily Construction Emissions of Criteria Air Pollutants
(Pounds per Day)

	ROG	NOx	PM10	PM2.5
801 Brannan site	28.0	22.07	17.27	4.36
One Henry Adams site	20.50	13.63	6.45	1.81
Total	48.50	35.70	23.77	6.17
BAAQMD Threshold of Significance	**54.00**	**54.00**	**82.00**	**54.00**

Notes:
- ROG = Reactive Organic Gases
- NOx = Nitrogen Oxides
- PM10 = Particulate Matter, 10 microns
- PM2.5 = Particulate Matter, 2.5 microns

Source: Donald Ballanti, *Air Quality Impact Report and Health Risk Assessment for the 801 Brannan/1Henry Adams Project*, San Francisco, March 2011, Table 1.

Impact C-AQ-3: Construction of the proposed project, or either variant, would not violate air quality standards or generate a cumulatively considerable increase in criteria air pollutant emissions. (Less than Significant)

BAAQMD CEQA guidance indicates that if an action does not result in a significant impact, then it would not contribute considerably to a significant cumulative effect. During construction of the proposed project, the highest average daily emissions of criteria air pollutants would not exceed the BAAQMD thresholds of significance (see Table 19) and there are no other nearby proposals with overlapping construction schedules that would generate a cumulatively considerable increase in criteria air pollutant emissions. Therefore, construction of the project, or either variant, would not contribute considerably to a significant cumulative impact on criteria air pollutant emissions, and would result in a ***less-than-significant*** impact.

Impact AQ-4: Operation of the proposed project, or either variant, would violate air quality standards with respect to, or generate a cumulatively considerable increase in, criteria air pollutants. (Significant and Unavoidable)

Operational emissions associated with the proposed project were calculated using the URBEMIS-2007 program. URBEMIS-2007 is a program developed specifically to quantify mobile and area source emissions from projects in California. Inputs to the URBEMIS-2007 program include trip generation rates, vehicle mix, average trip length by trip type and average speed. Default trip lengths and average trip speeds for San Francisco County were used. Project trip generation estimates from the project transportation report were used. URBEMIS-2007 requires that a project size be input for each land use.

EXHIBIT 9

DRAFT ENVIRONMENTAL IMPACT REPORT

Transit Center District Plan and Transit Tower

PLANNING DEPARTMENT
CASE NO. **2007.0558E and 2008.0789E**

STATE CLEARINGHOUSE NO. 2008072073

SAN FRANCISCO PLANNING DEPARTMENT

	Draft EIR Publication Date:	SEPTEMBER 28, 2011
	Draft EIR Public Hearing Date:	NOVEMBER 3, 2011
	Draft EIR Public Comment Period:	SEPTEMBER 28 THROUGH NOVEMBER 14, 2011

Written comments should be sent to:
Environmental Review Officer | 1650 Mission Street, Suite 400 | San Francisco, CA 94103

In 1988, California passed the California Clean Air Act (California Health and Safety Code Sections 39600 et seq.), which, like its federal counterpart, called for the designation of areas as attainment or nonattainment, but based on state ambient air quality standards rather than the federal standards. As indicated in Table 32, the Bay Area Air Basin is designated as "nonattainment" for state ozone, PM_{10}, and $PM_{2.5}$ standards. The Air Basin is designated as "attainment" for all other pollutants listed in the table.

California Air Resources Board

CARB is the state agency responsible for regulating air quality. CARB's responsibilities include establishing state ambient air quality standards, emissions standards, and regulations for mobile emissions sources (e.g., autos, trucks, etc.), as well as overseeing the efforts of countywide and multi-county air pollution control districts, such as the BAAQMD, which have primary responsibility over stationary sources.

Bay Area Air Quality Management District

The BAAQMD regulates air quality through its planning and review activities. The district has permit authority over most types of stationary emission sources and can require stationary sources to obtain permits; it can also impose emission limits, set fuel or material specifications, or establish operational limits to reduce air emissions. The BAAQMD regulates new or expanding stationary sources of toxic air contaminants. However, the district has no direct regulatory authority over mobile sources (e.g., cars and trucks), nor does it have permit authority over transportation terminals, such as the new Transit Center, currently under construction to replace the Transbay Terminal.

Air Quality Plans to Achieve Compliance with State Standards

Air quality plans developed to meet federal requirements are referred to as State implementation Plans. The federal Clean Air Act and the California Clean Air Act require plans to be developed for areas designated as non-attainment (with the exception of areas designated as non-attainment for the State particulate matter standards plans for which are not required by California Code of Regulations). In September 2010, BAAQMD adopted the *2010 Bay Area Clean Air Plan*, which updated the *2005 Ozone Strategy*, and also to function as a "multi-pollutant plan to protect public health and the climate."[222] This plan includes ozone control measures and also consider the impacts of these control measures on particulate matter (PM), air toxics, and Greenhouse Gas Emissions (GHGs) in a single, integrated plan.

The *2010 Clean Air Plan* explains how the Basin will achieve compliance with the State one-hour air quality standard for ozone as expeditiously as practicable and how the region will reduce transport of ozone and ozone precursors to neighboring air basins. The Strategy also discusses related air quality issues of interest including the BAAQMD's public involvement process, climate change, fine particulate matter, BAAQMD's Community Air Risk Evaluation program, local benefits of ozone control measures, the environmental review process, national ozone standards, and photochemical modeling.

[222] BAAQMD, *2010 Clean Air Plan*, September 2010. Available on the internet at: http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx.

In 1999, BAAQMD adopted its *CEQA Guidelines – Assessing the Air Quality Impacts of Projects and Plans*, as a guidance document to provide lead government agencies, consultants, and project proponents with uniform procedures for assessing air quality impacts and preparing the air quality sections of environmental documents for projects subject to CEQA. These BAAQMD Guidelines were revised and updated in June 2010, as the *BAAQMD CEQA Air Quality Guidelines*.

The 2010 *BAAQMD CEQA Air Quality Guidelines* is an advisory document and local jurisdictions are not required to utilize the methodology outlined therein, but the document is commonly relied upon by local agencies, including the San Francisco Planning Department.[223] The document describes the criteria that BAAQMD uses when reviewing and commenting on the adequacy of environmental documents. It recommends thresholds for use in determining whether projects would have significant adverse environmental impacts, identifies methodologies for predicting project emissions and impacts, and identifies measures that can be used to avoid or reduce air quality impacts. In practice, most local agencies rely on the *BAAQMD CEQA Air Quality Guidelines* when assessing the significance of air quality impacts.

Air Quality Plans to Achieve Compliance with Federal Standards

In response to the EPA re-designation of the basin for the 1-hour federal ozone standard to nonattainment, the BAAQMD, ABAG, and MTC were required to develop an ozone attainment plan to meet this standard. The *1999 Ozone Attainment Plan* was prepared and adopted by these agencies in June 1999. However, in March 2001, the EPA proposed and took final action to approve portions of the 1999 ozone plan and disapprove other portions, while also making the finding that the Bay Area had not attained the national 1-hour ozone standard. As a result, a revised Ozone Attainment Plan was prepared and adopted in October 2001. The 2001 Ozone Attainment Plan amends and supplements the 1999 plan. The 2001 Ozone Attainment Plan contains control strategies for stationary and mobile sources. The adopted mobile-source control program was estimated to substantially reduce volatile organic compound and NOx emissions between 2000 and 2006, reducing emissions from on- and off-road diesel engines (including construction equipment). In addition to emission reduction requirements for engines and fuels, the 2001 Ozone Attainment Plan identified 28 transportation control measures to reduce automobile emissions, including improved transit service and transit coordination, new carpool lanes, signal timing, freeway incident management, and increased state gas tax and bridge tolls.

San Francisco Policies and Ordinances

San Francisco General Plan Air Quality Element

The Air Quality Element of the *San Francisco General Plan* is composed of six sections, each of which focuses on different aspects of air quality improvement efforts. They are: (1) adherence to air quality standards, (2) improvements related to mobile sources, (3) land use planning, (4) public awareness, (5) reduction of dust, and (6) energy conservation. The overarching goal of the Air Quality Element is to "Give high priority to air quality improvement in San Francisco to protect its population from adverse

[223] BAAQMD, *CEQA Guidelines*, May 2011. See footnote 205, p. 370.

(2) Would the projected rate of increase in vehicle miles traveled or vehicle trips under the plan would be less than or equal to the projected rate of population increase under the plan.

If the two foregoing questions can be answered in the affirmative, the plan would neither:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation; nor
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors).[228]

Community Risk and Hazard Impacts

This analysis also responds to the criterion that asks whether the proposed plan would:

- Expose sensitive receptors to substantial pollutant concentrations.

For plan-related health risks and hazards resulting from emissions of toxic air contaminants, BAAQMD recommends that overlay zones be established around existing and proposed land uses that emit TACs. These overlay zones should be included in proposed plan policies, land use maps, and implementing ordinances. Additionally, the plan must "identify goals, policies, and objectives to minimize potential impacts."[229]

Odors

For odors, a plan must identify the location of existing and planned odor sources in the Plan area. The plan must also include policies to reduce potential odor impacts in the Plan area. Typical odor sources of concern include wastewater treatment plants, sanitary landfills, transfer stations, composting facilities, petroleum refineries, asphalt batch plants, chemical manufacturing facilities, fiberglass manufacturing facilities, auto body shops, rendering plants, and coffee roasting facilities. Given that the draft Plan would not locate sensitive receptors within close proximity to these types of facilities and would not include development of such facilities, it can be reasonably concluded that no odor impact would occur. Therefore, impacts related to odor are not discussed further in this EIR.

Transit Tower

Project level thresholds of significance set by the BAAQMD reflect the level at which a project's individual emissions would result in a cumulatively considerable contribution to an existing air quality problem; therefore, if project impacts identified are significant, impacts would also be cumulatively considerable. As stated in the BAAQMD *CEQA Air Quality Guidelines*:

> Past, present and future development projects contribute to the region's adverse air quality impacts on a cumulative basis. By its very nature, air pollution is largely a cumulative impact.

[228] The bulleted statements are the first three significance criteria in the City's CEQA Initial Study checklist.
[229] BAAQMD *CEQA Air Quality Guidelines* (see footnote 205, p. 370); p. 9-71.

> No single project is sufficient in size to, by itself, result in nonattainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulatively significant adverse air quality impacts. If a project's contribution to the cumulative impact is considerable, then the project's impact on air quality would be considered significant.[230]

According to BAAQMD, no further cumulative analysis should be required beyond the analysis of whether a proposed project's impacts would contribute considerably to ambient levels of pollutants or greenhouse gases,[231] with the exception of the above-noted cumulative risk and hazard analysis for toxic air contaminants.

Criteria Air Pollutants

The BAAQMD-recommended significance thresholds for criteria pollutant emissions from operations of an individual project, such as the proposed Transit Tower, are as follows: for ROG, NOx and $PM_{2.5}$, a net increase of 54 pounds per day or 10 tons per year would be considered significant, while for PM_{10}, a net increase of 82 pounds per day or 15 tons per year would be considered significant. For CO, an increase would be considered significant if it leads to or contributes to CO concentrations exceeding the State Ambient Air Quality Standard, although quantification would not be required if a project is consistent with the local congestion management program and plans and traffic volumes at affected intersections are below 24,000 vehicles per hour. For construction-period impacts, the same thresholds apply for ROG, NOx, $PM_{2.5}$, and PM_{10}, except that the thresholds for $PM_{2.5}$ and PM_{10} apply only to exhaust emissions, and thresholds are specifically based on average daily emissions. There are no quantitative thresholds for construction dust emissions; instead, impacts are considered less than significant if standard best management practices are employed to control dust during construction activities, including demolition and excavation.

Community Risk and Hazard Impacts

With respect to risk and hazard impacts. BAAQMD recommends either that a project be found to be in compliance with a "qualified Community Risk Reduction Plan," or that significance thresholds be used for both construction and operational emissions based on commonly used standards employed in health risk assessment. The thresholds for project-specific impacts are: an increase in lifetime cancer risk of 10 chances in one million, an increase in the non-cancer risk equivalent to a chronic or acute "Hazard Index" greater than 1.0,[232] or an increase in the annual average concentration of $PM_{2.5}$ in excess of 0.3 micrograms per cubic meter. BAAQMD also recommends cumulative thresholds of 100 in one million cancer risk, a chronic Hazard Index greater than 10.0, and a $PM_{2.5}$ concentration greater than 0.8 micrograms per cubic meter. Unlike the volume-based thresholds for criteria pollutants noted above, the toxic air contaminant thresholds are used for specific receptor locations when a risk analysis is required for specific project components, such as permitted stationary sources (boilers, emergency generators, etc.), non-permitted sources such as the new Transit Center, or the use of diesel-powered

[230] BAAQMD *CEQA Air Quality Guidelines* (see footnote 205, p. 370); p. 2-1.
[231] *Ibid*.
[232] Hazard Index represents the ratio of expected exposure levels to an acceptable reference exposure levels.

sources, and would also generate emissions of both criteria air pollutants and toxic air contaminants in construction equipment exhaust. Over the long term, the project would result in an increase in emissions primarily due to increased motor vehicle trips, as well as from operation of on-site stationary sources—in this case, a backup generator. Area sources (such as landscaping and use of consumer products) would result in lesser quantities of pollutant emissions.

Construction Air Quality Impacts

Impact AQ-6: Construction of the Transit Tower would result in emissions of criteria air pollutants, including ozone precursors, that would contribute to an existing or projected air quality violation or result in a cumulatively considerable increase in criteria pollutants, and could expose sensitive receptors to construction dust. (Less than Significant)

Demolition, grading and new construction activities would temporarily affect local air quality during the project's proposed 3-year construction schedule, causing temporary increases in particulate dust and other pollutants. Emissions generated from construction activities include combustion emissions of criteria air pollutants (reactive organic gases [ROG], nitrogen oxides [NOx], carbon monoxide [CO], sulfur oxides [SOx], and PM_{10} and $PM_{2.5}$) primarily from operation of construction equipment and worker vehicles, evaporative criteria pollutant emissions (ROG) from asphalt paving and architectural coating applications, and dust (including PM_{10} and $PM_{2.5}$) primarily from "fugitive" sources; that is, dust generated by construction activities and that escapes from the construction site.

Criteria Air Pollutants

Criteria pollutant emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ from construction equipment would incrementally add to the regional atmospheric loading of these pollutants during project construction. The BAAQMD *CEQA Air Quality Guidelines* recommend the quantification of project related exhaust emissions and comparison of the emissions to its new significance thresholds. Therefore, daily project construction exhaust emissions that would be associated with the proposed project have been estimated and are presented in **Table 34**.

As indicated in Table 34, emissions from project construction would not exceed the BAAQMD's significance thresholds. Even though construction-related emissions would not exceed the BAAQMD's significance thresholds for criteria pollutants, Implementation of Improvement Measure I-AQ-6 would further reduce the less-than-significant emissions from construction vehicles, and would be consistent with the BAAQMD's basic emissions control measures for all projects.

Improvement Measure

I-AQ-6 **Construction Vehicle Emissions Minimization:** To reduce construction vehicle emissions, the project sponsor shall incorporate the following into construction specifications:

- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

TABLE 34
TRANSIT TOWER PROJECT CONSTRUCTION EXHAUST EMISSIONS ESTIMATES

	Estimated Daily Emissions (pounds per day)[a]			
Construction Phase and Year	**ROG**	**NOx**	**PM10[b]**	**PM2.5[b]**
2013	14.4	43.1	1.9	1.7
2014	2.9	12.1	0.6	0.6
2015	40.5	11.0	0.6	0.5
2016	37.18	0.0	0.0	0.0
BAAQMD Threshold	54	54	82	54
Significant?	No	No	No	No

[a] Project construction emissions estimates are based on output from URBEMIS 2007 v.9.2.4 air quality model, using the model's default assumptions. Assumes construction starts in mid-2013 and ends in mid-2016.
[b] Vehicle exhaust only.
SOURCE: Environmental Science Associates, 2011

Fugitive Dust

For fugitive dust, the BAAQMD recommends a "best management practices" approach for dust control. Project-related demolition, excavation, grading and other construction activities may cause wind-blown dust that could contribute particulate matter into the local atmosphere. Although there are federal standards for air pollutants and implementation of state and regional air quality control plans, air pollutants continue to have impacts on human health throughout the country. California has found that particulate matter exposure can cause health effects at lower levels than national standards. The current health burden of particulate matter demands that, where possible, public agencies take feasible available actions to reduce sources of particulate matter exposure. According to the California Air Resources Board, reducing ambient particulate matter from 1998 – 2000 levels to natural background concentrations in San Francisco would prevent over 200 premature deaths.

Dust can be an irritant causing watering eyes or irritation to the lungs, nose and throat. Demolition, excavation, grading and other construction activities can cause wind-blown dust to add to particulate matter in the local atmosphere. Depending on exposure, adverse health effects can occur due to this particulate matter in general and also due to specific contaminants such as lead or asbestos that may be constituents of soil.

In response, as noted under Regulatory Setting (p. 383), the San Francisco Board of Supervisors approved a series of amendments to the *San Francisco Building* and *Health Codes* generally referred hereto as the Construction Dust Control Ordinance (Ordinance 176-08, effective July 30, 2008) with the intent of reducing the quantity of dust generated during site preparation, demolition and construction work in order to protect the health of the general public and of onsite workers, minimize public nuisance complaints, and to avoid orders to stop work by the Department of Building Inspection (DBI).

Level of Significance After Mitigation

Implementation of the above measure would result in the maximum feasible reduction of diesel emissions that would contribute to construction-period health risk, thereby lowering both lifetime cancer risk and the concentration of $PM_{2.5}$ to which receptors would be exposed. Furthermore, the above analysis indicates that use of interim Tier 4 diesel construction equipment or Tier 2/ Tier 3 equipment with Level 3 VDECS would reduce the health risk to a level that would not exceed any of the significance thresholds identified by the BAAQMD. It is also noted that construction emissions could be lower if newer equipment is employed or less powerful or smaller diesel equipment is used than assumed in the analysis. Emissions could also be higher if more or larger diesel equipment is used. Depending on the regulations in place at the time construction begins, and depending on the precise mix of diesel-powered construction equipment employed, it is possible that the impact would be reduced to a less-than-significant level. However, because it cannot be stated with certainty that either cancer risk or $PM_{2.5}$ concentration would be reduced to below the BAAQMD-recommended significance thresholds, and because of the uncertainty concerning the availability and feasibility of using construction equipment that meets the requirements of Mitigation Measure M-AQ-7, this impact is conservatively judged to be **significant and unavoidable**.

Operational Air Quality Impacts

Impact AQ-8: Operation of the proposed Transit Tower would not conflict with *2010 Clean Air Plan*, result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment, either individually or cumulatively. (Less than Significant)

Based on the project transportation analysis,[253] the proposed project would generate approximately 4,000 vehicle trips per day. Operational emissions from project traffic and from operation of the proposed building were calculated using the URBEMIS 2007 (version 9.2.4) model, and are presented in **Table 35**. As shown in Table 6, emission increases attributable to the proposed project would be substantially below the significance thresholds established by the BAAQMD. Therefore, the project's effects of regional criteria pollutant emissions would be less than significant.

The proposed project would be generally consistent with the San Francisco General Plan, as proposed for amendment by the draft Transit Center District Plan. Additionally, the General Plan, Planning Code, and City Charter implement various Transportation Control Measures identified in the 2010 Bay Area Clean Air Plan through the City's Transit First Program, bicycle parking requirements, transit development impact fees applicable to commercial uses, and other actions. The draft Plan would also be consistent with the Transportation Control Measures in the 2010 Clean Air Plan, as described in the analysis under Impact AQ-1, above, and the Transit Tower would be an integral part of the proposed Plan. In light of the above, the project would not make a considerable contribution to cumulative air quality impacts, nor

[253] AECOM, *Transit Tower Transportation Impact Study* (see footnote 155, p. 276).

TABLE 35
TRANSIT TOWER ESTIMATED DAILY REGIONAL EMISSIONS (2016)

	Projected Emissions (Pounds per Day)[1,2]			
	ROG	NO_X	PM_{10}	$PM_{2.5}$
Area-Source Emissions	1.1	7.4	0.02	0.02
Mobile-Source (Vehicle) Emissions	23.7	26.5	55.1	10.4
TOTAL	24.7	33.9	55.1	10.4
BAAQMD Threshold	54	54	82	54

NOTES:
1 Emission factors were generated by the URBEMIS 2007 (v. 9.2.4) model for San Francisco County, and assume a default vehicle mix. All daily estimates are the average of summer and winter conditions. Traffic generated emissions based on trip generation from the project transportation study.
2 Columns may not total due to rounding.

SOURCE: Environmental Science Associates, 2011.

would it interfere with implementation of the 2010 Clean Air Plan, which is the applicable regional air quality plan developed to improve air quality and to effectively meet the state and federal ambient air quality standards.

Mitigation: None required.

Local Air Quality Impacts

Impact AQ-9: Operation of the proposed Transit Tower would not result in emissions of carbon monoxide that would exceed state or federal standards, either individually or cumulatively. (Less than Significant)

The San Francisco Bay Area Air Basin is designated as "attainment" for carbon monoxide (CO). As stated in the 2010 update of the BAAQMD *CEQA Air Quality Guidelines*, "Emissions and ambient concentrations of CO have decreased dramatically in the Bay Area Air Basin with the introduction of the catalytic converter in 1975. No exceedances of the CAAQS or NAAQS for CO have been recorded at nearby monitoring stations since 1991."[254] Accordingly, as noted in the Significance Criteria, BAAQMD states that CO impacts may be determined to be less than significant if a project is consistent with the applicable congestion management plan and would not increase traffic volumes at local intersections to more than 24,000 vehicles per hour, for locations, such as the project site, in heavily urban areas, where "urban canyons" formed by buildings tend to reduce air circulation. The project would be consistent with applicable congestion management planning and, as described under Impact AQ-1, above, the greatest

[254] BAAQMD *CEQA Air Quality Guidelines* (see footnote 205, p. 370); p. 6-1.

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EXHIBITS 10-19

To Mission Bay Alliance Comment Letter dated July 26, 2015

Re: **Air Quality Impacts** - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

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EXHIBIT 10

Volume 2

Draft Environmental Impact Report

San Francisco Planning Department Case No. 2010.0493E
State Clearinghouse No. 2011022040

Draft EIR Publication Date: July 11, 2011
Draft EIR Public Hearing Date: August 11, 2011
Draft EIR Public Comment Period: July 11, 2011 – August 25, 2011

Written comments should be sent to the
Environmental Review Officer
1650 Mission Street, Suite 400
San Francisco, CA 94103

San Francisco Planning Department

Table 5.8-2. California ambient standards tend to be at least as protective as national ambient standards and are often more stringent.

In 1988, California passed the California Clean Air Act (California Health and Safety Code Sections 39600 et seq.), which, like its federal counterpart, called for the designation of areas as attainment or nonattainment, but based on state ambient air quality standards rather than the federal standards. As indicated in Table 5.8-2, the Bay Area Air Basin is designated as "nonattainment" for state ozone, PM_{10}, and $PM_{2.5}$ standards. The Bay Area Air Basin is designated as "attainment" for most other pollutants listed in the table.

The California Clean Air Act requires that air districts in which state air quality standards are exceeded prepare a plan that documents reasonable progress towards attainment. A three-year update is required. In the Bay Area, this planning process is incorporated into the BAAQMD Clean Air Plan, as discussed in Section 5.8.2.3, Local Regulations, below under Regional Air Quality Planning.

5.8.2.3 Local Regulations

Regional Air Quality Planning

The BAAQMD is the regional agency responsible for air quality regulation within the San Francisco Bay Area Air Basin. The BAAQMD regulates air quality through its planning and review activities and has permit authority over most types of stationary emission sources. The BAAQMD can require stationary sources to obtain permits, and can impose emission limits, set fuel or material specifications, or establish operational limits to reduce air emissions. The BAAQMD regulates new or expanding stationary sources of toxic air contaminants.

For state air quality planning purposes, the Bay Area is classified as a serious nonattainment area for ozone. The "serious" classification triggers various plan submittal requirements and transportation performance standards. One such requirement is that the BAAQMD updates the *Clean Air Plan* (CAP) every three years to reflect progress in meeting the air quality standards and to incorporate new information regarding the feasibility of control measures and new emission inventory data. The Bay Area's record of progress in implementing previous measures must also be reviewed. On September 15, 2010, the BAAQMD adopted the most recent revision to the CAP—the 2010 CAP. The goals of the 2010 CAP are to:

- Update the Bay Area 2005 Ozone Strategy in accordance with the requirements of the California Clean Air Act to implement "all feasible measures" to reduce ozone;
- Consider the impacts of ozone control measures on PM_{10} and $PM_{2.5}$, TACs, and greenhouse gases (GHGs) in a single, integrated plan;
- Review progress in improving air quality in recent years; and
- Establish emission control measures to be adopted or implemented in the 2009–2012 timeframe.

In June 2010, BAAQMD issued its *CEQA Air Quality Guidelines*, replacing former guidelines adopted in December 1999, and adopted new thresholds of significance (BAAQMD Thresholds) to assist lead agencies in determining when potential air quality impacts would be considered significant under CEQA. Updated in May 2011,[20] these guidelines include recommendations for analytical methodologies to determine air quality impacts and identify mitigation measures that can be used to avoid or reduce air quality impacts. The analysis herein uses the BAAQMD Thresholds and the *CEQA Air Quality Guidelines* to determine the proposed project's significance with respect to air pollutant emissions.

Local Air Quality Planning

San Francisco General Plan Air Quality Element

The *San Francisco General Plan* (General Plan) includes the 1997 Air Quality Element.[21] The objectives specified by the City include the following:

> *Objective 1*: Adhere to state and federal air quality standards and regional programs.
>
> *Objective 2*: Reduce mobile sources of air pollution through implementation of the Transportation Element of the General Plan.
>
> *Objective 3*: Decrease the air quality impacts of development by coordination of land use and transportation decisions.
>
> *Objective 4*: Minimize particulate matter emissions from road and construction sites.
>
> *Objective 5*: Link the positive effects of energy conservation and waste management to emission reductions.

San Francisco Construction Dust Control Ordinance

San Francisco Health Code Article 22B and San Francisco Building Code Section 106.A.3.2.6, which collectively comprise the Construction Dust Control Ordinance, require that all site preparation work, demolition, or other construction activities within San Francisco that have the potential to create dust or to expose or disturb more than 10 cubic yards or 500 square feet of soil comply with specified dust control measures whether or not the activity requires a permit from the Department of Building Inspection (DBI).

Pursuant to Health Code Article 22B, Section 1247, all departments, boards, commissions, and agencies of the City and County of San Francisco — including the Port of San Francisco — that authorize construction or improvements on land under their jurisdiction under circumstances where no building, excavation, grading, foundation or other permits are required to be obtained under the San Francisco Building Code shall adopt rules and regulations to ensure that the same dust control requirements that are set forth in this article are followed.

20 Bay Area Air Quality Management District, *California Environmental Quality Act Air Quality Guidelines*, updated May 2011.

21 San Francisco Planning Department, Air Quality Element of the *San Francisco General Plan*, July 1997, updated in 2000.

Dust suppression activities may include watering of all active construction areas sufficiently to prevent dust from becoming airborne; increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water must be used if required by Article 21, Section 1100 et seq. of the San Francisco Public Works Code. If not required, reclaimed water should be used whenever possible. Contractors shall provide as much water as necessary to control dust (without creating runoff in any area of land clearing and/or earth movement). During excavation and earth-moving activities, contractors must wet sweep or vacuum the streets, sidewalks, paths, and intersections where work is in progress at the end of the work day. Inactive stockpiles (where no disturbance occurs for more than seven days) greater than 10 cubic yards or 500 square feet of excavated materials, backfill material, import material, gravel, sand, road base and soil must be covered with a 10-millimeter (0.01-inch) polyethylene plastic (or equivalent) tarp, braced down, or other equivalent soil stabilization techniques must be used.

For project sites greater than one-half acre in size, the ordinance requires that the project sponsor submit a Dust Control Plan for approval by the San Francisco Health Department. Interior-only tenant improvements, even if over one-half acre, that will not produce exterior visible dust are exempt from the site-specific Dust Control Plan requirement.

San Francisco Health Code Provisions

The City and County of San Francisco adopted Article 38 of the San Francisco Health Code in 2008, requiring that an Air Quality Assessment be prepared for new residential projects of ten or more units located in proximity to high-traffic roadways, as mapped by the Department of Public Health, to determine whether residents would be exposed to potentially unhealthful levels of $PM_{2.5}$.

San Francisco Clean Construction Ordinance

The San Francisco Board of Supervisors adopted the Clean Construction Ordinance in 2007, which became effective in 2009. The Clean Construction Ordinance is implemented for public works projects in the City of San Francisco or City-financed construction projects. The ordinance amended the Administrative Code to add Section 6.25 to require City contractors to adopt clean construction practices including use of biodiesel fuels and emission controls. The ordinance also requires departments that are authorized to award contracts to compare bids on the basis that the work will be performed using cleaner off-road diesel equipment and biodiesel fuel. The proposed projects would be subject to the Clean Construction Ordinance.

5.8.3 Impacts and Mitigation Measures

5.8.3.1 Significance Criteria

The City has not formally adopted significance standards for impacts related to air quality, but generally considers that implementation of the project could have a potentially significant impact related to air quality if it were to:

- Conflict with or obstruct implementation of the applicable air quality plan;

- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- Expose sensitive receptors to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people.

As described above, the BAAQMD issued CEQA Air Quality Guidelines,[22] including Air Quality CEQA Thresholds of Significance, in June 2010 and updated them in May 2011. These guidelines provide reference thresholds for considering whether a project would have a significant air quality impact. The guidelines, published for assessing impacts relative to these thresholds, also provide recommended procedures for evaluating potential air quality impacts during the environmental review process. Additionally, the BAAQMD has adopted new risk and hazard exposure thresholds for the siting of new sensitive receptors that apply to projects for which the Notice of Preparation (NOP)was issued*)* and environmental analysis began subsequent to May 1, 2011. However, neither the proposed AC34 events nor the proposed cruise terminal would permanently locate a new sensitive receptor, and this threshold is not applicable to the proposed projects. The following analysis has been conducted in accordance with BAAQMD's *CEQA Air Quality Guidelines* (May 2011).

AC34 Event and Cruise Terminal Construction Impact Criteria

Under the BAAQMD CEQA thresholds, a project would have a significant air quality impact if it would result in average daily construction-related emissions of ROG, NOx, or $PM_{2.5}$ (non-inclusive of fugitive dust[23]) of 54 pounds (25 kilograms) average daily emissions or greater. There is a separate emission threshold for PM_{10} (non-inclusive of fugitive dust[24]) of 82 pounds (37 kilograms) average daily emissions. The thresholds for PM_{10} and $PM_{2.5}$ are inclusive only of construction exhaust emissions. BAAQMD guidance regarding construction-related emission of fugitive dust identifies implementation of best management practices as its threshold of significance.[25] The BAAQMD *CEQA Air Quality Guidelines* identify a list of eight "Basic Construction Mitigation Measures Recommended for All Proposed Projects" and consider implementation of these measures as meeting the best management practices requirements for fugitive dust emissions.[26]

22 BAAQMD, *CEQA Air Quality Guidelines*, May 2011, http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20CEQA%20Guidelines%20May%202011.ashx.
23 Fugitive dust consists of very small liquid and solid particulate matter that is suspended in the air by the wind and human activities. Fugitive dust originates primarily from the soil.
24 Fugitive dust is PM suspended in the air by the wind and human activities. It originates primarily from the soil and is not emitted from exhaust pipes, vents, or stacks.
25 BAAQMD, *CEQA Air Quality Guidelines*, Table 2-1.
26 BAAQMD, *CEQA Air Quality Guidelines*, Table 8-2.

The 2010 BAAQMD CEQA thresholds indicate that a project would also have a significant air quality impact if construction activities would result in an incremental increase in localized annual average concentrations of $PM_{2.5}$ exceeding 0.3 micrograms per cubic meter ($\mu g/m^3$) within a 1,000-foot radius from the property line of the construction area or a receptor. A project would also have a significant air quality impact if it would expose persons to substantial levels of TACs (including DPM), such that the probability of contracting cancer for the Maximally Exposed Individual (MEI)[27] exceeds 10 in one million or if it would expose persons to TACs such that a non-cancer Hazard Index of 1.0 would be exceeded. A Hazard Index is a summation of the non-cancer hazard quotients for all chemicals to which an individual is exposed.

AC34 Event and Cruise Terminal Operational Impact Criteria

For the AC34 event and Cruise Terminal project impact operational analyses, the 2011 BAAQMD *CEQA Air Quality Guidelines* include various thresholds and tests of significance. For ROG, NOx, and $PM_{2.5}$, a net increase equal to or greater than 10 tons per year (maximum annual) or 54 pounds average daily emissions is considered significant, while for PM_{10} a net increase equal to or greater than 15 tons per year (maximum annual) or 82 pounds average daily emissions is considered significant.

For CO emissions, an increase would be considered significant if it leads to or contributes to CO concentrations exceeding the state ambient air quality standard, although quantification would not be required if a project is consistent with the local congestion management program and plans and traffic volumes at affected intersections are below 44,000 vehicles per hour or 24,000 vehicles per year in tunnel-like conditions.

Under the 2010 BAAQMD thresholds, project operations would also have a significant air quality impact if they would result in an incremental increase in localized annual average concentrations of $PM_{2.5}$ exceeding 0.3 micrograms per cubic meter.

Additionally, a project would also have a significant air quality impact if project operations would expose persons to substantial levels of TACs, such that the probability of contracting cancer for the MEI exceeds 10 in one million or if the project would expose persons to TACs such that a non-cancer Hazard Index of 1.0 would be exceeded.

Cumulative Impact Criteria

The 2011 BAAQMD *CEQA Air Quality Guidelines* state that if the individual emissions from a project would result in an increase in ROG, NOx, $PM_{2.5}$, or PM_{10} that exceeds the project-level significance criteria, then the project would also be considered to contribute considerably to a significant cumulative effect. Cumulative air quality impacts relative to emissions of $PM_{2.5}$ and TACs are new concepts contained in BAAQMD's updated thresholds.

27 The Maximally Exposed Individual is the person with the highest exposure in a given population.

With regard to cumulative impacts from $PM_{2.5}$, a significant cumulative air quality impact would occur if localized annual average concentrations of $PM_{2.5}$ would exceed 0.8 micrograms per cubic meter at any receptor from project operations in addition to existing emission sources and cumulative emissions sources within a 1,000-foot radius of the property line of the source or receptor.

With regard to cumulative impacts from TACs, a significant cumulative air quality impact would occur if the probability of contracting cancer for the MEI would exceed 100 in one million or if the project would expose persons to TACs such that a non-cancer chronic Hazard Index of 10.0 would be exceeded at any receptor as a result of project operations, in addition to existing emission sources and cumulative emissions sources within a 1,000-foot radius of the project site.

However, a project's construction or operational impacts would be considered to result in a considerable contribution to an identified cumulative health risk impact if the project's construction or operation activities would exceed the project-level health risk significance thresholds identified above.

5.8.3.2 Approach to Analysis

The air quality impact analysis is organized to address potential impacts from the AC34 events and the Cruise Terminal project separately. Construction and operational emissions are assessed individually as recommended by BAAQMD guidance. Cumulative air quality impacts are discussed with regard to the near-term cumulative construction and operational impacts of the AC34 venues and pier improvements including near-term construction-related effects of the cruise terminal. The cruise terminal would be completed and in operation after the AC34 events end, and long-term (year 2035) operational cumulative impacts are assessed only with respect to the cruise terminal.

Evaluation of air quality impacts from operational and construction air emission sources of the proposed projects under the BAAQMD *CEQA Air Quality Guidelines* requires the quantification of the estimated mass emissions of criteria air pollutants such as ROG, NO_x, PM_{10}, and $PM_{2.5}$. In addition, an evaluation of potential human health effects from the emission of specific toxic air contaminants (TACs) present in the ROG or PM emissions is also required. The following sections describe the emissions estimation, air dispersion modeling, and risk characterization methodologies that were used to evaluate project-related emissions.

Analytical Approach for Construction Emissions

Construction exhaust emissions of criteria air pollutants and toxic air contaminants (TACs, in order to evaluate health risks and hazards) were estimated by first collecting extensive information on all of the different types of air emissions sources involved in project construction and the level of activity anticipated from these sources during each phase of construction. This information was then combined with emission factors applicable to each source type to generate

Impact AQ-2: Construction of the America's Cup facilities would result in emission of criteria pollutants and precursors that would violate an air quality standard or contribute substantially to an existing or projected air quality violation. (Significant and Unavoidable with Mitigation)

A number of temporary and some permanent facilities would be constructed in preparation for the America's Cup events at various locations as described in Chapter 3, Project Description.

Demolition of existing structures would occur at Piers 27-29 and Piers 30-32 in 2012. Installation of temporary floating docks would occur at Piers 30-32, Pier 80, and Marina Green for the AC34 2012 events. Other construction activities in 2012 would include construction of the new cruise terminal building "cold shell" and paving/concrete improvements at Piers 27-29, and installation of the team base at Piers 30-32 and/or Pier 80. Emissions would also result from construction and erection of facilities at spectator locations. For the AC34 2013 events, construction of temporary floating docks and/or wave attenuators would occur at several locations (e.g., Piers 30-32, 32-36, 27-29, 26-28, 23, and 1; Piers 9-15 water basin; Rincon Point Open Water Basin; Piers 17-19; and Fort Mason). Mooring anchoring would be installed at Brannan Street Wharf Open Water Basin and Piers 27-29, and dredging would occur at Brannan Street Wharf Open Water Basin and Pier 28. The team base would remain at Piers 30-32. In addition, all temporary floating docks, wave attenuators, the communications barge, associated pilings and mooring anchoring, and the Pier 80 and Piers 30-32 team bases would be removed in 2013 after completion of the AC34 events. Phase 2 buildout of the new cruise terminal at Piers 27-29 would also start at the end of 2013 for proposed operation of the new cruise terminal in 2014, the impacts of which are addressed in Impacts AQ-9 and AQ-10, below, relative to the Cruise Terminal project.

Criteria and ozone precursor pollutant (NO_x, ROG, PM_{10}, $PM_{2.5}$) emissions from construction equipment exhaust would incrementally add to the regional atmospheric loading of these pollutants during project construction. The BAAQMD *CEQA Air Quality Guidelines* recommend the quantification of project-related criteria pollutant exhaust emissions from construction, separate from operational emissions, and comparison with significance thresholds included in the guidelines. Daily engine exhaust emissions from construction activities associated with the proposed project are compared with emission BAAQMD significance thresholds in **Table 5.8-5**. Emissions were estimated separately for construction scheduled to occur in 2012 and 2013 and then combined. Total construction emissions were divided by the number of construction days to derive average daily emissions for comparison against BAAQMD significance threshold levels. The BAAQMD construction significance thresholds for criteria pollutants are established in terms of average daily emissions, and this is how emissions are reported in Table 5.8-5.

The emissions presented in Table 5.8-5 would be generated by many different construction sources including off-road construction equipment such as loaders, backhoes, pile drivers, and cranes; in-water construction sources such as assist tugs, barges and dredge equipment; and on-road trucks. The predominant source of emissions would be off-road equipment, which would generate approximately double the emissions of in-water construction sources at most locations, except those where dredging would occur; in dredging locations, in-water construction would be the predominant emissions source. At all locations, emissions from on-road trucks would be substantially lower than emissions from either off-road or water sources.

TABLE 5.8-5
AC34 AVERAGE DAILY CONSTRUCTION-RELATED EMISSIONS

	Average Daily Construction Emissions (pounds/day)			
	ROG	NOx	PM10	PM2.5
Cruise Terminal Phase I and AC34 Construction				
Demolition at Piers 27-29	0.2	1.3	0.1	0.05
Shell Construction Piers 27-29	16	90	7	6
AC34 Venue Construction	8	69	4	3
Total[a]	24	160	10	10
BAAQMD Threshold	54	54	82	54
Above Threshold?	No	Yes	No	No

NOTES:
[a] The total emissions may not sum precisely due to rounding of subtotals.

SOURCE: ENVIRON, 2011

Construction of the America's Cup facilities would result in emission of criteria pollutants and precursors that, with the exception of NOx, would be at levels below the BAAQMD thresholds of significance. However, the estimated construction emissions of NOx would exceed the BAAQMD significance threshold, resulting in a significant air quality impact.

Impact Summary

Construction of the America's Cup facilities would result in emission of NOx that would exceed BAAQMD thresholds of significance, a *significant* impact. Implementation of **Mitigation Measure M-AQ-2a** (Construction Vehicle Emissions Minimization) and **M-AQ-2b** (Off-Road Construction Equipment), requiring use of off-road equipment that meets the most stringent U.S. EPA standards, as available, and the requirements specified under the Clean Construction Ordinance would reduce the severity of the impact. However, as discussed below, the ability of the mitigation measures to reduce the impact to less than significant depends on the feasibility of implementing the measures.

A discussion of available mitigation and associated feasibility of implementation is presented with the mitigation measures below. The results indicate that limited emission reduction would be expected due to lack of available feasible mitigation. Therefore, this impact would remain *significant and unavoidable with mitigation*.

Mitigation Measure M-AQ-2a: Construction Vehicle Emissions Minimization

To reduce construction vehicle emissions, the project sponsors shall incorporate the following into construction specifications:

- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure, Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

Operational Impacts

Impact AQ-4: Operations of the America's Cup facilities would violate an air quality standard or contribute substantially to an existing or projected air quality violation. (Significant and Unavoidable with Mitigation)

Operations of the America's Cup events during 2012 and 2013 would involve a wide variety of activities, both on water and on land, as well as helicopter activities. On-water activities would include boat and yacht trips (e.g., race-sponsored spectator vessels, race support vessels, small and large private spectator boats, and assist tugs). Boat lifts would be used at several locations. On-land activities would include generators and other equipment used at race-sponsored viewing sites and on-road vehicle trips. Helicopters would be used for broadcasting and media operations and would follow each race route. In addition, the increase in cruise ship emissions at Pier 27 during 2013 associated with the loss of the shore power hookup (which would be relocated and disconnected until completion of the AC34 events at Piers 27-29) during the America's Cup are included in the AC34 operational emissions total. No existing emissions were assumed for the AC34 event itself, as all emissions associated with the event were assumed to be new, additional emissions.

Criteria and ozone precursor pollutant (ROG, CO, NOx, PM_{10}, and $PM_{2.5}$) emissions associated with these activities were estimated for 2012 and 2013 using methods and data sources described previously and in Appendix AQ. Emissions for 2012 and 2013 were summed and divided by the total number of days of race operations to determine daily average emissions that were then compared with BAAQMD *CEQA Air Quality Guidelines* threshold levels as presented in **Table 5.8-7**. Because a variety of activities would occur throughout the AC34 event period, the number of days of "race operations" in each year was determined on the basis of the length of time that major operations are scheduled to take place (assumed to be 20 days in 2012 and 50 days in 2013 for vessel and on-road traffic and 80 days in 2012 and 90 days in 2013 for other sources), not simply the number of days on which actual races are scheduled.

As shown in Table 5.8-7, estimated average daily emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ would exceed the BAAQMD significance thresholds. Over 90 percent of daily PM and daily ROG emissions shown in Table 5.8-7 are attributable to operation of private spectator and race-support vessels. Daily emissions of NOx have substantial contributions from all sources except assist tugs.

Annual emissions from AC34 operations in 2012 and 2013 were also tabulated and compared to the BAAQMD threshold levels shown in Table 5.8-7. Emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ are predicted to exceed the BAAQMD significance thresholds. As per the above discussion of daily average emissions, over 90 percent of the annual ROG and particulate emissions would be generated by private spectator and race-support vessel operations.

America's Cup operations would result in emission of criteria pollutants and precursors that could exceed BAAQMD thresholds of significance for NOx, ROG, PM_{10}, and $PM_{2.5}$; this would be a significant air quality impact.

TABLE 5.8-7
AC34 AVERAGE DAILY AND MAXIMUM ANNUAL OPERATIONAL EMISSIONS

	Average Daily Emissions (pounds/day)			
	ROG	**NOx**	**PM10**	**PM2.5**
Race Operations				
Race Sponsored Vessels	9	102	4	4
Race Support Vessels	875	104	155	143
Small Private Vessels	1,272	198	212	195
Large Private Vessels	22	244	10	10
Assist Tugs	0	1	0	0
Other Sources[a]	21	174	5	5
Shoreside Power Temporary Decommissioning (2013)	4	94	2	2
Overall Spectator Traffic	30	62	4	4
Total Overall (2012+2013)	2,233	979	392	362
BAAQMD Threshold	54	54	82	54
Above Threshold?	Yes	Yes	Yes	Yes

	Maximum Annual Emissions (short tons/year)			
	ROG	**NOx**	**PM10**	**PM2.5**
2012 Race Operations				
Race Sponsored Vessels	1	6	0	0
Race Support Vessels	37	4	6	6
Small Private Vessels	83	12	13	12
Large Private Vessels	0	0	0	0
Assist Tugs	0	0	0	0
Other Sources[a]	1	8	0	0
Spectator Traffic	2	4	0	0
2012 Total	124	35	20	18
BAAQMD Threshold	10	10	15	10
Above Threshold?	Yes	Yes	Yes	Yes
2013 Race Operations				
Race Sponsored Vessels	1	17	1	1
Race Support Vessels	157	19	28	26
Small Private Vessels	200	32	34	31
Large Private Vessels	5	54	2	2
Assist Tugs	0	0	0	0
Other Sources[a]	4	31	1	1
Shoreside Power Temporary Decommissioning (2013)	1	21	0	0
Spectator Traffic	5	10	1	1
2013 Total	372	183	67	62
BAAQMD Thresholds	10	10	15	10
Above Threshold?	Yes	Yes	Yes	Yes

NOTES:
BAAQMD = Bay Area Air Quality Management District

[a] Other sources include boat lifts, generators, helicopters, and truck trips.

SOURCE: ENVIRON, 2011

EXHIBIT 11

DRAFT ENVIRONMENTAL IMPACT REPORT

Western SoMa Community Plan, Rezoning of Adjacent Parcels, and 350 Eighth Street Project

PLANNING DEPARTMENT
CASE NOS. 2008.0877E AND 2007.1035E
STATE CLEARINGHOUSE NO. 2009082031

	Draft EIR Publication Date:	JUNE 20, 2012
	Draft EIR Public Hearing Date:	JULY 26, 2012
	Draft EIR Public Comment Period:	JUNE 20, 2012 TO AUGUST 6, 2012

SAN FRANCISCO PLANNING DEPARTMENT

Written comments should be sent to:
Environmental Review Officer | Bill Wycko, Environmental Review Officer
bill.wycko@sfgov.org | 1650 Mission Street, Suite 400, San Francisco, CA 94103

ENVIRONMENTAL PLANNING | SAN FRANCISCO PLANNING DEPARTMENT

Impacts and Mitigation Measures

Significance Criteria

In 1999, the BAAQMD adopted its *CEQA Guidelines – Assessing the Air Quality Impacts of Projects and Plans*, as a guidance document to provide lead government agencies, consultants, and project proponents with uniform procedures for assessing air quality impacts and preparing the air quality sections of environmental documents for projects subject to CEQA. These BAAQMD guidelines were revised and updated in May 2011 and May 2012, as the *BAAQMD CEQA Air Quality Guidelines*.

The 2011 *CEQA Air Quality Guidelines* is an advisory document intended to assist lead agencies in evaluating the air quality impacts of projects and plans in the Air Basin during the environmental review process.[29] The document describes the criteria that the BAAQMD uses when reviewing and commenting on the adequacy of environmental documents. It recommends thresholds for use in determining whether projects would have significant adverse environmental impacts, identifies methodologies for predicting project emissions and impacts, and identifies measures that can be used to avoid or reduce air quality impacts. In practice, most local agencies rely on the *BAAQMD CEQA Air Quality Guidelines* when assessing the significance of air quality impacts.

BAAQMD's adoption of the significance thresholds for CEQA air quality analysis is the subject of recent judicial actions. In a ruling dated March 5, 2012, Alameda County Superior Court Judge Frank Roesch found that, in adopting updated significance thresholds for air quality impacts, the BAAQMD violated CEQA by not first studying the potential environmental impacts of its new rules, and required that the thresholds be rescinded pending formal CEQA review.[30]

Western SoMa Community Plan and Rezoning of Adjacent Parcels

Criteria Air Pollutants

The significance thresholds for assessment of a planning document, such as the proposed *Western SoMa Community Plan* and the Rezoning of Adjacent Parcels, involve an evaluation of whether:

(1) The plan would be consistent with the control measures contained in the current regional air quality plan (the *2010 Clean Air Plan*) and would support the primary objectives of that plan and would not hinder implementation of that plan; and

(2) The projected rate of increase in vehicle miles traveled or vehicle trips under the plan would be less than or equal to projected rate of population increase under the plan.

If the two foregoing questions can be answered in the affirmative, the Draft Plan would neither:

- Conflict with or obstruct implementation of the applicable air quality plan;

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29 BAAQMD, *CEQA Air Quality Guidelines*, May 2012. Available online at http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20CEQA%20Guidelines_Final_May%202012.ashx?la=en, accessed on June 13, 2012; p 1-1.

30 *California Building Industry Association v. Bay Area Air Quality Management District*, 2012. Statement of Decision. Case No. RG10-548693. Superior Court of the State of California in and for the County of Alameda.

- Violate any air quality standard or contribute substantially to an existing or projected air quality violation; nor
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors).[31]

Community Risk and Hazard Impacts

This analysis responds to the criterion that asks whether the proposed Draft Plan would:

- Expose sensitive receptors to substantial pollutant concentrations.

For plan-related health risks and hazards resulting from emissions of TACs, the BAAQMD *CEQA Air Quality Guidelines* (2011) recommend that overlay zones be established around existing and proposed land uses that emit TACs and $PM_{2.5}$. These overlay zones should be included in proposed plan policies, land use maps, and implementing ordinances. Additionally, the plan must "identify goals, policies, and objectives to minimize potential impacts."[32]

Odors

The Proposed Project would result in a significant impact with respect to odors if it would:

- Create objectionable odors affecting a substantial number of people.

For odors, a proposed land use plan must identify the location of existing and planned odor sources. The proposed land use plan must also include policies to reduce potential odor impacts. Typical odor sources of concern include wastewater treatment plants, sanitary landfills, transfer stations, composting facilities, petroleum refineries, asphalt batch plants, chemical manufacturing facilities, fiberglass manufacturing facilities, auto body shops, rendering plants, and coffee roasting facilities. BAAQMD identifies a screening distance for new sources of potential odors, such as wastewater treatment plants, landfills and transfer stations, refineries, asphalt and chemical plants, food processing facilities, and the like, of 1 or 2 miles, depending on use. In general, such setback distances would avoid the potential for significant odor impacts.

Proposed Transportation Improvements and 350 Eighth Street Project

For the proposed transportation improvements to be undertaken in the Draft Plan Area and for an individual development project such as the 350 Eighth Street project, the City relies on the quantitative thresholds of significance. **Table 4.G-3**, on the following page, summarizes these thresholds of significance. A discussion of each threshold is provided below.

[31] The bulleted statements are the first three significance criteria in the City's CEQA Initial Study checklist.
[32] BAAQMD, *CEQA Air Quality Guidelines*, May 2011. Available online at http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Updated-CEQA-Guidelines.aspx, accessed on April 19, 2012; p. 9-71.

TABLE 4.G-3
AIR QUALITY SIGNIFICANCE THRESHOLDS

Pollutant	Construction Thresholds: Average Daily Emissions (pounds/day)	Operational Thresholds: Average Daily Emissions (pounds/day)	Operational Thresholds: Annual Average Emissions (tons/year)
Criteria Air Pollutants			
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82	82	15
$PM_{2.5}$	54	54	10
CO	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	
Health Risks and Hazards for New Sources			
Excess Cancer Risk	10 per 1 million	10 per 1 million	
Chronic or Acute Hazard Index	1.0	1.0	
Incremental annual average $PM_{2.5}$	0.3 µg/m³	0.3 µg/m³	
Health Risks and Hazards for Sensitive Receptors (Cumulative from all sources within 1,000 foot zone of influence) and Cumulative Thresholds for New Sources			
Excess Cancer Risk	100 per 1 million		
Chronic Hazard Index	10.0		
Annual Average $PM_{2.5}$	0.8 µg/m³		

ppm – parts per million
µg/m3 – microgram per cubic meter

SOURCE: San Francisco Planning Department, 2012.

Ozone Precursors

As discussed previously, the Air Basin is currently designated as nonattainment for ozone and particulate matter (PM_{10} and $PM_{2.5}$). The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants, which may contribute to an existing or projected air quality violation, is based on the state and federal Clean Air Acts' emissions limits for stationary sources. The federal New Source Review program was created under the federal Clean Air Act to ensure that stationary sources of air pollution are constructed in a manner that is consistent with attainment of federal health based ambient air quality standards. Similarly, to ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors, ROG and NO_x, the offset emissions level is an annual average of 10 tons per year (or 54 lbs. per day).[33] These levels represent emissions by which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants.

[33] BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance*. October 2009; p. 17.

Although this regulation applies to new or modified stationary sources, land use development projects result in ROG and NO_x emissions as a result of increases in vehicle trips, architectural coating, and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of land use projects and those projects that result in emissions below these thresholds, would not be considered to contribute to an existing or projected air quality violation or result in a cumulatively considerable net increase in ROG and NO_x emissions. Because construction activities are temporary in nature only the average daily thresholds are applicable to construction phase emissions.

Particulate Matter (PM_{10} and $PM_{2.5}$)

The BAAQMD has not established an offset limit for $PM_{2.5}$ and the current federal Prevention of Significant Deterioration (PSD) offset limit of 100 tons per year for PM_{10} is too high and would not be an appropriate significance threshold for the Bay Area considering the nonattainment status of PM_{10}. However, the federal New Source Review emissions limits for stationary sources in nonattainment areas provide for appropriate thresholds. For PM_{10} and $PM_{2.5}$, the emissions limit under New Source Review is 15 tons per year (82 pounds per day) and 10 tons per year (54 pounds per day), respectively. These emissions limits represent levels at which a source is not expected to have an impact on air quality.[34] Similar to ozone precursor thresholds identified above, land use development projects typically result in particulate matter emissions as a result of increases in vehicle trips, space heating and natural gas combustion, landscape maintenance, and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of a land use project. Those projects that result in emissions below the New Source Review emissions limits would not be considered to contribute to an existing or projected air quality violation or result in a cumulatively considerable net increase in PM_{10} and $PM_{2.5}$ emissions. Because construction activities are temporary in nature only the average daily thresholds are applicable to construction-phase emissions.

Other Criteria Pollutants

Regional concentrations of CO in the Bay Area have not exceeded the state standards in the past 11 years and SO_2 concentrations have never exceeded the standards. The primary source of CO emissions from land use projects is vehicle traffic. Construction-related SO_2 emissions represent a negligible portion of the total basin-wide emissions and construction-related CO emissions represent less than five percent of the Bay Area total basin-wide CO emissions.[35] As discussed previously, the Bay Area is in attainment for both CO and SO_2. Furthermore, the BAAQMD has demonstrated, based on modeling, that in order to exceed the California ambient air quality standard of 9.0 ppm (8-hour average) or 20.0 ppm (1-hour average) for CO, project traffic in addition to existing traffic would need to exceed 44,000 vehicles per hour at affected intersections (or 24,000 vehicles per hour where vertical and/or horizontal mixing is limited). Therefore, given the Bay Area's attainment status and the limited CO and SO_2 emissions that could result from a land use projects, land use projects would not result in a cumulatively considerable net increase in CO or SO_2, and quantitative analysis not required.

34 *Ibid.*, p. 16.
35 *Ibid.*, p. 27.

these mid-block streets are very low, these improvements would result in minimal changes in traffic patterns, particularly because most traffic on these streets is presumably local. To the extent that the pedestrian improvements might discourage existing cut-through traffic, the volumes in question are so small as to not represent a meaningful impact relative to vehicular emissions. Therefore, no substantial air quality impacts would ensue, and the impact of installation of pedestrian improvements would be less than significant.

Mitigation: None required.

Impacts of the 350 Eighth Street Project (Project-Level Analysis)

Air quality impacts from the proposed 350 Eighth Street project would fall into two categories: short-term impacts due to construction, and long-term impacts due to project operation. These potential impacts are consistent with those described above for development in the Project Area as a whole. First, during project construction, the 350 Eighth Street project would affect local particulate concentrations primarily due to fugitive dust sources, and would also generate emissions of both criteria air pollutants and TACs from construction equipment exhaust. Over the long term, the 350 Eighth Street project would result in an increase in emissions primarily due to increased motor vehicle trips, as well as from operation of on-site stationary sources—in this case, a backup generator. Area sources (such as landscaping and the use of consumer products) would generate lesser quantities of air pollutants.

Construction Air Quality Impacts

Impact AQ-10: Construction of the 350 Eighth Street project would not result in emissions of criteria air pollutants, including ozone precursors, that would contribute to an existing or projected air quality violation or result in a cumulatively considerable increase in criteria pollutants, and would not result in substantial construction dust. (Less than Significant)

Demolition, grading and new construction activities would temporarily affect local air quality during the 350 Eighth Street project's proposed three-year construction schedule, causing temporary increases in particulate dust and other pollutants. Emissions generated from construction activities include combustion emissions of criteria air pollutants (ROG, NOx, CO, SOx, and PM_{10} and $PM_{2.5}$) primarily from construction equipment and worker vehicles, evaporative criteria pollutant emissions (ROG) from asphalt paving and architectural coating applications, and dust (including PM_{10} and $PM_{2.5}$) primarily from "fugitive" sources; that is, dust generated by construction activities and that escapes from the construction site.

Criteria Air Pollutants

Criteria pollutant emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ from construction equipment during construction of the 350 Eighth Street project would incrementally add to the regional atmospheric loading of these pollutants. The Planning Department requires quantification of project-related exhaust emissions and comparison of the emissions to applicable significance thresholds.

The HRA for the proposed Plan included an estimate of construction criteria air pollutant impacts specific to the 350 Eighth Street Project. Average daily criteria air pollutant emissions from project construction were estimated using the California Emissions Estimator Model (CalEEMod). Averaged daily construction criteria air pollutant emissions are based on estimates of construction phasing and equipment expected to be used, as provided by the project sponsor. Where project-specific data were not available (e.g., equipment horsepower and load factors) default assumptions from CalEEMod and ARB's 2011 In-Use Off-Road Equipment Emissions Inventory Model were used to estimate construction emissions. Additional modeling parameters are detailed in the HRA prepared for the proposed project. Average daily emissions are presented in **Table 4.G-5**, page 4.G-54. The methodology used to estimate construction-period emissions is described under "Approach to Analysis" on page 4.G-26.[74]

TABLE 4.G-5
350 EIGHTH STREET PROJECT CONSTRUCTION EXHAUST EMISSIONS ESTIMATES

	Estimated Daily Emissions (pounds per day)[a]			
Construction Phase	**ROG**	**NOx**	**PM10[b]**	**PM2.5[b]**
Demolition	28	88	16	16
Grading	88	628	28	28
Building Construction	1,600	6,100	288	288
Architectural Coating	11,700	720	76	76
Total Construction Emissions	13,146	7,536	408	408
Average Daily Emissions[c]	**18**	**10**	**0.6**	**0.6**
Significance Threshold	54	54	82	54
Significant?	No	No	No	No

[a] Project construction emissions estimates are based on output from CalEEMod v. 2011.1.1 air quality model, using the model's default assumptions. Assumes construction starts in 2013 and ends in 2015.
[b] Vehicle exhaust only.
[c] Based on 730-day construction schedule

SOURCE: Environ International, 2012

As indicated in Table 4.G-6, emissions from the construction of 350 Eighth Street project would not exceed the applicable significance thresholds for criteria pollutants, and construction-related air pollutant impacts would be less than significant.

Fugitive Dust

Dust can be an irritant causing watering eyes or irritation to the lungs, nose and throat. Demolition, excavation, grading and other construction activities can cause wind-blown dust to add to particulate matter in the local atmosphere. Depending on exposure, adverse health effects can occur due to this

[74] CalEEMod output sheets are presented in the health risk assessment (see footnote 53), which is available for review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2008.0877E.

standard are infeasible. It should be noted that, for specialty equipment types (e.g., drill rigs, shoring rigs and concrete pumps), it may not be feasible for construction contractors to modify their current, older equipment to accommodate the particulate filters, or for them to provide newer models with these filters pre-installed.

Significance after Mitigation: Implementation of the above measure would result in the maximum feasible reduction of diesel emissions that would contribute to construction-period health risk, thereby lowering both lifetime cancer risk and the concentration of $PM_{2.5}$ to which receptors would be exposed. However, Tier 4 equipment is not readily available at this time. Both federal (EPA) and ARB Interim Tier 4 standards took effect in January 2011 for new equipment, and it is anticipated that it will take several years, at a minimum, for this equipment to be placed in widespread use, because heavy construction equipment typically has a useful life of 15 years or more. Meanwhile, as also noted above under "Toxic Air Contaminant (TAC) Regulations," ARB has delayed implementation of emissions standards for existing off-road diesel engines, including requirements that construction equipment use so-called Best Available Control Technology or that each operator's fleet of equipment meet a specified average emissions standards. Moreover, retrofitting of off-road equipment with Level 3 VDECS is not yet required by ARB.

It is noted that construction emissions could be lower if newer equipment is employed or less powerful or smaller diesel equipment is used than assumed in the analysis. Emissions could be higher if more or larger diesel equipment is used. Depending on the regulations in place at the time construction begins, and depending on the precise mix of diesel-powered construction equipment employed, it is possible that the impact would be reduced to a less-than-significant level. However, because it cannot be stated with certainty that estimated excess cancer risk from construction emissions would be reduced to below the applicable significance thresholds, and because of the uncertainty concerning the availability and feasibility of using construction equipment that meets the performance requirements of Mitigation Measure M-AQ-11, this impact is conservatively judged to be **significant and unavoidable**.

Operational Air Quality Impacts

Impact AQ-12: Operation of the proposed 350 Eighth Street project would not conflict with the *2010 Clean Air Plan,* violate or contribute to violation of an air quality standard, or result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment, either individually or cumulatively. (Less than Significant)

Based on the Proposed Project transportation analysis,[78] the 350 Eighth Street project would generate approximately 1,870 vehicle trips per day. Operational emissions from project traffic and from operation of the proposed building were calculated using the CalEEMod (version 2011.1.1) model, and are presented in **Table 4.G-6**, page 4.G-59. As shown in Table 4.G-7, emission increases attributable to the 350 Eighth Street project would be substantially below the applicable significance thresholds. Therefore, the 350 Eighth Street project's effects of regional criteria pollutant emissions would be less than significant.

[78] LCW Consulting, *Western SoMa Community Plan Transportation Study, June 15, 2012*

TABLE 4.G-6
350 EIGHTH STREET PROJECT ESTIMATED DAILY REGIONAL EMISSIONS (2016)

	Daily Projected Emissions (Pounds per Day)[a,b,c]			
	ROG	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Area-Source Emissions	12	1	<1	<1
Mobile-Source (Vehicle) Emissions	15	27	22	2
TOTAL	**27**	**29**	**22**	**2**
Significance Threshold	*54*	*54*	*82*	*54*
Significant?	No	No	No	No
	Annual Projected Emissions (Tons per Year)[a,b,c]			
	ROG	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Area-Source Emissions	2.3	0.3	<0.1	<0.1
Mobile-Source (Vehicle) Emissions	0.8	1.4	1.3	0.1
TOTAL	**3.1**	**1.6**	**1.4**	**0.1**
Significance Threshold	*10*	*10*	*15*	*10*
Significant?	No	No	No	No

NOTES:
[a] Emission factors were generated by the CalEEMod (v. 2011.1.1) model for San Francisco County, and assume a default vehicle mix. All daily estimates are the average of summer and winter conditions. Traffic generated emissions based on trip generation from the project transportation study.
[b] Columns may not total due to rounding.
[c] Emergency generator emissions not included, as they were modeled in the SCREEN3 model and found to amount to less than 0.002 pounds per day of any pollutant averaged over the course of the year, and less than 0.02 pounds per day of any pollutant on a day when the generator is tested.

SOURCE: Environ International, 2012; Environmental Science Associates, 2012.

The proposed 350 Eighth Street project would be generally consistent with the *San Francisco General Plan*, as proposed for amendment by the *Western SoMa Community Plan*. Additionally, the General Plan, Planning Code, and City Charter implement various Transportation Control Measures identified in the *2010 Clean Air Plan* through the City's Transit First Program, bicycle parking requirements, transit development impact fees applicable to commercial uses, and other actions.

Consistency with this *2010 Bay Area Clean Air Plan* is the basis for determining whether the proposed project would conflict with or obstruct implementation of an applicable air quality plan. A consistency analysis of the proposed project in relation to the goals and objectives of the *Clean Air Plan* focuses on the proposed project's support of the primary goals in the *Clean Air Plan*, the proposed project's implementation of applicable control measures in the *Clean Air Plan*, and evaluation of any potential disruption to or hindrance of implementation of the *Clean Air Plan*. In determining whether a proposed project or plan would conflict with the *Clean Air Plan*, three criteria area evaluated: would the Project implement the applicable control measures in the *Clean Air Plan*; would the Project disrupt or hinder implementation of any of these control measures; and would the Project support the primary goals of the *Clean Air Plan*?

EXHIBIT 12

DRAFT ENVIRONMENTAL IMPACT REPORT

200-214 6th Street Affordable Housing with Ground-Floor Retail Project

PLANNING DEPARTMENT
CASE NO. 2011.0119E

STATE CLEARINGHOUSE
NO. 2012082052

Draft EIR Publication Date: February 27, 2013

Draft EIR Public Hearing Date: April 4, 2013

Draft EIR Public Comment Period: February 27, 2013 – April 15, 2013

SAN FRANCISCO PLANNING DEPARTMENT

Written comments should be sent to:
Environmental Review Officer | 1650 Mission Street, Suite 400 | San Francisco, CA 94103

Topics:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact	Not Applicable
7. AIR QUALITY—Would the project:					
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal, state, or regional ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐	☐

Setting

The Bay Area Air Quality Management District (BAAQMD) is the regional agency with jurisdiction over the nine-county San Francisco Bay Area Air Basin (SFBAAB), which includes San Francisco, Alameda, Contra Costa, Marin, San Mateo, Santa Clara and Napa counties and portions of Sonoma and Solano counties. BAAQMD is responsible for attaining and maintaining air quality in the SFBAAB within federal and state air quality standards, as established by the federal Clean Air Act (CAA) and the California Clean Air Act (CCAA), respectively. Specifically, the BAAQMD has the responsibility to monitor ambient air pollutant levels throughout the SFBAAB and to develop and implement strategies to attain the applicable federal and state standards. The CAA and the CCAA require plans to be developed for areas that do not meet air quality standards, generally. The most recent air quality plan, the *2010 Clean Air Plan*, was adopted by the BAAQMD on September 15, 2010. The *2010 Clean Air Plan* updates the *Bay Area 2005 Ozone Strategy* in accordance with the requirements of the CCAA to implement all feasible measures to reduce ozone; provide a control strategy to reduce ozone, particulate matter, air toxics, and GHGs in a single, integrated plan; and establish emission control measures to be adopted or implemented. The primary goals of the *2010 Clean Air Plan* are to:

- Attain air quality standards;

- Reduce population exposure and protect public health in the San Francisco Bay Area; and
- Reduce GHG emissions and protect the climate.

The *2010 Clean Air Plan* represents the most current applicable air quality plan for the SFBAAB. Consistency with this plan is the basis for determining whether the proposed project would conflict with or obstruct implementation of an applicable air quality plan.

Criteria Air Pollutants

In accordance with the state and federal CAAs, air pollutant standards are identified for the following six criteria air pollutants: ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and lead. These air pollutants are termed criteria air pollutants because they are regulated by developing specific public health- and welfare-based criteria as the basis for setting permissible levels. In general, the SFBAAB experiences low concentrations of most pollutants when compared to federal or state standards. The SFBAAB is designated as either in attainment[40] or unclassified for most criteria pollutants with the exception of ozone, $PM_{2.5}$, and PM_{10}, for which these pollutants are designated as non-attainment for either the state or federal standards. By its very nature regional air pollution is largely a cumulative impact in that no single project is sufficient in size to, by itself, result in non-attainment of air quality standards. Instead, a project's individual emissions contribute to existing cumulative air quality impacts. If a project's contribution to cumulative air quality impacts is considerable, then the project's impact on air quality would be considered significant.[41]

Land use projects may contribute to regional criteria air pollutants during the construction and operational phases of a project. Table 3, page 71, identifies air quality significance thresholds followed by a discussion of each threshold. Projects that would result in criteria air pollutant emissions below these significance thresholds would not violate an air quality standard, contribute substantially to an air quality violation or result in a cumulatively considerable net increase in criteria air pollutants within the SFBAAB.

[40] "Attainment" status refers to those regions that are meeting federal and/or state standards for a specified criteria pollutant. "Non-attainment" refers to regions that do not meet federal and/or state standards for a specified criteria pollutant. "Unclassified" refers to regions where there is not enough data to determine the region's attainment status.

[41] Bay Area Air Quality Management District (BAAQMD). *California Environmental Quality Act Air Quality Guidelines*. May 2011. Page 2-1.

Table 3
Criteria Air Pollutant Significance Thresholds

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs./day)	Average Daily Emissions (lbs./day)	Annual Average Emissions (tons/year)
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82 (exhaust)	82	15
$PM_{2.5}$	54 (exhaust)	54	10
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	

Ozone Precursors. As discussed previously, the SFBAAB is currently designated as non-attainment for ozone and particulate matter (PM_{10} and $PM_{2.5}$[42]). Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and oxides of nitrogen (NO_x). The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants, which may contribute to an existing or projected air quality violation, are based on the state and federal Clean Air Acts emissions limits for stationary sources. The federal New Source Review (NSR) program was created by the federal CAA to ensure that stationary sources of air pollution are constructed in a manner that is consistent with attainment of federal health based ambient air quality standards. Similarly, to ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors, ROG and NO_x, the offset emissions level is an annual average of 10 tons per year (or 54 pounds (lbs.) per day).[43] These levels represent emissions by which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants.

Although this regulation applies to new or modified stationary sources, land use development projects result in ROG and NO_x emissions as a result of increases in vehicle trips, architectural coating and construction activities. Therefore, the above thresholds can be applied to the construction and operational

[42] PM_{10} is often termed "coarse" particulate matter and is made of particulates that are 10 microns in diameter or larger. $PM_{2.5}$, termed "fine" particulate matter, is composed of particles that are 2.5 microns or less in diameter.

[43] BAAQMD, Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance. October 2009. At page 17.

phases of land use projects and those projects that result in emissions below these thresholds, would not be considered to contribute to an existing or projected air quality violation or result in a considerable net increase in ROG and NO_x emissions. Due to the temporary nature of construction activities, only the average daily thresholds are applicable to construction phase emissions.

Particulate Matter (PM_{10} and $PM_{2.5}$). The BAAQMD has not established an offset limit for $PM_{2.5}$. However, the emissions limit in the federal NSR for stationary sources in nonattainment areas is an appropriate significance threshold. For PM_{10} and $PM_{2.5}$, the emissions limit under NSR is 15 tons per year (82 lbs. per day) and 10 tons per year (54 lbs. per day), respectively. These emissions limits represent levels at which a source is not expected to have an impact on air quality.[44] Similar to ozone precursor thresholds identified above, land use development projects typically result in particulate matter emissions as a result of increases in vehicle trips, space heating and natural gas combustion, landscape maintenance, and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of a land use project. Again, because construction activities are temporary in nature, only the average daily thresholds are applicable to construction-phase emissions.

Fugitive Dust. Fugitive dust emissions are typically generated during construction phases. Studies have shown that the application of best management practices (BMPs) at construction sites significantly control fugitive dust.[45] Individual measures have been shown to reduce fugitive dust by anywhere from 30 percent to 90 percent.[46] The BAAQMD has identified a number of BMPs to control fugitive dust emissions from construction activities.[47] The City's Construction Dust Control Ordinance (Ordinance 176-08, effective July 30, 2008) requires a number of measures to control fugitive dust to ensure that construction projects do not result in visible dust. The BMPs employed in compliance with the City's Construction Dust Control Ordinance is an effective strategy for controlling construction-related fugitive dust.

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44 Ibid, p. 16.

45 Western Regional Air Partnership. 2006. *WRAP Fugitive Dust Handbook*. September 7, 2006. This document is available online at *http://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf*, accessed February 16, 2012.

46 BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance*. October 2009, p. 27.

47 BAAQMD, *CEQA Air Quality Guidelines*, May 2011. This document is available online at *http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Updated-CEQA-Guidelines.aspx*, accessed February 27, 2012.

(retail, likely restaurant). During the project's approximately 20-month construction period, construction activities would have the potential to result in fugitive dust emissions, criteria air pollutants, and DPM, as discussed further below.

Impact AQ-1: The proposed project's construction activities would generate fugitive dust and criteria air pollutants, but would not violate an air quality standard, contribute substantially to an existing or projected air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants. (Less than Significant)

Fugitive Dust

Project-related demolition, excavation, grading, and other construction activities may cause wind-blown dust that could contribute particulate matter into the local atmosphere. Although there are federal standards for air pollutants and implementation of state and regional air quality control plans, air pollutants continue to have impacts on human health throughout the country. California has found that particulate matter exposure can cause health effects at lower levels than national standards. The current health burden of particulate matter demands that, where possible, public agencies take feasible available actions to reduce sources of particulate matter exposure. According to the California Air Resources Board, reducing ambient particulate matter from 1998-2000 levels to natural background concentrations in San Francisco would prevent over 200 premature deaths.

Dust can be an irritant causing watering eyes or irritation to the lungs, nose, and throat. Demolition, excavation, grading, and other construction activities can cause wind-blown dust to add to particulate matter in the local atmosphere. Depending on exposure, adverse health effects can occur due to general particulate matter and specific contaminants such as lead or asbestos that may be constituents of soil.

In response, the San Francisco Board of Supervisors approved a series of amendments to the San Francisco Building and Health Codes generally referred hereto as the Construction Dust Control Ordinance (Ordinance 176-08, effective July 30, 2008) with the intent of reducing the quantity of dust generated during site preparation, demolition and construction work in order to protect the health of the general public and of onsite workers, to minimize public nuisance complaints, and to avoid orders to stop work by the Department of Building Inspection (DBI).

The Ordinance requires that all site preparation work, demolition, or other construction activities within San Francisco that have the potential to create dust or to expose or disturb more than 10 cubic yards or 500 square feet of soil comply with specified dust control measures whether or not the activity requires a permit from DBI. The Director of DBI may waive this requirement for activities on sites less than one half-acre that are unlikely to result in any visible wind-blown dust.

The project sponsor and the contractor responsible for construction activities at the project site shall use the following practices to control construction dust on the site or other practices that result in equivalent dust control that are acceptable to the Director. Dust suppression activities may include watering all active construction areas sufficiently to prevent dust from becoming airborne; increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water must be used if required by Article 21, Section 1100 et seq. of the San Francisco Public Works Code. If not required, reclaimed water should be used whenever possible. Contractors shall provide as much water as necessary to control dust (without creating run-off in any area of land clearing, and/or earth movement). During excavation and dirt-moving activities, contractors shall wet sweep or vacuum the streets, sidewalks, paths and intersections where work is in progress at the end of the workday. Inactive stockpiles (where no disturbance occurs for more than seven days) greater than 10 cubic yards or 500 square feet of excavated materials, backfill material, import material, gravel, sand, road base, and soil shall be covered with a 10 millimeter (0.01 inch) polyethylene plastic (or equivalent) tarp, braced down, or use other equivalent soil stabilization techniques.

These regulations and procedures set forth by the San Francisco Building Code would ensure that potential dust-related air quality impacts would be reduced to a level of insignificance.

Criteria Air Pollutants

As discussed above, construction activities would also result in emissions of criteria air pollutants. To assist lead agencies in determining whether short-term construction-related air pollutant emissions require further analysis as to whether the project may exceed the criteria air pollutant significance thresholds shown in Table 4, the BAAQMD, in their *CEQA Air Quality Guidelines* (May 2011), has developed screening criteria. If all the screening criteria are met by a proposed project, then the lead agency or applicant does not need to perform a detailed air quality assessment of the project's air pollutant emissions, and construction of the proposed project would result in less-than-significant criteria air pollutant impacts. Projects that exceed the screening sizes may require further project-level quantification to determine whether criteria air pollutant emissions may exceed significance thresholds. The *CEQA Air Quality Guidelines* note that the screening levels are generally representative of new development on greenfield[56] sites without any form of mitigation measures taken into consideration. In

[56] Agricultural or forest land or an undeveloped site earmarked for commercial, residential, or industrial projects.

addition, the screening criteria do not account for project design features, attributes, or local development requirements that could also result in lower emissions. For projects that are mixed-use, infill and/or proximate to transit service and local services such as the proposed project, emissions would be expected to be less than the greenfield-type project that the screening criteria are based upon.

The proposed project would include 67 residential units and approximately 2,845 square feet of ground-floor commercial space (retail, likely restaurant). The proposed project would be below the criteria air pollutant screening sizes for mid-rise residential (494 units) identified in the BAAQMD's *CEQA Air Quality Guidelines*. The guidelines do not have screening criteria for generic commercial, retail, or restaurant uses; however, the screening criteria for various applicable retail and restaurant uses are at a minimum of 5,000 square feet (24-hour convenience market) or 8,000 square feet (fast food restaurant without drive-through).

Thus, quantification of construction-related criteria air pollutant emissions is not required, and the proposed project's construction activities would not exceed any of the significance thresholds for criteria air pollutants, and would result in a less-than-significant construction criteria air pollutant impact.

Impact AQ-2: The proposed project's construction activities would generate toxic air contaminants, including diesel particulate matter, which would expose sensitive receptors to substantial pollutant concentrations. (Less than Significant with Mitigation)

Off-road equipment (which includes construction-related equipment) was once estimated to be the second largest source of ambient DPM emissions in California. However, newer and more refined emission inventories have substantially lowered the estimates of DPM emissions from off-road equipment such that off-road equipment is now considered the sixth largest source of DPM emissions in California.[57] This reduction in emissions is due, in part, to effects of the economic recession and the decline in construction. Also, more refined emissions estimation methodologies are showing decreases in emissions. For example, revised particulate matter (PM) emission estimates for the year 2010, for which DPM is a major component of total PM, have decreased by 83 percent from previous estimates for the SFBAAB.[58] Approximately half of the reduction can be attributed to the economic recession and

[57] California Air Resources Board (ARB), *Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments to the Regulation for In-Use Off-Road Diesel-Fueled Fleets and the Off-Road Large Spark-Ignition Fleet Requirements*, October 2010.

[58] ARB, "In-Use Off-Road Equipment, 2011 Inventory Model," Query accessed online, April 2, 2012, http://www.arb.ca.gov/msei/categories.htm#inuse_or_category.

EXHIBIT 13

SAN FRANCISCO
PLANNING DEPARTMENT

Preliminary Mitigated Negative Declaration

1650 Mission St.
Suite 400
San Francisco,
CA 94103-2479

Reception:
415.558.6378

Fax:
415.558.6409

Planning
Information:
415.558.6377

Date:	March 20, 2013
Case No.:	**2007.0385E**
Project Title:	**345 Brannan Street**
Zoning:	Mixed Use Office District 65-X Height and Bulk District
Block/Lot:	3788/039
Lot Size:	24,110 square feet
Project Sponsor:	Charles Bloszies, (415) 834-9002
Staff Contact:	Don Lewis, (415) 575-9095, don.lewis@sfgov.org

PROJECT DESCRIPTION:

The "L"-shaped project site is located mid-block between Stanford and Third Streets on the block bounded by Brannan Street to the north, Third Street to the west, Townsend Street to the south, and Second Street to the east within the South of Market area. The proposed project involves the removal of an existing 94-space surface parking lot and construction of a new, five-story, 65-foot-tall, office building totaling approximately 116,615 square feet in size with 26 below-grade parking spaces. The project sponsor proposes two options for the ground-floor. Option 1 would include ground-floor retail/restaurant use, while Option 2 would include ground-floor office use. Under Option 1, the building would contain 95,585 square feet of office use and 7,000 square feet of ground-floor retail/restaurant use. Under Option 2, the building would contain 102,585 square feet of office use. Under both options, approximately 825 square feet of private open space would be provided on the second floor and approximately 4,000 square feet of common open space would be provided on the roof deck. Pedestrian access would be from Brannan Street and vehicular access to the underground parking garage would be from Stanford Street. The proposed project would require Planning Commission authorization under Planning Code Section 321 (Office Development Annual Limit), Section 329 (Large Project Authorization), and Section 295 (Shadow). The project site is located within the Eastern Neighborhoods Plan Area.

FINDING:

This project could not have a significant effect on the environment. This finding is based upon the criteria of the Guidelines of the State Secretary for Resources, Sections 15064 (Determining Significant Effect), 15065 (Mandatory Findings of Significance), and 15070 (Decision to prepare a Negative Declaration), and the following reasons as documented in the Initial Evaluation (Initial Study) for the project, which is attached.

Mitigation measures are included in this project to avoid potentially significant effects. See pages 127-134.

cc: Chuck Bloszies, Project Sponsor; Supervisor Jane Kim, District 6; Virna Byrd, M.D.F.

Topics:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact	Not Applicable
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐	☐

Setting

The Bay Area Air Quality Management District (BAAQMD) is the regional agency with jurisdiction over the nine-county San Francisco Bay Area Air Basin (SFBAAB), which includes San Francisco, Alameda, Contra Costa, Marin, San Mateo, Santa Clara, and Napa Counties and portions of Sonoma and Solano Counties. The BAAQMD is responsible for attaining and maintaining air quality in the SFBAAB within federal and state air quality standards, as established by the federal Clean Air Act (CAA) and the California Clean Air Act (CCAA), respectively. Specifically, the BAAQMD has the responsibility to monitor ambient air pollutant levels throughout the SFBAAB and to develop and implement strategies to attain the applicable federal and state standards. The CAA and the CCAA require plans to be developed for areas that do not meet air quality standards, generally. The most recent air quality plan, the *2010 Clean Air Plan*, was adopted by the BAAQMD on September 15, 2010. The *2010 Clean Air Plan* updates the *Bay Area 2005 Ozone Strategy* in accordance with the requirements of the CCAA to implement all feasible measures to reduce ozone; provide a control strategy to reduce ozone, particulate matter, air toxics, and greenhouse gases in a single, integrated plan; and establish emission control measures to be adopted or implemented. The 2010 Clean Air Plan contains the following primary goals:

- Attain air quality standards;
- Reduce population exposure and protect public health in the San Francisco Bay Area; and
- Reduce greenhouse gas emissions and protect the climate.

The *2010 Clean Air Plan* represents the most current applicable air quality plan for the SFBAAB. Consistency with this plan is the basis for determining whether the proposed project would conflict with or obstruct implementation of an applicable air quality plan.

Criteria Air Pollutants

In accordance with the state and federal CAAs, air pollutant standards are identified for the following six criteria air pollutants: ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. These air pollutants are termed criteria air

pollutants because they are regulated by developing specific public health- and welfare-based criteria as the basis for setting permissible levels. In general, the SFBAAB experiences low concentrations of most pollutants when compared to federal or state standards. The SFBAAB is designated as either in attainment[24] or unclassified for most criteria pollutants with the exception of ozone, $PM_{2.5}$, and PM_{10}, for which these pollutants are designated as non-attainment for either the state or federal standards. By its very nature, regional air pollution is largely a cumulative impact in that no single project is sufficient in size to, by itself, result in non-attainment of air quality standards. Instead, a project's individual emissions contribute to existing cumulative air quality impacts. If a project's contribution to cumulative air quality impacts is considerable, then the project's impact on air quality would be considered significant.[25]

Land use projects may contribute to regional criteria air pollutants during the construction and operational phases of a project. Table 1, below, identifies air quality significance thresholds followed by a discussion of each threshold. Projects that would result in criteria air pollutant emissions below these significance thresholds would not violate an air quality standard, contribute substantially to an air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants within the SFBAAB.

Ozone Precursors. As discussed previously, the SFBAAB is currently designated as non-attainment for ozone and particulate matter (PM10 and PM2.5[26]). Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and oxides of nitrogen (NOx). The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants, which may contribute to an existing or projected air quality violation, are based on the state and federal Clean Air Acts emissions limits for stationary sources. The federal New Source Review (NSR) program was created by the federal CAA to ensure that stationary sources of air pollution are constructed in a manner that is consistent with attainment of federal health based ambient air quality standards. Similarly, to ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors ROG and NOx, the offset emissions level is an annual average of 10 tons per

24 "Attainment" status refers to those regions that are meeting federal and/or state standards for a specified criteria pollutant. "Non-attainment" refers to regions that do not meet federal and/or state standards for a specified criteria pollutant. "Unclassified" refers to regions where there is not enough data to determine the region's attainment status.

25 Bay Area Air Quality Management District (BAAQMD), *California Environmental Quality Act Air Quality Guidelines*, May 2011, page 2-1.

26 PM_{10} is often termed "coarse" particulate matter and is made of particulates that are 10 microns in diameter or smaller. $PM_{2.5}$, termed "fine" particulate matter, is composed of particles that are 2.5 microns or less in diameter.

year (or 54 pounds (lbs.) per day).[27] These levels represent emissions by which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants.

Although this regulation applies to new or modified stationary sources, land use development projects result in ROG and NOx emissions as a result of increases in vehicle trips, architectural coating and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of land use projects and those projects that result in emissions below these thresholds, would not be considered to contribute to an existing or projected air quality violation or result in a considerable net increase in ROG and NOx emissions. Due to the temporary nature of construction activities, only the average daily thresholds are applicable to construction phase emissions.

Table 1
Criteria Air Pollutant Significance Thresholds

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs./day)	Average Daily Emissions (lbs./day)	Annual Average Emissions (tons/year)
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82 (exhaust)	82	15
$PM_{2.5}$	54 (exhaust)	54	10
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	

Particulate Matter (PM_{10} and $PM_{2.5}$). The BAAQMD has not established an offset limit for $PM_{2.5}$. However, the emissions limit in the federal NSR for stationary sources in nonattainment areas is an appropriate significance threshold. For PM_{10} and $PM_{2.5}$, the emissions limit under NSR is 15 tons per year (82 lbs. per day) and 10 tons per year (54 lbs. per day), respectively. These emissions limits represent levels at which a source is not expected to have an impact on air quality.[28] Similar to ozone precursor thresholds identified above, land use development projects typically result in particulate matter emissions as a result of increases in vehicle trips, space heating and natural gas combustion, landscape maintenance, and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of a land use project. Again, because

27 BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance*, October 2009, page 17.

28 BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance*, October 2009, page 16.

construction activities are temporary in nature, only the average daily thresholds are applicable to construction-phase emissions.

Fugitive Dust. Fugitive dust emissions are typically generated during construction phases. Studies have shown that the application of best management practices (BMPs) at construction sites significantly control fugitive dust.[29] Individual measures have been shown to reduce fugitive dust by anywhere from 30 to 90 percent.[30] The BAAQMD has identified a number of BMPs to control fugitive dust emissions from construction activities.[31] The City's Construction Dust Control Ordinance (Ordinance 176-08, effective July 30, 2008) requires a number of measures to control fugitive dust to ensure that construction projects do not result in visible dust. The BMPs employed in compliance with the City's Construction Dust Control Ordinance is an effective strategy for controlling construction-related fugitive dust.

Local Health Risks and Hazards

In addition to criteria air pollutants, individual projects may emit toxic air contaminants (TACs). TACs collectively refer to a diverse group of air pollutants that are capable of causing chronic (i.e., of long-duration) and acute (i.e., severe but of short-term) adverse effects to human health, including carcinogenic effects. A TAC is defined in California Health and Safety Code §39655 as an air pollutant which may cause or contribute to an increase in mortality or serious illness, or which may pose a present or potential hazard to human health. Human health effects of TACs include birth defects, neurological damage, cancer, and death. There are hundreds of different types of TACs with varying degrees of toxicity. Individual TACs vary greatly in the health risk they present; at a given level of exposure, one TAC may pose a hazard that is many times greater than another.

Unlike criteria air pollutants, TACs do not have ambient air quality standards but are regulated by the BAAQMD using a risk-based approach. This approach uses a health risk assessment to determine which sources and pollutants to control as well as the degree of control. A health risk assessment is an analysis in which human health exposure to toxic substances is estimated, and

29 Western Regional Air Partnership. *2006. WRAP Fugitive Dust Handbook*. September 7, 2006. This document is available online at *http://www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf*, accessed February 16, 2012.

30 BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance*, October 2009, page 27.

31 BAAQMD, *CEQA Air Quality Guidelines*, May 2011.

Construction Air Quality Impacts

Project-related air quality impacts fall into two categories: short-term impacts due to construction and long term impacts due to project operation. The following addresses construction-related air quality impacts resulting from the proposed project.

Impact AQ-1: The proposed project's construction activities would generate fugitive dust and criteria air pollutants, but would not violate an air quality standard, contribute substantially to an existing or projected air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants. (Less than Significant)

Construction activities (short-term) typically result in emissions of fugitive dust, criteria air pollutants, and DPM. Emissions of criteria pollutants and DPM are primarily a result of the combustion of fuel from on-road and off-road vehicles. However, ROGs are also emitted from activities that involve painting or other types of architectural coatings or asphalt paving activities. The proposed project includes the removal of the surface parking lot and the construction of a five-story office building. During the project's approximately ten to twelve month construction period, construction activities would have the potential to result in fugitive dust emissions, criteria air pollutants and DPM.

Fugitive Dust

Project-related demolition, excavation, grading, and other construction activities may cause wind-blown dust that could contribute particulate matter into the local atmosphere. Although there are federal standards for air pollutants and implementation of state and regional air quality control plans, air pollutants continue to have impacts on human health throughout the country. California has found that particulate matter exposure can cause health effects at lower levels than national standards. The current health burden of particulate matter demands that, where possible, public agencies take feasible available actions to reduce sources of particulate matter exposure. According to the California Air Resources Board, reducing ambient particulate matter from 1998-2000 levels to natural background concentrations in San Francisco would prevent over 200 premature deaths.

Dust can be an irritant causing watering eyes or irritation to the lungs, nose, and throat. Demolition, excavation, grading, and other construction activities can cause wind-blown dust to add to particulate matter in the local atmosphere. Depending on exposure, adverse health effects can occur due to this particulate matter in general and also due to specific contaminants such as lead or asbestos that may be constituents of soil.

In response, the San Francisco Board of Supervisors approved a series of amendments to the San Francisco Building and Health Codes generally referred hereto as the Construction Dust Control

Ordinance (Ordinance 176-08, effective July 30, 2008) with the intent of reducing the quantity of dust generated during site preparation, demolition and construction work in order to protect the health of the general public and of onsite workers, minimize public nuisance complaints, and to avoid orders to stop work by the Department of Building Inspection (DBI).

The Ordinance requires that all site preparation work, demolition, or other construction activities within San Francisco that have the potential to create dust or to expose or disturb more than 10 cubic yards or 500 square feet of soil comply with specified dust control measures whether or not the activity requires a permit from DBI. The Director of DBI may waive this requirement for activities on sites less than one half-acre that are unlikely to result in any visible wind-blown dust.

In compliance with the Construction Dust Control Ordinance, the project sponsor and the contractor responsible for construction activities at the project site would be required to use the following practices to control construction dust on the site or other practices that result in equivalent dust control that are acceptable to the Director. Dust suppression activities may include watering all active construction areas sufficiently to prevent dust from becoming airborne; increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water must be used if required by Article 21, Section 1100 et seq. of the San Francisco Public Works Code. If not required, reclaimed water should be used whenever possible. Contractors shall provide as much water as necessary to control dust (without creating run-off in any area of land clearing, and/or earth movement). During excavation and dirt-moving activities, contractors shall wet sweep or vacuum the streets, sidewalks, paths, and intersections where work is in progress at the end of the workday. Inactive stockpiles (where no disturbance occurs for more than seven days) greater than 10 cubic yards or 500 square feet of excavated materials, backfill material, import material, gravel, sand, road base, and soil shall be covered with a 10 millimeter (0.01 inch) polyethylene plastic (or equivalent) tarp, braced down, or use other equivalent soil stabilization techniques.

For projects over one half-acre, such as the proposed project, the Dust Control Ordinance requires that the project sponsor submit a Dust Control Plan for approval by the San Francisco Department of Public Health. DBI will not issue a building permit without written notification from the Director of Public Health that the applicant has a site-specific Dust Control Plan, unless the Director waives the requirement. Interior-only tenant improvement projects that are over one-half acre in size that will not produce exterior visible dust are exempt from the site-specific Dust Control Plan requirement.

The site-specific Dust Control Plan would require the project sponsor to: submit of a map to the Director of Public Health showing all sensitive receptors within 1,000 feet of the site; wet down areas of soil at least three times per day; provide an analysis of wind direction and install upwind and downwind particulate dust monitors; record particulate monitoring results; hire an independent, third-party to conduct inspections and keep a record of those inspections; establish shut-down conditions based on wind, soil migration, etc.; establish a hotline for surrounding community members who may be potentially affected by project-related dust; limit the area subject to construction activities at any one time; install dust curtains and windbreaks on the property lines, as necessary; limit the amount of soil in hauling trucks to the size of the truck bed and securing with a tarpaulin; enforce a 15 mph speed limit for vehicles entering and exiting construction areas; sweep affected streets with water sweepers at the end of the day; install and utilize wheel washers to clean truck tires; terminate construction activities when winds exceed 25 miles per hour; apply soil stabilizers to inactive areas; and sweep off adjacent streets to reduce particulate emissions. The project sponsor would be required to designate an individual to monitor compliance with these dust control requirements.

Compliance with these regulations and procedures set forth by the San Francisco Building Code would ensure that potential dust-related air quality impacts would be reduced to a level of insignificance.

Criteria Air Pollutants

As discussed above, construction activities would result in emissions of criteria air pollutants from the use of off- and on-road vehicles and equipment. To assist lead agencies in determining whether short-term construction-related air pollutant emissions require further analysis as to whether the project may exceed the criteria air pollutant significance thresholds shown in Table 1, above, the BAAQMD, in its *CEQA Air Quality Guidelines* (May 2011), developed screening criteria. If a proposed project meets the screening criteria, then construction of the proposed project would result in less-than-significant criteria air pollutant impacts. A project that exceeds the screening criteria may require a detailed air quality assessment to determine whether criteria air pollutant emissions would exceed significance thresholds. The *CEQA Air Quality Guidelines* note that the screening levels are generally representative of new development on greenfield[40] sites without any form of mitigation measures taken into consideration. In addition, the screening criteria do not account for project design features, attributes, or local development requirements that could also result in lower emissions. For projects that are mixed-use, infill, and/or proximate to transit service and local services, emissions would be expected to be less than the greenfield-type project that the screening criteria are based upon.

40 A greenfield site refers to agricultural or forest land or an undeveloped site earmarked for commercial, residential, or industrial projects.

The proposed project involves the removal of a surface parking lot and construction of a five-story office building with potential ground-floor retail use. The proposed project would be below the criteria air pollutant screening sizes for a General Office Building (277,000 square feet) and Quality Restaurant[41] (277,000 square feet) identified in the BAAQMD's *CEQA Air Quality Guidelines*. Thus, quantification of construction-related criteria air pollutant emissions is not required, and the proposed project's construction activities would not exceed any of the significance thresholds for criteria air pollutants, and would result in a less-than-significant construction criteria air pollutant impact.

Impact AQ-2: The proposed project's construction activities would generate toxic air contaminants, including diesel particulate matter, but would not expose sensitive receptors to substantial pollutant concentrations. (Less than Significant)

Off-road equipment (which includes construction-related equipment) is a large contributor to DPM emissions in California, although since 2007, the ARB has found the emissions to be substantially lower than previously expected.[42] Newer and more refined emission inventories have substantially lowered the estimates of DPM emissions from off-road equipment such that off-road equipment is now considered the sixth largest source of DPM emissions in California.[43] This reduction in emissions is due, in part, to effects of the economic recession and refined emissions estimation methodologies. For example, revised particulate matter (PM) emission estimates for the year 2010, which DPM is a major component of total PM, have decreased by 83 percent from previous estimates for the SFBAAB.[44] Approximately half of the reduction can be attributed to the economic recession and approximately half can be attributed to updated assumptions independent of the economic recession (e.g., updated methodologies used to better assess construction emissions).[45]

41 Although the retail use of the proposed project Option 1 has not yet been determined, a Quality Restaurant represents a best estimate at this time and is closest to any of uses list on Table 3-1.

42 ARB, *Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments to the Regulation for In-Use Off-Road Diesel-Fueled Fleets and the Off-Road Large Spark-Ignition Fleet Requirements*, p.1 and p. 13 (Figure 4), October 2010.

43 ARB, *Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments to the Regulation for In-Use Off-Road Diesel-Fueled Fleets and the Off-Road Large Spark-Ignition Fleet Requirements*, October 2010.

44 ARB, "In-Use Off-Road Equipment, 2011 Inventory Model," Query accessed online, April 2, 2012, http://www.arb.ca.gov/msei/categories.htm#inuse_or_category.

45 ARB, *Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Amendments to the Regulation for In-Use Off-Road Diesel-Fueled Fleets and the Off-Road Large Spark-Ignition Fleet Requirements*, October 2010.

EXHIBIT 14

SAN FRANCISCO
PLANNING DEPARTMENT

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PRELIMINARY MITIGATED NEGATIVE DECLARATION

Date:	March 27, 2013
Case No.:	2011.0702E
Project Title:	101 Polk Street Residential Development
Block and Lot:	0811/002 & 003
Zoning:	C-3-G (Downtown Commercial General) 120-X Height and Bulk District
Lot Size:	13,200 square feet
Project Sponsor:	Marc Babsin, Emerald Fund, (415) 489-1313 marcb@emeraldfund.com
Staff Contact:	Andrea Contreras, (415) 575-9044 andrea.contreras@sfgov.org

PROJECT DESCRIPTION:

The project site (site) is located at 101 Polk Street, at the northwest corner of Polk and Hayes Streets in the Downtown/Civic Center area of San Francisco, approximately one-half block south of San Francisco City Hall, one block north of Market Street, and about three blocks from the Civic Center Bay Area Rapid Transit (BART) Station. The site is bordered by Hayes Street to the south, Lech Walesa Alley to the north, and Polk Street to the east. The 13,200-square-foot site is currently in use as a surface parking lot. The project sponsor proposes to build a 13-story, 162 unit residential building on the site. A subterranean garage would contain vehicle and bicycle parking, and would be accessible from the adjacent Lech Walesa Alley. Street frontage along Polk and Hayes Streets would consist of walk-up residential units, as well as the building's lobby and leasing area. The proposed project would require three exceptions per Planning Code Section 309 for parking (Code Section 151.1) and rear yard requirements (Code Section 134 (d)), as well as the continuation of existing wind comfort level exceedances (Code Section 148). A Conditional Use Authorization would also be required per Planning Code Sections 215, 124(f), and 303 to allow dwelling unit density in excess of one unit per 125 square feet of lot area and to exempt the on-site inclusionary dwelling units from the floor area ratio limits.

FINDING:

This project could have a significant effect on the environment. This finding is based upon the criteria of the Guidelines of the State Secretary for Resources, Sections 15064 (Determining Significant Effect), 15065 (Mandatory Findings of Significance), and 15070 (Decision to Prepare a Negative Declaration), and the following reasons as documented in the Initial Evaluation (Initial Study) for the project, which is attached.

Mitigation and improvement measures are included in this project to avoid potentially significant effects. See pp.143-150.

measures to reduce ozone; provide a control strategy to reduce ozone, particulate matter, air toxics, and GHGs in a single, integrated plan; and establish emission control measures to be adopted or implemented. The primary goals of the 2010 Clean Air Plan are to:

- Attain air quality standards;
- Reduce population exposure and protect public health in the San Francisco Bay Area; and
- Reduce GHG emissions and protect the climate.

The 2010 Clean Air Plan represents the most current applicable air quality plan for the SFBAAB. Consistency with this plan is the basis for determining whether the proposed project would conflict with or obstruct implementation of an applicable air quality plan.

Criteria Air Pollutants

In accordance with the state and federal CAAs, air pollutant standards are identified for the following six criteria air pollutants: ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO2), sulfur dioxide (SO2) and lead. These air pollutants are termed criteria air pollutants because they are regulated by developing specific public health- and welfare-based criteria as the basis for setting permissible levels. In general, the SFBAAB experiences low concentrations of most pollutants when compared to federal or state standards. The SFBAAB is designated as either in attainment[35]or unclassified for most criteria pollutants with the exception of ozone, $PM_{2.5}$, and PM_{10}, for which these pollutants are designated as non-attainment for either the state or federal standards. By its very nature regional air pollution is largely a cumulative impact in that no single project is sufficient in size to, by itself, result in non-attainment of air quality standards. Instead, a project's individual emissions contribute to existing cumulative air quality impacts. If a project's contribution to cumulative air quality impacts is considerable, then the project's impact on air quality would be considered significant.[36]

Land use projects may contribute to regional criteria air pollutants during the construction and operational phases of a project. Table 6, identifies air quality significance thresholds followed by a discussion of each threshold. Projects that would result in criteria air pollutant emissions below these significance thresholds would not violate an air quality standard, contribute substantially to an air quality violation or result in a cumulatively considerable net increase in criteria air pollutants within the SFBAAB.

[35] "Attainment" status refers to those regions that are meeting federal and/or state standards for specified criteria pollutant. "Non-attainment" refers to regions that do not meet federal and/or state standards for a specified criteria pollutant. "Unclassified" refers to regions where there is not enough data to determine the region's attainment status.

[36] Bay Area Air Quality Management District (BAAQMD), California Environmental Quality Act Air Quality Guidelines, page 2-1. May 2011.

Table 6: Criteria Air Pollutant Significance Threshold

	Construction Thresholds	Operational Thresholds	
Pollutant	**Average Daily Emissions (lbs./day)**	**Average Daily Emissions (lbs./day)**	**Annual Average Emissions (tons/year)**
ROG	54	54	10
NOx	54	54	10
PM10	82 (exhaust)	82	15
PM2.5	54 (exhaust)	54	10
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	

Source: BAAQMD CEQA Guidelines, 2010 and 2011.

Ozone Precursors

As discussed previously, the SFBAAB is currently designated as non-attainment for ozone and particulate matter (PM_{10} and $PM_{2.5}$)[37]. Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and oxides of nitrogen (NO_x). The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants, which may contribute to an existing or projected air quality violation, are based on the state and federal Clean Air Acts emissions limits for stationary sources. The federal New Source Review (NSR) program was created by the federal CAA to ensure that stationary sources of air pollution are constructed in a manner that is consistent with attainment of federal health based ambient air quality standards. Similarly, to ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation Two, Rule Two requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors, ROG and NO_x, the offset emissions level is an annual average of ten tons per year (or 54 pounds (lbs.) per day).[38] These levels represent emissions by which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants.

Although this regulation applies to new or modified stationary sources, land use development projects result in ROG and NOx emissions as a result of increases in vehicle trips, architectural coating and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of land use projects and those projects that result in emissions below these thresholds, would not be considered to contribute to an existing or projected air quality violation or result in a considerable net increase in ROG and NOx emissions. Due to the temporary nature of construction activities, only the average daily thresholds are applicable to construction phase emissions.

[37] PM_{10} is often termed "coarse" particulate matter and is made of particulates that are 10 microns in diameter or larger. $PM_{2.5}$, termed "fine" particulate matter, is composed of particles that are 2.5 microns or less in diameter.

[38] BAAQMD, Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance, page 16. October 2009.

Construction Air Quality Impacts

Impact AQ-1: The proposed project's construction activities would generate fugitive dust and criteria air pollutants, but would not violate an air quality standard, contribute substantially to an existing or projected air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants. (Less than Significant)

Construction activities (short-term) typically result in emissions of fugitive dust, criteria air pollutants, and DPM. Emissions of criteria pollutants and DPM are primarily a result of the combustion of fuel from on-road and off-road vehicles. However, ROGs are also emitted from activities that involve painting or other types of architectural coatings or asphalt paving activities. The proposed project includes demolition of a surface parking lot and construction of a new 13-story building with 162 residential units and 635 square feet of commercial space (leasing office). During the project's approximately 18-month construction period, construction activities would have the potential to result in fugitive dust emissions, criteria air pollutants.

Fugitive Dust

Project-related demolition, excavation, grading, and other construction activities may cause wind-blown dust that could contribute particulate matter into the local atmosphere. Although there are federal standards for air pollutants and implementation of state and regional air quality control plans, air pollutants continue to have impacts on human health throughout the country. California has found that particulate matter exposure can cause health effects at lower levels than national standards. The current health burden of particulate matter demands that, where possible, public agencies take feasible available actions to reduce sources of particulate matter exposure. According to the California Air Resources Board, reducing ambient particulate matter from 1998-2000 levels to natural background concentrations in San Francisco would prevent over 200 premature deaths.

Dust can be an irritant causing watering eyes or irritation to the lungs, nose, and throat. Demolition, excavation, grading, and other construction activities can cause wind-blown dust to add to particulate matter in the local atmosphere. Depending on exposure, adverse health effects can occur due to general particulate matter and specific contaminants such as lead or asbestos that may be constituents of soil.

In response, the San Francisco Board of Supervisors approved a series of amendments to the San Francisco Building and Health Codes generally referred hereto as the Construction Dust Control Ordinance (Ordinance 176-08, effective July 30, 2008) with the intent of reducing the quantity of dust generated during site preparation, demolition and construction work in order to protect the health of the general public and of onsite workers, to minimize public nuisance complaints, and to avoid orders to stop work by the Department of Building Inspection (DBI).

The Ordinance requires that all site preparation work, demolition, or other construction activities within San Francisco that have the potential to create dust or to expose or disturb more than 10 cubic yards or 500 square feet of soil comply with specified dust control measures whether or not the activity requires a permit from DBI. The Director of DBI may waive this requirement for activities on sites less than ½ acre

that are unlikely to result in any visible wind-blown dust. The project would disturb 9,000 cubic yards of soil and would be required to implement dust control measures.

The project sponsor and the contractor responsible for construction activities at the project site shall use the following practices to control construction dust on the site or other practices that result in equivalent dust control that are acceptable to the Director. Dust suppression activities may include watering all active construction areas sufficiently to prevent dust from becoming airborne; increased watering frequency may be necessary whenever wind speeds exceed 15 mph. Reclaimed water must be used if required by Article 21, Section 1100 et seq. of the San Francisco Public Works Code. If not required, reclaimed water should be used whenever possible. Contractors shall provide as much water as necessary to control dust (without creating run-off in any area of land clearing, and/or earth movement). During excavation and dirt-moving activities, contractors shall wet sweep or vacuum the streets, sidewalks, paths and intersections where work is in progress at the end of the workday. Inactive stockpiles (where no disturbance occurs for more than seven days) greater than 10 cubic yards or 500 square feet of excavated materials, backfill material, import material, gravel, sand, road base, and soil shall be covered with a 10 millimeter (0.01 inch) polyethylene plastic (or equivalent) tarp, braced down, or use other equivalent soil stabilization techniques. Compliance with these regulations and procedures set forth in the San Francisco Building Code would ensure that potential dust-related air quality impacts would remain *less than significant*.

Criteria Air Pollutants

As discussed above, construction activities would also result in emissions of criteria air pollutants. To assist lead agencies in determining whether short-term construction-related air pollutant emissions require further analysis as to whether the project may exceed the criteria air pollutant significance thresholds shown in Table 6, the BAAQMD, in their CEQA Air Quality Guidelines (May 2011), has developed screening criteria. If all the screening criteria are met by a proposed project, then the lead agency or applicant does not need to perform a detailed air quality assessment of the project's air pollutant emissions, and construction of the proposed project would result in less-than-significant criteria air pollutant impacts. Projects that exceed the screening sizes may require further project-level quantification to determine whether criteria air pollutant emissions may exceed significance thresholds. The CEQA Air Quality Guidelines note that the screening levels are generally representative of new development on greenfield[50] sites without any form of mitigation measures taken into consideration. In addition, the screening criteria do not account for project design features, attributes, or local development requirements that could also result in lower emissions. For projects that are mixed-use, infill and/or proximate to transit service and local services such as the proposed project, emissions would be expected to be less than the greenfield-type project that the screening criteria are based upon.

The proposed project would include 162 residential units and approximately 635 square feet of ground floor commercial space (leasing office). The proposed project would be below the criteria air pollutant screening sizes for mid-rise residential (494 units) identified in the BAAQMD's CEQA Air Quality

[50] Agricultural or forest land or undeveloped site earmarked for commercial, residential, or industrial projects.

Operational Air Quality Impacts

Land use projects typically result in emissions of criteria air pollutants and toxic air contaminants primarily from an increase in motor vehicle trips. However, land use projects may also result in criteria air pollutants and toxic air contaminants from combustion of natural gas, landscape maintenance, use of consumer products, and architectural coating. The proposed project includes landscaped areas, a leasing office, and residences, which would involve the use of consumer products. Construction of the proposed project would include the use of architectural coatings, and the operation of the proposed project would also result in 591 vehicle trips per day. [59]

Impact AQ-3. The proposed project would result in emissions of criteria air pollutants, but not at levels that would violate an air quality standard, contribute to an existing or projected air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants. (Less than Significant)

As discussed above in Impact AQ-1, the BAAQMD in their *CEQA Air Quality Guidelines* (May 2011), has developed screening criteria to determine whether a project requires an analysis of project-generated criteria air pollutants. If all the screening criteria are met by a proposed project, then the lead agency or applicant does not need to perform a detailed air quality assessment. The proposed project includes 162 residential units and approximately 635 square feet of ground-floor commercial space (leasing office). The proposed project would be below the criteria air pollutant screening sizes for mid-rise residential (494 units) and the lowest potential screening criteria for various commercial uses (5,000 square feet for a 24-hour convenience market or 8,000 square feet for a fast-food restaurant without drive-through) identified in the BAAQMD's CEQA Air Quality Guidelines. Thus, quantification of project-generated criteria air pollutant emissions is not required, and the proposed project would not exceed any of the significance thresholds for criteria air pollutants, and would result in a *less-than-significant* impact with respect to criteria air pollutants.

Impact AQ-4: The proposed project would generate toxic air contaminants, including diesel particulate matter, and would expose sensitive receptors to substantial air pollutant concentrations. (Less than Significant with Mitigation)

As discussed above, the San Francisco Planning Department and DPH, in partnership with BAAQMD, has modeled and assessed air pollutant impacts from mobile, stationary and area sources within the City. This assessment has resulted in the identification of air pollutant hot spots, or areas within the City that deserve special attention when siting uses that either emit toxic air contaminants or uses that are considered sensitive to air pollution. The project site is partially within a hot spot (and is considered within a hot spot for CEQA purposes) and sensitive land uses exist in the residential uses adjacent to the project site. With its inclusion of 162 residential units, the proposed project would site new sensitive land uses within this potential air pollutant hot spot.

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[59] Transportation Calculations prepared by Rachel Schuett. This document is available for public review as part of Case No. 2011.0702E at the San Francisco Planning Department, 1650 Mission Street, Suite 400 San Francisco, CA.

EXHIBIT 15

SAN FRANCISCO
PLANNING DEPARTMENT

Preliminary Mitigated Negative Declaration

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Date:	May 13, 2015
Case No.:	**2014.0198E**
Project Title:	**850 Bryant Street – Hall of Justice Rehabilitation and Detention Facility Project**
Zoning:	Western SoMa Special Use District Public Use (P) Zoning District 105-J Height and Bulk District Service/Arts/Light Industrial (SALI) Zoning District 30-X Height and Bulk District
Block/Lot:	3759/009 through 012, 014, 043, 045, a portion of 042, and Harriet Street and Ahern Way street rights-of way
Lot Size:	40,276 square feet
Project Sponsor	Jumoke Akin-Taylor San Francisco Department of Public Works Building, Design and Construction, Project Management (415) 557-4751 Dan Santizo City and County of San Francisco Sheriff's Department Sheriff's Bureau of Building Services (415) 522-8123
Lead Agency:	San Francisco Planning Department
Staff Contact:	Christopher Espiritu - (415) 575-9022 christopher.espiritu@sfgov.org

PROJECT DESCRIPTION:

The site for the proposed Hall of Justice (HOJ) Rehabilitation and Detention Facility (RDF) project is located in San Francisco's South of Market neighborhood, at the intersection of Bryant and Sixth streets, and consists of eight parcels: Assessor's Block 3759, Lots 9 through 12, 14, 43, 45, a portion of Lot 42, and portions of the Harriet Street and Ahern Way rights-of-way. The western portion of the project site (the HOJ site), located at 850 Bryant Street, contains the existing eight-story, 117-foot-tall (105 feet to the rooftop plus an additional 12-foot-tall mechanical penthouse), 610,000-gsf HOJ, constructed between 1958 and 1961. The existing HOJ serves as one of the primary County Jail Facilities for the San Francisco Sheriff's Department. County Jails No. 3 (CJ#3) and No. 4 (CJ#4) are located on the 6th and 7th floors of the existing HOJ. Other uses within the existing HOJ include the justice center for the San Francisco County Superior Court, the Chief Medical Examiner and morgue, and the current operational headquarters for the San Francisco Police Department. County Jails No. 3 (CJ#3) and No. 4 (CJ#4) are located on the 6th and 7th floors of the existing HOJ. Directly east of the HOJ site is the project building site, which is bounded by Ahern Way to the north, Sixth Street to the east, Bryant Street to the south, and Harriet Street to the west. The 40,276-sf project building site contains two vacant lots, areas of surface parking, and five existing buildings: a one-story, 6,000-gsf office building, constructed in 1956 (444 Sixth Street); a one-story, 5,100-gsf commercial building, constructed in 1959 (450 Sixth Street); a three-story, 7,150-gsf,

- Reduce GHG emissions and protect the climate.

The *2010 Clean Air Plan* represents the most current applicable air quality plan for the SFBAAB. Consistency with this plan is the basis for determining whether the proposed project would conflict with or obstruct implementation of air quality plans.

Criteria Air Pollutants

In accordance with the state and federal CAAs, air pollutant standards are identified for the following six criteria air pollutants: ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. These air pollutants are termed criteria air pollutants because they are regulated by developing specific public health- and welfare-based criteria as the basis for setting permissible levels. In general, the SFBAAB experiences low concentrations of most pollutants when compared to federal or state standards. The SFBAAB is designated as either in attainment[78] or unclassified for most criteria pollutants with the exception of ozone, $PM_{2.5}$, and PM_{10}, for which these pollutants are designated as non-attainment for either the state or federal standards. By its very nature, regional air pollution is largely a cumulative impact in that no single project is sufficient in size to, by itself, result in non-attainment of air quality standards. Instead, a project's individual emissions contribute to existing cumulative air quality impacts. If a project's contribution to cumulative air quality impacts is considerable, then the project's impact on air quality would be considered significant.[79]

Land use projects may contribute to regional criteria air pollutants during the construction and operational phases of a project. **Table 12: Criteria Air Pollutant Significance Thresholds** identifies air quality significance thresholds. This table is followed by a discussion of each threshold. Projects that would result in criteria air pollutant emissions below these significance thresholds would not violate an air quality standard, contribute substantially to an air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants within the SFBAAB.

[78] "Attainment" status refers to those regions that are meeting federal and/or state standards for a specified criteria pollutant. "Non-attainment" refers to regions that do not meet federal and/or state standards for a specified criteria pollutant. "Unclassified" refers to regions where there is not enough data to determine the region's attainment status for a specified criteria air pollutant.

[79] Bay Area Air Quality Management District (BAAQMD), *California Environmental Quality Act Air Quality Guidelines*, May 2011 (hereinafter "*CEQA Air Quality Guidelines*"), p. 2-1.

Table 12: Criteria Air Pollutant Significance Thresholds

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs/day)	Average Daily Emissions (lbs/day)	Annual Average Emissions (tons/year)
ROG[a]	54	54	10
NOx	54	54	10
PM_{10}	82 (exhaust)	82	15
$PM_{2.5}$	54 (exhaust)	54	10
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	

Note:
[a] ROG = Reactive Organic Gases
Source: BAAQMD, 2011

Ozone Precursors

As discussed previously, the SFBAAB is currently designated as non-attainment for ozone and particulate matter. Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and oxides of nitrogen (NO_x). The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants, which may contribute to an existing or projected air quality violation, are based on the state and federal Clean Air Acts emissions limits for stationary sources. To ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors ROG and NO_x, the offset emissions level is an annual average of 10 tons per year (or 54 pounds [lbs] per day).[80] These levels represent emissions by which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants.

Although this regulation applies to new or modified stationary sources, land use development projects result in ROG and NO_x emissions as a result of increases in vehicle trips, architectural coating and construction activities. Therefore, the above thresholds can be applied to the construction and operational phases of land use projects, and those projects that result in emissions below these thresholds would not be considered to contribute to an existing or projected air quality violation or result in a considerable net increase in ROG and NO_x emissions. Due to the temporary nature of construction activities, only the average daily thresholds are applicable to construction phase emissions.

[80] BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance,* October 2009 (hereinafter "*Revised Draft Options and Justification Report*"), p. 17.

EXHIBIT 16

VOLUME II

DRAFT ENVIRONMENTAL IMPACT REPORT

Academy of Art University Project

PLANNING DEPARTMENT
CASE NO. **2008.0586E**

STATE CLEARINGHOUSE NO. 2010092080

	Draft EIR Publication Date:	FEBRUARY 25, 2015
	Draft EIR Public Hearing Date:	APRIL 16, 2015
	Draft EIR Public Comment Period:	FEBRUARY 25, 2015–APRIL 27, 2015

SAN FRANCISCO
PLANNING
DEPARTMENT

Written comments should be sent to:
Sarah B Jones Environmental Review Officer | 1650 Mission Street, Suite 400 | San Francisco, CA 94103
or Sarah.B.Jones@sfgov.org

City of San Francisco Health Code Article 30

San Francisco Health Code Article 30 requires all diesel backup generators used by facilities within the City and County of San Francisco to be registered through the Department of Public Health. The regulation also requires all new backup diesel generators to have air emissions control technologies as determined by the BAAQMD, be limited in their nonemergency use, and have records kept of all operations. The regulation also provides for enforcement for violations of the regulation requirements.

City of San Francisco Health Code Article 38

San Francisco adopted San Francisco Health Code Article 38 in 2008, with revisions taking effect December 2014. The revised code requires that sensitive use developments within the Air Pollutant Exposure Zone incorporate Minimum Efficiency Reporting Value (MERV) 13 equivalent ventilation systems to remove particulates from outdoor air. This regulation also applies to conversion of a nonsensitive use to a sensitive use (e.g., student housing).

4.8.3 Impacts and Mitigation Measures

Significance Thresholds

For purposes of this EIR, the Proposed Project would result in a significant impact related to air quality, if it would:

- Conflict with or obstruct implementation of the applicable air quality plan
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation
- Result in a cumulatively considerable net increase of any criteria air pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)
- Expose sensitive receptors to substantial pollutant concentrations
- Create objectionable odors affecting a substantial number of people

By its very nature, regional air pollution is largely a cumulative impact in that no single project is sufficient in size to result, by itself, in nonattainment of air quality standards. Instead, a project's individual emissions contribute to existing cumulative air quality impacts. If a project's contribution to cumulative air quality impacts is considerable, then the project's impact on air quality would be considered significant.[283]

[283] BAAQMD, *California Environmental Quality Act Air Quality Guidelines* (May 2011), p. 2-1.

Land use projects may contribute to regional criteria air pollutants during the construction and operational phases of a project. Table 4.8-9, Criteria Air Pollutant Significance Thresholds, p. 4.8-27, identifies air quality significance thresholds for criteria air pollutants. Projects that would result in criteria air pollutant emissions below these significance thresholds would not violate an air quality standard, contribute substantially to an air quality violation, or result in a cumulatively considerable net increase in criteria air pollutants within the SFBAAB.

Table 4.8-9 Criteria Air Pollutant Significance Thresholds

	Construction Threshold	Operational Threshold	
	Average Daily Emissions (lb/day)	Average Daily Emissions (lb/day)	Maximum Annual Emissions (ton/year)
Criteria Air Pollutants			
ROG	54	54	10
NO_X	54	54	10
PM_{10}	82	82	15
$PM_{2.5}$	54	54	10
CO	Not Applicable	9.0 ppm (8-hr average) or 20.0 ppm (1-hr average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	

Ozone Precursors. As discussed previously, the SFBAAB is currently designated as nonattainment for ozone and particulate matter. Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG)[284] and NO_X. The potential for a project to result in a cumulatively considerable net increase in criteria air pollutants, which may contribute to an existing or projected air quality violation, is based on the state and federal Clean Air Act's emissions limits for stationary sources. To ensure that new stationary sources do not cause or contribute to a violation of an air quality standard, BAAQMD Regulation 2, Rule 2 requires that any new source that emits criteria air pollutants above a specified emissions limit must offset those emissions. For ozone precursors ROG and NO_X, the offset emissions level is an annual average of 10 tons per year (or 54 pounds [lb] per day).[285] These levels represent emissions by which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants.

Particulate Matter (PM_{10} and $PM_{2.5}$). The federal New Source Review (NSR) program was created by the federal CAA to ensure that stationary sources of air pollution are constructed in a manner

[284] ROG or VOCs are defined as any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Although there are slight differences in the definitions of ROG and VOCs, the two terms are often used interchangeably.

[285] BAAQMD, *Revised Draft Options and Justification Report, California Environmental Quality Act Thresholds of Significance* (October 2009), p. 17.

EXHIBIT 17

BUSINESS & REAL ESTATE MARCH 17, 2015

New 'green diesel' rolls out for Sacramento motorists

HIGHLIGHTS

Sacramento motorists will be among the first in California to be offered a new "high-performance renewable diesel fuel" produced by Redwood City-based Propel Fuels.

Diesel HPR, made from 98 percent recycled plant and animal fats and oils, is being introduced at 18 Propel Fuels pumps in Sacramento, the Bay Area and Fresno.

Darren Johnson, operations manager of Northern California at Propel Fuels, finishes polishing up the pumps that will open at a Valero station. Diesel HPR is a performance fuel that meets the specifications for use in all diesel engines. | **Renée C. Byer** - rbyer@sacbee.com

BY MARK GLOVER
mglover@sacbee.com

Sacramento motorists on Wednesday will be among the first in California to be offered a new "high-performance renewable" diesel fuel

among the first in California to be offered a new "high-performance renewable" diesel fuel – produced largely from recycled plant and animal oils.

This new generation of diesel biofuel, by Redwood City-based Propel Fuels Inc., is manufactured almost entirely from various plant- and animal-based waste, including vegetable oils, animal fats, industrial tallow and restaurant byproducts.

Rob Elam, co-founder and CEO of Propel, said Tuesday that "California carbon market regulation has created a market to attract these renewable fuels."

According to Propel, renewable diesel fuel can produce up to 70 percent less carbon emissions than petroleum-based diesel.

The formal launch of the company's "Diesel HPR" – short for High Performance Renewable – will be at 10:15 a.m. Wednesday with ribbon-cutting ceremonies at the Propel fueling site at 1101 Broadway in Sacramento. Among those scheduled to speak is Mary Nichols, chairwoman of the California Air Resources Board.

"This renewable diesel joins a growing suite of new, cleaner transportation fuels in California, thanks to our low carbon fuel standard and forward-thinking companies like Propel," said Nichols in a statement ahead of the official launch.

The new fuel, which is selling for $2.89 a gallon at the Broadway station, can be used in any diesel vehicle.

Propel's renewable diesel is made overseas in Singapore by Neste Oil Corp., a Finland-based refining and marketing company. According to the U.S. Department of Energy's Alternative Fuels Data Center, the combustion quality of renewable or "green diesel" results in similar or better vehicle performance compared with conventional diesel fuel.

Propel has 45 fueling stations in California and Washington state, most of which are stand-alone pumps at regular gas stations, such as Chevron, Shell or Valero.

Initially, its Diesel HPR will only be available at 18 fueling sites throughout Sacramento, the Bay Area and Fresno.

In addition to the Broadway station, the new fuel is selling at nine other local locations: 8062 Florin Road and 8090 Folsom Blvd. in Sacramento; 705 Harbor Pointe Place in West Sacramento; 7741 Auburn Blvd. and 7901 Madison Ave. in Citrus Heights; 9190 E. Stockton Blvd. in Elk Grove; 6700 Five Star Blvd. in Rocklin; 999 Sunrise Ave. in Roseville; and 151 Main St. in Placerville.

Propel CEO Elam said similar diesel fuel has been offered in "very low blend rates" in other parts of the nation, "but we think we make the highest-tech diesel in the market." Diesel HPR is made from 98 percent renewable content, while biodiesel is 20 percent renewable and 80 percent petroleum.

Call The Bee's Mark Glover, (916) 321-1184.

New 'green diesel' rolls out for Sacramento motorists | The Sacrament... http://www.sacbee.com/news/business/article15203738.html

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Stephanie Rubin 76 days ago

I'm not a fan of HPR. Used it for a couple of months with no problem, then major engine power loss. Switched back to diesel and car is better. I drive an old Mercedes.

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EXHIBIT 18

California Emissions Estimator Model™

8

- Home (caleemod/home)
- Download Model (caleemod/download-model)
- User's Guide (caleemod/user's-guide)
- Events (caleemod/events-current)
- FAQs (caleemod/facs)
- Inquiry (caleemod/inquiry)
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NEW RFP to Upgrade CalEEMod - Open to Submit Bid by April 13, 2015 (/docs/default-source/caleemod/upgrades/2015-rfp-caleemod-final.pdf?sfvrsn=2) (PDF, 3MB)

CalEEMod is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and greenhouse gas (GHG) emissions associated with both construction and operations from a variety of land use projects. The model quantifies direct emissions from construction and operations (including vehicle use), as well as indirect emissions, such as GHG emissions from energy use, solid waste disposal, vegetation planting and/or removal, and water use. The mobile source emission factors used in the model (EMFAC2011) includes the Pavley standards and Low Carbon Fuel standards into the mobile source emission factors. Further, the model identifies mitigation measures to reduce criteria pollutant and GHG emissions along with calculating the benefits achieved from measures chosen by the user. The GHG mitigation measures were recently developed and adopted by the California Air Pollution Control Officers Association (CAPCOA).

The model was developed in collaboration with the air districts of California. Default data (e.g., emission factors, trip lengths, meteorology, source inventory, etc.) have been provided by the various California air districts to account for local requirements and conditions. The model is free of charge and will be periodically updated when modifications are warranted.

The model is an accurate and comprehensive tool for quantifying air quality impacts from land use projects throughout California. The model can be used for a variety of situations where an air quality analysis is necessary or desirable such as California Environmental Quality Act (CEQA) documents, National Environmental Policy Act (NEPA) documents, pre-project planning, compliance with local air quality rules and regulations, etc.

EXHIBIT 19

San Francisco Ordinance No. 27-06 which took effect on July 1, 2006 enacted a new Chapter of the Environment Code and made amendments to the Building Code, the Health Code and the Police Code in order to establish a comprehensive program to effectuate the City's goals. The text of each code is included below.

- **ENVIRONMENT CODE:**
  - Created Chapter 14 entitled "Construction and Demolition Debris Recovery Ordinance" [see page 1, below]

- **BUILDING CODE**:
  - Amended Section 106.3.2.2 [see page 12, below]
  - Amended the title of Chapter 13 from "Energy Conservation to "Resource Conservation" [The text of this Chapter is not included below since only the title was amended]
  - Added Chapter 13B entitled "Construction and Demolition Debris Recovery Program" [see page 13, below]

- **HEALTH CODE**:
  - Added Section 288 [see page 14, below]
  - Added Section 288.1 [see page 15, below]

- **POLICE CODE**:
  - Amended Section 39-1 [see page 15, below]

* * * * *

ENVIRONMENT CODE

CHAPTER 14: CONSTRUCTION AND DEMOLITION DEBRIS RECOVERY ORDINANCE*

Sec. 1400. Findings.

Sec. 1401. Definitions.

Sec. 1402. Requirements.

Sec. 1403. Reserved.

Sec. 1404. Registration Requirement for Facilities and Transporters.

Sec. 1405. Registration Criteria.

Sec. 1406. General Terms and Conditions for Registered Facilities and Transporters.

Editor's note: *; Ordinance 27-06, File No. 051142, Approved February 16, 2006, from which Chapter 14 of this Code derives, shall take effect on July 1, 2006.

SEC. 1400. FINDINGS.

The Board of Supervisors finds and declares the following:

A. People who live in, work in or visit San Francisco generate 1.8 million tons of solid waste annually with more than half of these materials recovered through waste prevention, recycling and composting.

B. The State of California through its California Integrated Waste Management Act of 1989, Assembly Bill 939 (AB 939), requires that each local jurisdiction in the state divert 50% of discarded materials (base year 1990) from landfill. Every city and county in California, including the City, could face fines up to $10,000 a day for not meeting the above mandated goal.

C. The Source Reduction and Recycling Element (SRRE) for San Francisco adopted by the Board of Supervisors in 1992, recognized the importance of recovering wood, metals, and inerts from construction and demolition activities in order to meet the state mandated waste reduction goal.

D. The Board of Supervisors adopted Resolution No. 679-02 setting a goal of 75% diversion from landfill by 2010 and promoting the highest and best use of recovered materials and authorizing the Commission on the Environment to adopt a zero waste goal, which it set as 2020.

E. The Green Building Ordinance, Chapter 7 of the Environment Code, establishes LEEDTM Silver level as the standard for all City building projects, which can include the goal of diverting 75% of construction and demolition debris from landfill for each project.

F. There are facilities both within the City and in nearby surrounding areas that can effectively reuse, recycle or otherwise recover the constituent elements of the materials generated by construction and demolition activity and thereby divert such materials from landfill.

G. Construction and demolition waste recovery programs reduce the amount of materials generated and hauled to landfill, decrease worker exposure to hazards, improve worker safety, reduce truck trips and traffic and improve air quality, thereby enhancing the health, safety and welfare of San Franciscans.

H. This Chapter requires construction and demolition debris to be transported by a registered vehicle and processed by a registered facility in order to ensure proper handling and to recover an additional estimated 100,000 tons from landfill disposal annually.

I. State law requires the California Integrated Waste Management Board to adopt a model construction and demolition debris ordinance and requires that Board to take into account a city's efforts to encourage or require recovery of construction and demolition debris in determining whether a city has met the mandated 50% recovery rate and other solid waste reduction and recycling requirements. This Chapter would help the City maintain the levels required by the state mandate and achieve the City's goals of 75% landfill diversion by 2010 and zero waste by 2020.

J. In keeping with the Precautionary Principle, codified in Chapter 1 of the Environment Code, this Chapter requires proper handling of construction debris as a deterrent to unsafe and wasteful practices. In this way, the City will create and maintain a healthy, viable environment for current and future generations, and will become a model of sustainability.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1401. DEFINITIONS.

For the purposes of this Chapter, the following words have the following meanings:

(a) "Alternative Daily Cover" or "ADC" shall mean materials, other than soil, that have been approved by the California Integrated Waste Management Board or a successor agency for use as an overlay on an exposed landfill face.

(b) "Bio-mass Conversion" shall mean the controlled combustion, when separated from other solid waste and used for producing electricity or heat, of wood, woodchips, woodwaste, tree and brush prunings. Bio-mass conversion does not include the controlled combustion of recyclable pulp or recyclable paper materials, sludge, medical or hazardous waste.

(c) "Construction and Demolition Debris" shall mean building materials and solid waste generated from construction and demolition activities, including, but not limited to, fully-cured asphalt, concrete, brick, rock, soil, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, fixtures, plastic pipe, metals, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction, deconstruction, demolition or land developments. This term does not include; refuse regulated under the 1932 Refuse Collection and Disposal Initiative Ordinance or sections of the Municipal Code that implement the provisions of that ordinance; materials excavated from the public right-of-way; or, unless otherwise specified in Section 1402(b), materials source separated for reuse or recycling. Hazardous waste, as defined in California Health and Safety Code section 25100 et seq., as amended, is not Construction and Demolition Debris for purposes of this Chapter.

(d) "Department" shall mean the San Francisco Department of the Environment.

(e) "Director" shall mean the Director of the Department of the Environment or his or her designee.

(f) "Facility" shall mean a facility that receives and processes construction and demolition debris into its component material types for reuse, recycling, and disposal of residuals.

(g) "Person" shall mean a natural person, a firm, joint stock company, business concern, association, partnership or corporation or governmental entity, including the City and County of San Francisco and its departments, boards and commissions for projects within the geographic boundaries of the City, and its or their successors or assigns.

(h) "Recover" or "Recovery" shall mean any activity, including source reduction, deconstruction and salvaging, reuse, recycling and composting, which causes materials to be recovered for use as a resource and diverted from disposal.

(i) "Registered Transporter" or "Registered Facility" shall mean a person who holds a valid registration issued by the Director pursuant to this Chapter.

(j) "Transport" or "Transportation" shall mean transportation of construction and demolition debris, "Transport" or "Transportation" does not include transportation of less than one cubic yard of construction and demolition debris or transportation in a vehicle that has no more than two axles and no more than two tires per axle.

(k) "Transporter" shall mean a person that transports construction and demolition debris as defined in this Chapter. "Transporter" does not include a person that owns the property at which the construction and demolition debris was generated.

(l) "Vehicle" shall mean a vehicle used to transport construction and demolition debris as those terms are defined in this Chapter.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1402. REQUIREMENTS.

(a) Except as provided in this Chapter, no person, other than the owner of the property where the construction and demolition debris was generated, may transport and no person may process

construction and demolition debris unless that person has a registration from the Department as provided in this Chapter. Except as provided in this Chapter, all construction and demolition debris, regardless of transport or volume, must be processed at a registered facility.

(b) A person conducting full demolition of an existing structure must submit a waste diversion plan to the Director which provides for a minimum of 65% diversion from landfill of construction and demolition debris, including materials source separated for reuse or recycling which would otherwise not be subject to this Chapter. The plan may propose to use facilities and transporters that are not registered under this Chapter. The waste diversion plan must be submitted to the Director at the time the person applies for a demolition permit from the Department of Building Inspection and must include the following information: a list of all material types and volumes anticipated from the demolition; the market or destination for each material; the estimated recovery rate (diversion from landfill) by material or market; and the anticipated transporter for each material type. The Director shall make a determination as to the adequacy of the plan within five (5) business days and shall notify the Department of Building Inspection of its decision.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1403. RESERVED.

SEC. 1404. REGISTRATION REQUIREMENT FOR FACILITIES AND TRANSPORTERS.

(a) A person subject to Section 1402 shall apply for a registration by filing with the Director an application form prescribed by the Director, which contains the following information, and the information set forth in Section 1405.

(i) For construction and demolition debris processing facilities: the name and address of the person who owns the facility; the name and address of the person who operates the facility; a statement that the owner or operator has all permits, authorizations or licenses required by any local, state or federal agency to operate the facility and all necessary insurance.

(ii) For transporters of construction and demolition debris: the name and address of the person who owns the vehicle(s); a statement that the vehicle(s) and each operator has all permits, authorizations or licenses and any insurance required by any local, state or federal agency to operate the vehicle(s). An owner of a vehicle may obtain a single registration covering all vehicles and all debris boxes or other containers, provided that each vehicle is clearly and prominently marked as belonging to that owner (with the name of the business entity). The owner of the vehicle(s) is responsible for compliance by any operator of a vehicle owned by that person being used to transport construction and demolition debris.

(b) The person who owns the facility or the vehicle(s) must certify the accuracy of the information submitted in the application form under penalty of perjury.

(c) The Director must act on an application form within 15 days of receipt.

(d) If the Director determines that the information required by the application form is not complete, the Director will provide written notice to the potential registrant of the remaining information needed.

(e) If the Director determines that the application form is complete, the Director shall issue a registration containing the following minimum information: a reference to the general terms and conditions specified in Section 1406; the name and address of the registrant, the name and address of the facility (if applicable); the effective and expiration date of the registration; and a registration number assigned by the Director.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1405. REGISTRATION CRITERIA.

The owner of the facility or the transporter shall include the following information in the application form described in Section 1404.

(a) **For Facilities**.

(i) The facility meets an overall minimum recovery rate of 65 percent for construction and demolition debris (based on the most recent month), which may include materials used as ADC or bio-mass conversion, provided that the facility can demonstrate that the use as ADC or bio-mass conversion is the highest and best use. The recovery rate will be determined by the total quantity of materials delivered to established recycling and composting markets divided by the total quantity received by the registered facility. Highest and best use for ADC does not include ADC which is generated by intentional crushing or grinding of construction and demolition debris that has not been processed to remove wood, metal, wallboard, glass and other materials for which markets or uses other than ADC are available. Consistent with this section, the Director shall adopt regulations pursuant to Section 1412 to specify how the recovery rate will be calculated and when ADC or bio-mass conversion is considered to be the highest and best use of a particular material.

(ii) The facility has and is implementing a hazardous waste load checking program to minimize hazardous waste accepted at the facility.

(iii) The facility has no outstanding notices of violation from any federal, state or local agency that could affect the permits, authorizations or licenses required for its continued operation.

(iv) The facility agrees to submit annual reports to the Director on forms and by dates specified by the Director pursuant to Section 1412. The reports must include, with respect to San Francisco materials only, the following information; the total quantity of material received at the registered facility, the breakdown of all of the specific recycled commodities, the end use of the recycled commodity (reuse, recycling, composting, ADC, bio-mass conversion) landfill destination for residuals, and the recovery ratio for the report period by processing area.

(v) For each truckload received at a discrete facility processing area, the facility agrees to provide each vehicle with a uniquely numbered receipt specifying, at a minimum, the facility name and processing area, the quantity of material received and the current recovery rate for that processing area. The

receipt will also include the identity of the transporter and the permit application number issued by the Department of Building Inspections, if any, associated with that load.

(vi) The facility agrees to comply with the provisions of this Chapter; provide documentation to support the information in the application form, including the Section 1404(b) certification, to the Director upon request; and allow the Director to make inspections of the facility in order to verify the information in the application form and required reports.

(b) **For Transporters**.

(i) The owner has no outstanding notices of violation from any federal, state or local agency that could affect the permits, authorizations or licenses required for continued operation of his or her vehicles.

(ii) The owner agrees to submit to the Director, upon request, the receipts specified in subsection (a)(v).

(iii) The owner agrees that for each truckload of materials delivered to a facility, the operator of the vehicle will provide to the facility the permit application number, if any, associated with that load.

(iv) The owner of the vehicle agrees to comply with the provisions of this Chapter; provide documentation to support the information in the application form, including the Section 1404(b) certification, to the Director upon request; and allow the Director to make inspections of vehicles in order to verify the information in the application form and reports.

(v) The owner agrees that all vehicles will operate in accordance with state and federal laws and motor carrier regulations and in accordance with best business practices to ensure against leakage and unsafe loads. All Construction and Demolition Debris must be transported in either a fully enclosed vehicle or container and must be covered to minimize any potential spillage or littering.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1406. GENERAL TERMS AND CONDITIONS FOR REGISTERED FACILITIES AND TRANSPORTERS.

The following terms and conditions shall apply to each registration:

(a) A registration is valid for two years.

(b) Each registrant must submit a registration renewal on a form specified by the Director thirty (30) days prior to the expiration date of the registration. Except as provided in this subsection, if a registrant submits a properly completed renewal form thirty (30) days prior to the expiration date, the current registration will continue in full force and effect until the Director issues a registration or all administrative and judicial appeals have been exhausted or the time for appeal has expired. A person may not renew a registration during a period of suspension, either by filing a renewal form or by operation of law. At the end of the suspension period, the person may apply for a registration.

(c) All records required to be kept by registered facilities and transporters shall be kept for at least three (3) years.

(d) A registration is not transferable.

(e) A registration does not take the place of any license required by state, federal or local law nor does compliance with the requirements of this Chapter relieve any party of compliance with any other applicable State, federal or local law.

(f) A copy of proof of registration shall be prominently displayed at any registered facility and kept in a registered vehicle.

(g) Within thirty (30) days of a change of any of the information required on a registration or renewal form, a registrant must file an amendment to the registration on a form prescribed by the Director.

(h) Each registrant must notify the Director, in writing, within twenty-four (24) hours of the time a permit, authorization or license required by any local, state or federal agency to operate the facility or vehicle terminates, expires or is revoked or suspended.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1407. TRADE SECRETS.

(a) If a person believes that any information required to be reported or disclosed by this Chapter contains a trade secret, the person shall provide the information to the Director and shall notify the Director in writing of that belief, detailing the basis of the belief as to each specific item of information the person claims is a trade secret. For purposes of this Chapter, "trade secret" shall have the same meaning as it has under state law. The person designating information as a trade secret shall specify a name and street address for notification purposes and shall be responsible for updating such information. The Director shall not disclose any properly substantiated trade secret which is so designated by a person except as required by this Chapter or as otherwise required by law.

(b) Information designated as trade secret may be disclosed to an officer or employee of the City and County of San Francisco, the State of California, or the United States of America for use in connection with the official duties of such officer or employee acting under authority of law for the protection of health, without liability on the part of the City.

(c) When the Director or other City official or employee receives a request for information that has been designated as, or which the City determines may be, a trade secret, the City shall notify the person or business of the request. The City may request further evidence or explanation from the person as to why the information requested is a trade secret. If the City determines that the information does not constitute a trade secret, the City shall notify the person or business of that conclusion and that the information will be released by a specified date in order to provide the person or business the opportunity to obtain a court order prohibiting disclosure.

(d) In adopting this Chapter, the Board of Supervisors does not intend to authorize or require the disclosure to the public of any trade secrets protected under the laws of the State of California.

(e) This Section is not intended to empower a person or business to refuse to disclose any information, including but not limited to trade secrets, to the Director or other City Departments required under this Chapter.

(f) Notwithstanding any other provision of this Chapter, any officer or employee of the City and County of San Francisco, or former officer or employee or contractor with the City or employee thereof, who by virtue of such employment of official position has obtained possession or has had access to information, the disclosure of which is prohibited by this Section, and who, knowing that disclosure of the information is prohibited, knowingly and willfully discloses the information in any manner to any person or business not entitled to receive it, shall be guilty of a misdemeanor.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1408. RESERVED.

SEC. 1409. LIST OF REGISTERED FACILITIES AND REGISTERED TRANSPORTERS.

The Director will maintain a current list of registered facilities and registered transporters available at the Department's Office and on its website. The Director will update the list at least every sixty (60) days. The Director will work with the Department of Building Inspection and other City departments to ensure availability of this information to the public.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1410. ENFORCEMENT.

(a) The Director has authority to administer all provisions of this Chapter and to enforce its provisions by any lawful means available for such purpose. The Department of Building Inspection shall work together with the Director to coordinate enforcement of this Chapter with enforcement of relevant provisions of the Building Code.

(b) In order to carry out the provisions of this Chapter, the Director has the authority to inspect any registered facility or registered transporter. This right of entry will be exercised only at reasonable hours, and with the consent of the owner of the vehicle or facility or with a proper inspection warrant. The Director will inspect each registered facility and transporter at least once annually.

(c) **Suspension of registration**. Whenever the Director finds that information in a person's application, registration or any required report is inaccurate, a person does not have the appropriate permits, authorizations or licenses to operate the registered facility or vehicle, or that a person is violating or has violated this Chapter or the terms of a registration, the Director may issue an order suspending the registration as provided in this Section. The Director's order to suspend must include a written statement of the reasons for the suspension and must provide the person with an opportunity to respond in writing before the order becomes effective. The order shall provide the effective date and end date of the suspension. The suspension period will be no more than: one (1) month for the first violation; six (6) months for the second; and twelve months (12) for any subsequent violations. The Director's decision shall be final.

(d) A final decision of the Director to suspend a registration may be appealed to the Board of Appeals in the manner prescribed in Article 1 of the San Francisco Business and Tax Regulations Code. Any person who fails to appeal the Director's decision to the Board of Appeals within the time specified may not challenge a decision or final order of the Director in any judicial proceedings brought to enforce the decision or order or for other remedies.

Within ninety (90) days of the decision of the Board of Appeals, a person may file with a Court of competent jurisdiction a petition for writ of mandate to review the Board of Appeals decision, provided that the responsible party has exhausted its administrative remedies. Any person who fails to file a petition within this 90-day period may not challenge a decision or final order of the Board of Appeals in any judicial proceedings brought to enforce the decision or order or for other remedies. Section 1094.5 of the California Code of Civil Procedure shall govern any proceedings conducted pursuant to this Section. In all proceedings pursuant to this Section, the Court shall affirm the Board of Appeal's decision if it is based upon substantial evidence in the whole record. This Section does not prohibit the Court from granting any appropriate relief within its jurisdiction.

(e) The Director may request the City Attorney or the District Attorney, as the case may be, to commence an action to enforce this Chapter.

(i) **Civil Penalties**. Any person who violates this Chapter shall be civilly liable to the City and County of San Francisco for a civil penalty in an amount not to exceed one-thousand dollars ($1,000) for each day in which the violation occurs. Each day that such violation continues shall constitute a separate violation. For a second violation of the Chapter, the civil penalty will be not less than one thousand dollars ($1,000) and not more than five thousand dollars ($5,000) for each day in which the violation occurs. In determining civil penalties, the court shall consider the extent of harm caused by the violation(s), the nature and persistence of the violation(s), the length of time over which the violation(s) occur(s), the frequency of past violations, any action taken to mitigate the violation, and the financial burden to the violator.

(ii) **Criminal Penalties**. Each violation shall be considered a separate misdemeanor punishable by a fine not exceeding than one thousand dollars ($1,000), or imprisonment not to exceed six (6) months in the County Jail, or both. In determining criminal penalties, the court shall consider the extent of harm caused by the violation(s), the nature and persistence of the violation(s), the length of time over which the violation(s) occur(s), the frequency of past violations, any action taken to mitigate the violation, the financial burden to the violator, and such other factors as deemed relevant and material.

f) Remedies under this Section are in addition to and do not supersede or limit any and all other remedies, civil or criminal.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1411. REPORTS.

Within two (2) years of the effective date of this Chapter, the Director shall report to the Commission on the Environment on the results of this ordinance, including the quantity recovered from landfill, and any recommended amendments of the ordinance.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1412. FORMS, REGULATIONS AND GUIDELINES.

(a) Consistent with the intent of this Chapter, and after consultation with other City departments, public notice and a public meeting, the Director may adopt forms, regulations, and guidelines as directed by this Chapter and as necessary and appropriate to implement this Chapter.

(b) The Department shall provide assistance and consulting to persons subject to this Chapter regarding compliance with this Chapter.

(c) The Director, consistent with this Chapter, may waive any specific requirement of this Chapter if the person seeking the waiver has demonstrated that strict application of the specific requirement would create practical difficulties not generally applicable to other persons in similar circumstances. The Director shall specify in writing the basis for any waiver under this Section.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1413. COST OF IMPLEMENTATION.

The Director shall determine the cost of implementing this Chapter. The Director may request that relevant City departments provide work orders to the Director to cover the cost of implementing and maintaining the program required by this Chapter.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1414. RESERVED.

SEC. 1415. DISCLAIMER OF LIABILITY.

The degree of protection required by this Chapter is considered to be reasonable for regulatory purposes. The standards set forth in this Chapter are minimal standards and do not imply that compliance will ensure proper handling of construction and demolition debris. This Chapter shall not create liability on the part of the City, or any of its officers or employees for any damages that result from reliance on this Article or any administrative decision lawfully made in accordance with this Chapter. All persons handling construction and demolition debris within the City should be and are advised to conduct their own inquiry as to the handling of such materials. In undertaking the implementation of this Chapter, the City is assuming an undertaking only to promote the general welfare. It is not assuming, nor is it imposing on its officer and employees, an obligation for breach of which it is liable in money damages to any person who claims that such breach proximately caused injury.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1416. DUTIES ARE DISCRETIONARY.

Subject to the limitations of due process and applicable requirements of State or federal laws, and notwithstanding any other provisions of this Code whenever the words "shall" or "must" are used in establishing a responsibility or duty of the City, its elected or appointed officers, employees or agents, it is the legislative intent that such words establish a discretionary responsibility or duty requiring the exercise of judgement and discretion.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 1417. SEVERABILITY.

If any section, subsection, sentence, clause, or phrase of this Chapter is for any reason held to be invalid or unconstitutional by a decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of the Chapter. The Board of Supervisors hereby declares that it would have passed this Chapter and each and every section, subsection, sentence, clause, or phrase not declared invalid or unconstitutional without regard to whether any portion of this Chapter would be subsequently declared invalid or unconstitutional.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

*   *   *   *   *

BUILDING CODE   SECTION 106.3.2.2

Section 106.3.2.2. Add the following section:

[Amended 2-7-2006 by Ord. No. 27-06]

22

106.3.2.2 Demolition. An application for a permit to demolish a building or structure shall not be deemed complete until (a) the applicant declares under penalty of perjury that every party who has a recorded interest in the property that is the subject of the application has been notified of the filing of the application. See Section 110, Table 1-L - Public Information - for fee to defray the cost of maintaining records of such declarations and other attendant costs and (b) the Department receives written notice from the Department of the Environment that the Department of the Environment has approved the applicant's waste diversion plan in accordance with Chapter 14 of the Environment Code.

Endnotes

22	This section contains a change from the original publication of the 2001 San Francisco Building Code.

*   *   *   *   *

BUILDING CODE

1

CHAPTER 13B
CONSTRUCTION AND DEMOLITION DEBRIS RECOVERY PROGRAM

SECTION 1301B — TITLE

[Added 2-7-2006 by Ord. No. 27-06]

This chapter shall be known as the "Construction and Demolition Debris Recovery Program."

SECTION 1302B — RECOVERY OF CONSTRUCTION AND DEMOLITION DEBRIS.

[Added 2-7-2006 by Ord. No. 27-06]

Under the requirements set forth herein and in Chapter 14 of the Environment Code, all construction and demolition debris in amounts of one cubic yard or greater generated in the course of a construction or demolition project must be transported off the site by a registered transporter, unless transported by the owner of the site, and handled, processed and otherwise managed by a registered facility for recovery of the materials. All persons subject to these requirements, including an applicant for any building or demolition permit shall comply with the requirements for construction and demolition debris recovery set forth in Chapter 14 of the Environment Code.

SECTION 1303B — DEFINITIONS.

[Added 2-7-2006 by Ord. No. 27-06]

"Construction and Demolition Debris" shall mean building materials and solid waste generated from construction and demolition activities, including, but not limited to, fully-cured asphalt, concrete, brick, rock, soil, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, fixtures, plastic pipe, metals, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction, deconstruction, demolition or land developments. This term does not include refuse regulated under the 1932 Refuse Collection and Disposal Initiative Ordinance or sections of the Municipal Code that implement the provisions of that ordinance; materials from the public right-of-way; or, unless specified in Chapter 14 of the Environment Code, materials source separated for reuse or recycling. Hazardous waste, as defined in

California Health and Safety Code section 25100 et seq., as amended, is not Construction and Demolition Debris for purposes of this Chapter.

"Registered Transporter" or "Registered Facility" shall mean a person who holds a valid registration issued by the Director of the Department of the Environment pursuant to Chapter 14 of the Environment Code. "Transporter" does not include a person that owns and operates only vehicles with no more than two axles and no more than two tires per axle.

SECTION 1304B — PERMIT CONDITION.

[Added 2-7-2006 by Ord. No. 27-06]

The provisions of Chapter 14 of the Environment Code and any approvals or conditions imposed in writing by the Department of the Environment are conditions of the permit issued by the Department under section 106.1, and a violation of Chapter 14 or such approvals or conditions shall be deemed non-compliance with the permit.

SECTION 1305B — PERMIT NOTIFICATION.

[Added 2-7-2006 by Ord. No. 27-06]

Permit application materials shall bear notice of and reference to the above requirements and the owner's responsibility for compliance with such requirements.

Endnotes

1	This section contains a change from the original publication of the 2001 San Francisco Building Code.

* * * * *

HEALTH CODE SECTIONS 288 AND 288.1

SEC. 288. CONSTRUCTION AND DEMOLITION DEBRIS.

No commercial establishment, dwelling, householder or other person or entity, including the City and County of San Francisco, shall place out for regular refuse collection any construction and demolition debris. Unless otherwise required by Chapter 14 of the Environment Code or acceptable in an on-site residential or commercial recycling or composting collection program, construction and demolition debris must be disposed of at a construction and demolition debris facility registered pursuant to Chapter 14 of the Environment Code. For purposes of this section, construction and demolition debris means building materials and solid waste generated by construction and demolition activities, including but not limited to: fully-cured asphalt, concrete, brick, rock, soil, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, fixtures, plastic pipe, metals, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction, deconstruction, demolition or land developments. Construction and demolition debris does not include any refuse regulated under the 1932 Refuse Collection and Disposal Initiative Ordinance or sections of the Municipal Code that implement the provisions of that ordinance.

Hazardous waste, as defined in California Health and Safety Code section 25100 et seq., as amended, is not construction and demolition debris for purposes of this section.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

SEC. 288.1. PENALTY.

Any person, firm or corporation violating any of the provisions of Section 288 of this Article shall be guilty of an infraction and, upon conviction thereof, shall be punished for the first offense by a fine of not less than $80 nor more than $100; and for a second offense by a fine of not less than $150 nor more than $200; and for each additional offense by a fine of not less than $250 nor more than $500. In the alternative, any person, firm or corporation violating any of the provisions of Section 288 of this Article may be assessed an administrative penalty not to exceed $300 for each violation. Such penalty shall be assessed, enforced and collected in accordance with Section 39-1 of the Police Code.

(Added by Ord. 27-06, File No. 051142, App. 2/16/2006)

* * * * * * *

POLICE CODE SECTION 39-1

SEC. 39-1. PROCEDURE FOR ASSESSMENT AND COLLECTION OF ADMINISTRATIVE PENALTIES FOR SPECIFIED LITTERING AND NUISANCE VIOLATIONS.

(a) This Section shall govern the imposition, assessment and collection of administrative penalties imposed pursuant to Sections 37, 38 and 63 of the Police Code, Sections 41.13, 283.1, 287, 288.1 and 600 of the Health Code, and Sections 170, 173, 174, 174.2, 184.63 and 724.5 of the Public Works Code.

(b) The Board of Supervisors finds:

(1) That it is in the best interest of the City and its citizens to provide an alternative, administrative penalty mechanism for enforcement of the littering and nuisance violations covered by this section in addition to the existing enforcement mechanisms authorized under the California Penal Code; and

(2) That the administrative penalty scheme established by this section is not intended to be punitive in nature, but is instead intended to compensate the public for the injury and damage caused by the prohibited conduct. The administrative penalties authorized under this section are intended to be reasonable and not disproportionate to the damage or injury to the City and the public caused by the prohibited conduct.

(c) Administrative Citation. Where an officer or employee designated in Section 38 determines that there has been a violation of a local litter or nuisance law that authorizes imposition of an administrative penalty, the officer or employee may issue an administrative citation to the person and/or entity responsible for the violation. For purposes of this Section, an entity is responsible if an officer, employee or agent of the entity commits the violation. The citation shall inform the person or entity responsible of the date, time, place and nature of the violation and the amount of the proposed penalty, and shall state that the penalty is due and payable to the City Treasurer within 15 City business days from the date of the notice, if not contested within the time period specified. The citation shall also state that the person or entity responsible has the right, pursuant to Subsection (d), to request administrative review of the citing officer or employee's determination as to the violation and assessment of penalties, and shall set forth the procedure for requesting administrative review. The Director shall serve the administrative citation as follows:

1. Where there is a nexus between the violator and a specific property:

(A) One copy of the Notice shall be posted in a conspicuous place upon the building or property.

(B) One copy of the Notice shall be served upon each of the following:

(i) The person, if any, in real or apparent charge and control of the premises or property involved;

(ii) The owner of record.

Service required by subparagraph (B) may be made by personal service or by certified mail.

2. Where the issuing officer or employee is unable to ascertain a nexus between the violation and property within the City, a completed copy of the administrative citation may be served on the individual who has committed the violation by personal service or by certified mail.

3. For purposes of this Section, there is a nexus where activity on the property has caused, contributed to, or been a substantial factor in causing, the violation.

(d) Request for Hearing; Hearing.

(1) A person or entity that has been issued an administrative citation may request administrative review in order to contest the citation issued in accordance with this section. Administrative review shall be initiated by filing a request for administrative review with the Director of Public Works within 15 City business days from the date of the citation. Failure to request a hearing within the time specified in the citation shall be deemed an admission that the cited person or entity committed the violation identified in the administrative citation.

(2) Whenever administrative review is requested pursuant to this Section, the Director of Public Works shall, within five City business days of receipt of the request, notify the requestor of the date, time, and place of the administrative review hearing by certified

mail. Such hearing shall be held no later than thirty (30) calendar days after the Director receives the request, unless time is extended by mutual agreement of the affected parties.

(3) The administrative review hearing shall be conducted by a neutral hearing of officer from outside the Department of Public Works and the department whose employee issued the citation, assigned by the Director of Administrative Services. The Director of Administrative Services may issue rules as needed to implement this requirement. The parties may present evidence and testimony to the hearing officer. All testimony shall be under oath. The hearing officer shall ensure that a record of the proceedings is maintained. The burden of proof to uphold the violation shall be on the City, but the administrative citation shall be prima facie evidence of the violation.

(4) The hearing officer shall issue a decision including a summary of the issues and the evidence presented, and findings and conclusions, within ten (10) calendar days of the conclusion of the hearing. The hearing officer may uphold the penalty imposed by the citation, reduce the penalty, or dismiss the citation. A copy of the decision shall be served by certified mail upon the person or entity contesting the violation. The decision shall be a final administrative determination. An aggrieved party may seek judicial review of the decision pursuant to California Code of Civil Procedure Sections 1094.5 and 1094.6.

(e) Payment and Collection of Penalty.

(1) Where a person or entity has not made a timely request for administrative review, the penalty shall be due and payable to the City Treasurer on or before 15 City business days from the date of issuance.

(2) Where a person or entity has made a timely request for administrative review, and the penalty has been upheld in whole or in part upon review, any administrative penalty imposed by the hearing officer shall be due and payable not later than ten City business days from the date of the notice of decision issued under subparagraph (d)(4).

(3) If a penalty due and payable under paragraphs (1) or (2) remains unpaid after the specified due date, the Director of Public Works shall send the violator written notice that the penalty is overdue. Penalties that remain unpaid 30 days after the due date shall be subject to a late payment penalty of ten percent (10%) plus interest at the rate of one percent (1%) per month on the outstanding balance, which shall be added to the penalty amounts from the date that payment is due. Persons and entities against whom administrative penalties are imposed shall also be liable for the costs and attorney's fees incurred by the City and County in bringing any civil action to enforce the provisions of this section, including obtaining a judgment for the amount of the administrative penalty and other costs and charges.

(4) Where there is a nexus between the violation and property in the City owned by the violator, the Director shall further inform the violator that if the amount due is not paid

within 30 days from the date of the notice, the Director shall initiate proceedings to make the amount due and all additional authorized costs and charges, including attorneys fees. a lien on the property. Such liens shall be imposed in accordance with Chapter l0, Article XX of the Administrative Code.

(f) The revenues generated by penalties from an administrative citation issued pursuant to this Section may be expended only by the department that is responsible for issuing the administrative citation, except that each department other than Public Works that issues administrative citations pursuant to this Section shall reimburse the Department of Public Works for the costs incurred by the Department of Public Works in administering review of those citations issued by the other department. The revenues from administrative citations issued by Class 8280 Environmental Control Officers and 8282 Senior Environmental Control Officers may be expended exclusively by the Department of Public Works for the purpose of funding litter enforcement and abatement except where the use or expenditure of those revenues is specifically directed by law to another program within the Department of Public Works.

(Added by Ord. 87-03, File No. 030482, App. 5/9/2003; amended by Ord. 27-06, File No. 051142, App. 2/16/2006)

Law Offices of
THOMAS N. LIPPE, APC

201 Mission Street
12th Floor
San Francisco, California 94105

Telephone: 415-777-5604
Facsimile: 415-777-5606
Email: Lippelaw@sonic.net

EXHIBITS 20-30

To Mission Bay Alliance Comment Letter dated July 26, 2015

Re: **Air Quality Impacts** - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

T:\TL\Mission Bay\Administrative Proceedings\LOTNL Docs\AQ Exhs\AQ DSEIR Exhibits 20-30 cover page.wpd

EXHIBIT 20

SF Environment

Registered Facilities 06.11.15

Construction & Demolition Debris Recovery Program,
City and County of San Francisco, Environment Code Chapter 14;
Ordinance No. 27-06; SFE Regulation 06-06-CDO

Big for Hauling and Demolitions
(Must call ahead)
51 Napoleon Ave
San Francisco, CA 94124
650.296.2119

Blue Line Transfer, Inc.
500 East Jamie Court
South San Francisco, CA 94080
650.589.4020

Certified Blue Recycling, Inc
2075 Williams St
San Leandro, CA 94577
510.346.8800

Davis Street Transfer & Recycling Center
(You must tell scalehouse that you have C&D debris)
2615 Davis Street
San Leandro, CA 94577
510.638.2303

Marin Resource Recovery Center
(You must have an account to get required receipt)
565 Jacoby Street
San Rafael, CA 94901
415.485.5648

Premier Recycle
(Must call ahead)
260 Leo Avenue
San Jose, CA 95112
408.297.7910

Recology San Francisco
501 Tunnel Ave.
San Francisco, CA 94134
415.330.1400

SF Recovery Inc
2401 Ingalls Street
San Francisco, CA 94124
415.368.2388

Smart Demolition
(Must call ahead)
231 Loomis St
San Francisco, CA 94124
650.222.2995

West Contra Costa Sanitary Landfill
(Driver must tell scalehouse of C&D debris load and provide job address to ensure proper credit)
1 Parr Blvd.
Richmond, CA 94801
510.233.4330

Windsor Materials Recovery Facility
590 Caletti Avenue
Windsor, CA 95492
877.698.8473

Zanker Materials Processing Facility
675 Los Esteros Road
San Jose, CA 95134
408.263.2384

EXHIBIT 21

SAN FRANCISCO
PLANNING DEPARTMENT

Notice of Availability of and Intent to Adopt a Negative Declaration

1650 Mission St.
Suite 400
San Francisco,
CA 94103-2479

Reception:
415.558.6378

Fax:
415.558.6409

Planning
Information:
415.558.6377

Date:	March 4, 2015
Case No.:	**2014.0653E**
Project Title:	**Agreement for Disposal of San Francisco Municipal Solid Waste at Recology Hay Road Landfill in Solano County**
Zoning:	Not Applicable – Agreement Citywide in Scope
Block/Lot:	Not Applicable
Project Sponsor:	Jack Macy, Department of the Environment, (415) 355-3751
Staff Contact:	Paul Maltzer – (415) 575-9038 paul.maltzer@sfgov.org

To Whom It May Concern:

This notice is to inform you of the availability of the environmental review document concerning the proposed project as described below. The document is a preliminary negative declaration (PND), containing information about the possible environmental effects of the proposed project. The PND documents the determination of the Planning Department that the proposed project could not have a significant adverse effect on the environment. Preparation of a negative declaration does not indicate a decision by the City to carry out or not to carry out the proposed project.

Project Description: The proposed project consists of an Agreement between the City of San Francisco and Recology to change the disposal site for San Francisco's municipal solid waste (MSW). Currently, Recology, the company that collects San Francisco's waste, transports San Francisco's MSW to the Altamont Landfill, located in eastern Alameda County, for disposal. San Francisco's existing agreement with Waste Management, Inc., operator of the Altamont Landfill, will expire around 2016. The proposed project consists of an Agreement to authorize the transportation of MSW from San Francisco to the existing Recology Hay Road Landfill located in unincorporated Solano County, at 6426 Hay Road, near State Route 113, southeast of Vacaville, where it would be disposed. San Francisco and Recology would enter into an Agreement for the transportation and disposal of five million tons of San Francisco's MSW at the Recology Hay Road Landfill. MSW would be transported by long haul semi-trucks, primarily from the Recology San Francisco transfer station located at 501 Tunnel Avenue, with several additional trucks hauling residual wastes for disposal from Recology's Recycle Central facility, located at Pier 96 in San Francisco, as is presently the case. At current rates of disposal, it is estimated that the Agreement would have a term of approximately 13 – 15 years. No new construction or changes in current Recology operations within San Francisco are proposed. No new construction or change in existing permits would be required at the Recology Hay Road Landfill in Solano County. The proposed project would correspond with the cessation of transport of San Francisco's MSW to Altamont Landfill. The Agreement between San Francisco and Recology to authorize the proposed change in disposal sites would need to be approved by the San Francisco Board of Supervisors.

The PND is available to view or download from the Planning Department's Negative Declarations and EIRs web page (http://www.sf-planning.org/sfceqadocs). Paper copies are also available at the Planning Information Center (PIC) counter on the ground floor of 1660 Mission Street, San Francisco.

If you have questions concerning environmental review of the proposed project, contact the Planning Department staff contact listed above.

Within 30 calendar days following publication of the PND (i.e., by 5:00 p.m. on **April 3, 2015**, any person may:

1) Review the PND as an informational item and take no action;
2) Make recommendations for amending the text of the document. The text of the PND may be amended to clarify or correct statements and may be expanded to include additional relevant issues or to cover issues in greater depth. This may be done **without** the appeal described below; **OR**
3) Appeal the determination of no significant effect on the environment to the Planning Commission in a letter which specifies the grounds for such appeal, accompanied by a $547 check payable to the San Francisco Planning Department.[1] An appeal requires the Planning Commission to determine whether or not an Environmental Impact Report must be prepared based upon whether or not the proposed project could cause a substantial adverse change in the environment. Send the appeal letter to the Planning Department, Attention: Sarah B. Jones, 1650 Mission Street, Suite 400, San Francisco, CA 94103. **The letter must be accompanied by a check in the amount of $547.00 payable to the San Francisco Planning Department, and must be received by 5:00 p.m. on April 3, 2015.** The appeal letter and check may also be presented in person at the PIC counter on the first floor of 1660 Mission Street, San Francisco.

In the absence of an appeal, the negative declaration shall be made final, subject to necessary modifications, after 30 days from the date of publication of the PND. If the PND is appealed, the final negative declaration (FND) may be appealed to the Board of Supervisors. The first approval action, as identified in the Initial Study, would establish the start of the 30-day appeal period for the FND pursuant to San Francisco Administrative Code Section 31.16(h).

Members of the public are not required to provide personal identifying information when they communicate with the Commission or the Department. All written or oral communications, including submitted personal contact information, may be made available to the public for inspection and copying upon request and may appear on the Department's website or in other public documents.

1 Upon review by the Planning Department, the appeal fee may be reimbursed for neighborhood organizations that have been in existence for a minimum of 24 months.

EXHIBIT 22

CA.GOV
California Environmental Protection Agency
Air Resources Board

EMFAC2011 Web Database

Data Type: Emissions / Emission Rates

Region: Please Select

Calendar Year: Please Select 1990 1991 1992

Season: Please Select

Vehicle Category: Please Select

Model Year: Please Select

Speed: Please Select

Fuel: Please Select

Download Data

EXHIBIT 23

Emission Factors for Greenhouse Gas Inventories

Last Modified: 4 April 2014

Red text indicates an update from the 2011 version of this document.

Typically, greenhouse gas emissions are reported in units of carbon dioxide equivalent (CO_2e). Gases are converted to CO_2e by multiplying by their global warming potential (GWP). The emission factors listed in this document have not been converted to CO_2e. To do so, multiply the emissions by the corresponding GWP listed in the table below.

Gas	100-year GWP
CH_4	25
N_2O	298

Source: Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report (AR4), 2007. See the source note to Table 9 for further explanation.

Table 1 Stationary Combustion Emission Factors

Fuel Type	Heating Value	CO_2 Factor	CH_4 Factor	N_2O Factor	CO_2 Factor	CH_4 Factor	N_2O Factor	Unit
	mmBtu per short ton	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per short ton	g CH_4 per short ton	g N_2O per short ton	
Coal and Coke								
Anthracite Coal	25.09	103.69	11	1.6	2,602	276	40	short tons
Bituminous Coal	24.93	93.28	11	1.6	2,325	274	40	short tons
Sub-bituminous Coal	17.25	97.17	11	1.6	1,676	190	28	short tons
Lignite Coal	14.21	97.72	11	1.6	1,389	156	23	short tons
Mixed (Commercial Sector)	21.39	94.27	11	1.6	2,016	235	34	short tons
Mixed (Electric Power Sector)	19.73	95.52	11	1.6	1,885	217	32	short tons
Mixed (Industrial Coking)	26.28	93.90	11	1.6	2,468	289	42	short tons
Mixed (Industrial Sector)	22.35	94.67	11	1.6	2,116	246	36	short tons
Coal Coke	24.80	113.67	11	1.6	2,819	273	40	short tons
Fossil Fuel-derived Fuels (Solid)								
Municipal Solid Waste	9.95	90.70	32	4.2	902	318	42	short tons
Petroleum Coke (Solid)	30.00	102.41	32	4.2	3,072	960	126	short tons
Plastics	38.00	75.00	32	4.2	2,850	1,216	160	short tons
Tires	28.00	85.97	32	4.2	2,407	896	118	short tons
Biomass Fuels (Solid)								
Agricultural Byproducts	8.25	118.17	32	4.2	975	264	35	short tons
Peat	8.00	111.84	32	4.2	895	256	34	short tons
Solid Byproducts	10.39	105.51	32	4.2	1,096	332	44	short tons
Wood and Wood Residuals	17.48	93.80	7.2	3.6	1,640	126	63	short tons
	mmBtu per scf	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per scf	g CH_4 per scf	g N_2O per scf	
Natural Gas								
Natural Gas (per scf)	0.001026	53.06	1.0	0.10	0.05444	0.00103	0.00010	scf
Fossil-derived Fuels (Gaseous)								
Blast Furnace Gas	0.000092	274.32	0.022	0.10	0.02524	0.000002	0.000009	scf
Coke Oven Gas	0.000599	46.85	0.48	0.10	0.02806	0.000288	0.000060	scf
Fuel Gas	0.001388	59.00	3.0	0.60	0.08189	0.004164	0.000833	scf
Propane Gas	0.002516	61.46	0.022	0.10	0.15463	0.000055	0.000252	scf
Biomass Fuels (Gaseous)								
Landfill Gas	0.000485	52.07	3.2	0.63	0.025254	0.001552	0.000306	scf
Other Biomass Gases	0.000655	52.07	3.2	0.63	0.034106	0.002096	0.000413	scf
	mmBtu per gallon	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon	
Petroleum Products								
Asphalt and Road Oil	0.158	75.36	3.0	0.60	11.91	0.47	0.09	gallon
Aviation Gasoline	0.120	69.25	3.0	0.60	8.31	0.36	0.07	gallon
Butane	0.103	64.77	3.0	0.60	6.67	0.31	0.06	gallon
Butylene	0.105	68.72	3.0	0.60	7.22	0.32	0.06	gallon
Crude Oil	0.138	74.54	3.0	0.60	10.29	0.41	0.08	gallon
Distillate Fuel Oil No. 1	0.139	73.25	3.0	0.60	10.18	0.42	0.08	gallon
Distillate Fuel Oil No. 2	0.138	73.96	3.0	0.60	10.21	0.41	0.08	gallon
Distillate Fuel Oil No. 4	0.146	75.04	3.0	0.60	10.96	0.44	0.09	gallon
Ethane	0.068	59.60	3.0	0.60	4.05	0.20	0.04	gallon
Ethylene	0.058	65.96	3.0	0.60	3.83	0.17	0.03	gallon
Heavy Gas Oils	0.148	74.92	3.0	0.60	11.09	0.44	0.09	gallon
Isobutane	0.099	64.94	3.0	0.60	6.43	0.30	0.06	gallon
Isobutylene	0.103	68.86	3.0	0.60	7.09	0.31	0.06	gallon
Kerosene	0.135	75.20	3.0	0.60	10.15	0.41	0.08	gallon
Kerosene-type Jet Fuel	0.135	72.22	3.0	0.60	9.75	0.41	0.08	gallon
Liquefied Petroleum Gases (LPG)	0.092	61.71	3.0	0.60	5.68	0.28	0.06	gallon
Lubricants	0.144	74.27	3.0	0.60	10.69	0.43	0.09	gallon
Motor Gasoline	0.125	70.22	3.0	0.60	8.78	0.38	0.08	gallon
Naphtha (<401 deg F)	0.125	68.02	3.0	0.60	8.50	0.38	0.08	gallon
Natural Gasoline	0.110	66.88	3.0	0.60	7.36	0.33	0.07	gallon
Other Oil (>401 deg F)	0.139	76.22	3.0	0.60	10.59	0.42	0.08	gallon
Pentanes Plus	0.110	70.02	3.0	0.60	7.70	0.33	0.07	gallon
Petrochemical Feedstocks	0.125	71.02	3.0	0.60	8.88	0.38	0.08	gallon
Petroleum Coke	0.143	102.41	3.0	0.60	14.64	0.43	0.09	gallon
Propane	0.091	62.87	3.0	0.60	5.72	0.27	0.05	gallon
Propylene	0.091	65.95	3.0	0.60	6.00	0.27	0.05	gallon
Residual Fuel Oil No. 5	0.140	72.93	3.0	0.60	10.21	0.42	0.08	gallon
Residual Fuel Oil No. 6	0.150	75.10	3.0	0.60	11.27	0.45	0.09	gallon
Special Naphtha	0.125	72.34	3.0	0.60	9.04	0.38	0.08	gallon
Still Gas	0.143	66.72	3.0	0.60	9.54	0.43	0.09	gallon
Unfinished Oils	0.139	74.54	3.0	0.60	10.36	0.42	0.08	gallon
Used Oil	0.138	74.00	3.0	0.60	10.21	0.41	0.08	gallon
Biomass Fuels (Liquid)								
Biodiesel (100%)	0.128	73.84	1.1	0.11	9.45	0.14	0.01	gallon
Ethanol (100%)	0.084	68.44	1.1	0.11	5.75	0.09	0.01	gallon
Rendered Animal Fat	0.125	71.06	1.1	0.11	8.88	0.14	0.01	gallon
Vegetable Oil	0.120	81.55	1.1	0.11	9.79	0.13	0.01	gallon
	mmBtu per gallon	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu				
Steam and Hot Water								
Steam and Hot Water		66.33	1.250	0.125				mmBtu

Source:

Solid, gaseous, liquid and biomass fuels: Federal Register (2009) EPA*; 40 CFR Parts 86, 87, 89 et al; Mandatory Reporting of Greenhouse Gases; Final Rule* , 30Oct09, 261 pp. Tables C-1 and C-2 at FR pp. 56409-56410. Revised emission factors for selected fuels: Federal Register (2010) EPA; 40 CFR Part 98; Mandatory Reporting of Greenhouse Gases; Final Rule, 17Dec10, 81 pp. With Amendments from Memo: Table of Final 2013 Revisions to the Greenhouse Gas Reporting Rule (PDF) to 40 CFR part 98, subpart C: Table C–1 to Subpart C—Default CO2 Emission Factors and High Heat Values for Various Types of Fuel and Table C–2 to Subpart C—Default CH4 and N2O Emission Factors for Various Types of Fuel.

Steam and Hot Water: EPA (2008) *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance - Indirect Emissions from Purchases/Sales of Electricity and Steam* . Assumption: 80% boiler efficiency and fuel type assumed natural gas. Factors are per mmBtu of steam or hot water purchased.

http://www.epa.gov/ghgreporting/documents/pdf/2013/documents/memo-2013-technical-revisions.pdf
http://www.epa.gov/ghgreporting/reporters/subpart/c.html

Table 2 Mobile Combustion CO_2 Emission Factors

Fuel Type	kg CO_2 per unit	Unit
Aviation Gasoline	8.31	gallon
Biodiesel (100%)	9.45	gallon
Compressed Natural Gas (CNG)	0.0545	scf
Diesel Fuel	10.21	gallon
Ethane	4.05	gallon
Ethanol (100%)	5.75	gallon
Jet Fuel (kerosene type)	9.75	gallon
Liquefied Natural Gas (LNG)	4.46	gallon
Liquefied Petroleum Gases (LPG)	5.68	gallon
Methanol	4.10	gallon
Motor Gasoline	8.78	gallon
Propane	5.72	gallon
Residual Fuel Oil	11.27	gallon

Source:

Federal Register (2009) *EPA; 40 CFR Parts 86, 87, 89 et al; Mandatory Reporting of Greenhouse Gases; Final Rule* , 30Oct09, 261 pp. Tables C-1 and C-2. Table of Final 2013 Revisions to the Greenhouse Gas

LNG sourced from: EPA (2008) *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance - Direct Emissions from Mobile Combustion Sources,* Table B-5.

Methanol sourced from: The Climate Registry (2013); *General Reporting Protocol for the Voluntary Reporting Program Version 2.0* , Default Emission Factors, Table 13.1 US Default CO_2 Emission Factors for Transport Fuels.

Table 3 Mobile Combustion CH_4 and N_2O Emission Factors for On-road Gasoline Vehicles

Vehicle Type	Year	CH_4 Factor (g / mile)	N_2O Factor (g / mile)
Gasoline Passenger Cars	1973-74	0.1696	0.0197
	1975	0.1423	0.0443
	1976-77	0.1406	0.0458
	1978-79	0.1389	0.0473
	1980	0.1326	0.0499
	1981	0.0802	0.0626
	1982	0.0795	0.0627
	1983	0.0782	0.0630
	1984-93	0.0704	0.0647
	1994	0.0531	0.0560
	1995	0.0358	0.0473
	1996	0.0272	0.0426
	1997	0.0268	0.0422
	1998	0.0249	0.0393
	1999	0.0216	0.0337
	2000	0.0178	0.0273
	2001	0.0110	0.0158
	2002	0.0107	0.0153
	2003	0.0114	0.0135
	2004	0.0145	0.0083
	2005	0.0147	0.0079
	2006	0.0161	0.0057
	2007	0.0170	0.0041
	2008	0.0172	0.0038
	2009-present	0.0173	0.0036
Gasoline Light-duty Trucks (Vans, Pickup Trucks, SUVs)	1973-74	0.1908	0.0218
	1975	0.1634	0.0513
	1976	0.1594	0.0555
	1977-78	0.1614	0.0534
	1979-80	0.1594	0.0555
	1981	0.1479	0.0660
	1982	0.1442	0.0681
	1983	0.1368	0.0722
	1984	0.1294	0.0764
	1985	0.1220	0.0806
	1986	0.1146	0.0848
	1987-93	0.0813	0.1035
	1994	0.0646	0.0982
	1995	0.0517	0.0908
	1996	0.0452	0.0871
	1997	0.0452	0.0871
	1998	0.0391	0.0728
	1999	0.0321	0.0564
	2000	0.0346	0.0621
	2001	0.0151	0.0164
	2002	0.0178	0.0228
	2003	0.0155	0.0114
	2004	0.0152	0.0132
	2005	0.0157	0.0101
	2006	0.0159	0.0089
	2007	0.0161	0.0079
	2008-present	0.0163	0.0066
Gasoline Heavy-duty Vehicles	<1981	0.4604	0.0497
	1982-84	0.4492	0.0538
	1985-86	0.4090	0.0515
	1987	0.3675	0.0849
	1988-1989	0.3492	0.0933
	1990-1995	0.3246	0.1142
	1996	0.1278	0.1680
	1997	0.0924	0.1726
	1998	0.0641	0.1693
	1999	0.0578	0.1435
	2000	0.0493	0.1092
	2001	0.0528	0.1235
	2002	0.0546	0.1307
	2003	0.0533	0.1240
	2004	0.0341	0.0285
	2005	0.0326	0.0177
	2006	0.0327	0.0171
	2007	0.0330	0.0153
	2008-present	0.0333	0.0134

Source: EPA (2014) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012. All values are calculated from Tables A-101 through A-105.

Table 4 Mobile Combustion CH_4 and N_2O Emission Factors for On-road Diesel and Alternative Fuel Vehicles

Vehicle Type	Vehicle Year	CH_4 Factor (g / mile)	N_2O Factor (g / mile)
Diesel Passenger Cars	1960-1982	0.0006	0.0012
	1983-1995	0.0005	0.0010
	1996-present	0.0005	0.0010
Diesel Light-duty Trucks	1960-1982	0.0011	0.0017
	1983-1995	0.0009	0.0014
	1996-present	0.0010	0.0015
Diesel Medium- and Heavy-duty Vehicles	1960-present	0.0051	0.0048
Gasoline Motorcycles	1960-1995	0.0899	0.0087
	1996-present	0.0672	0.0069
CNG Light-duty Vehicles		0.7370	0.0500
CNG Heavy-duty Vehicles		1.9660	0.1750
CNG Buses		1.9660	0.1750
LPG Light-duty Vehicles		0.0370	0.0670
LPG Heavy-duty Vehicles		0.0660	0.1750
LNG Heavy-duty Vehicles		1.9660	0.1750
Ethanol Light-duty Vehicles		0.0550	0.0670
Ethanol Heavy-duty Vehicles		0.1970	0.1750
Ethanol Buses		0.1970	0.1750

Source: EPA (2014) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012. All values are calculated from Tables A-104 through A-106.

Table 5 Mobile Combustion CH_4 and N_2O Emission Factors for Non-road Vehicles

Vehicle Type	CH_4 Factor (g / gallon)	N_2O Factor (g / gallon)
LPG Non-Highway Vehicles	0.50	0.22
Residual Oil Ships and Boats	0.11	0.57
Diesel Ships and Boats	0.06	0.45
Gasoline Ships and Boats	0.64	0.22
Diesel Locomotives	0.80	0.26
Gasoline Agricultural Equip.	1.26	0.22
Diesel Agricultural Equip.	1.44	0.26
Gasoline Construction Equip.	0.50	0.22
Diesel Construction Equip.	0.57	0.26
Jet Fuel Aircraft	0.00	0.30
Aviation Gasoline Aircraft	7.06	0.11
Biodiesel Vehicles	0.57	0.26
Other Diesel Sources	0.57	0.26
Other Gasoline Sources	0.50	0.22

Source: EPA (2014) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012. All values are calculated from Table A-107.
Note: LPG non-highway vehicles assumed equal to other gasoline sources. Biodiesel vehicles assumed equal to other diesel sources.

Table 6 Electricity Emission Factors

eGRID Subregion	Total output emission factors			Non-baseload emission factors		
	CO_2 Factor (lb CO_2 /MWh)	CH_4 Factor (lb CH_4 /MWh)	N_2O Factor (lb N_2O /MWh)	CO_2 Factor (lb CO_2/MWh)	CH_4 Factor (lb CH_4/MWh)	N_2O Factor (lb N_2O/MWh)
AKGD (ASCC Alaska Grid)	1,256.87	0.02608	0.00718	1,387.37	0.03405	0.00693
AKMS (ASCC Miscellaneous)	448.57	0.01874	0.00368	1,427.76	0.05997	0.01180
AZNM (WECC Southwest)	1,177.61	0.01921	0.01572	1,210.44	0.02188	0.00986
CAMX (WECC California)	610.82	0.02849	0.00603	932.82	0.03591	0.00455
ERCT (ERCOT All)	1,218.17	0.01685	0.01407	1,181.70	0.02012	0.00763
FRCC (FRCC All)	1,196.71	0.03891	0.01375	1,277.42	0.03873	0.01083
HIMS (HICC Miscellaneous)	1,330.16	0.07398	0.01388	1,690.72	0.10405	0.01912
HIOA (HICC Oahu)	1,621.86	0.09930	0.02241	1,588.23	0.11948	0.02010
MROE (MRO East)	1,610.80	0.02429	0.02752	1,755.66	0.03153	0.02799
MROW (MRO West)	1,536.36	0.02853	0.02629	2,054.55	0.05986	0.03553
NEWE (NPCC New England)	722.07	0.07176	0.01298	1,106.82	0.06155	0.01207
NWPP (WECC Northwest)	842.58	0.01605	0.01307	1,340.34	0.04138	0.01784
NYCW (NPCC NYC/Westchester)	622.42	0.02381	0.00280	1,131.63	0.02358	0.00244
NYLI (NPCC Long Island)	1,336.11	0.08149	0.01028	1,445.94	0.03403	0.00391
NYUP (NPCC Upstate NY)	545.79	0.01630	0.00724	1,253.77	0.03683	0.01367
RFCE (RFC East)	1,001.72	0.02707	0.01533	1,562.72	0.03593	0.02002
RFCM (RFC Michigan)	1,629.38	0.03046	0.02684	1,744.52	0.03231	0.02600
RFCW (RFC West)	1,503.47	0.01820	0.02475	1,982.87	0.02450	0.03107
RMPA (WECC Rockies)	1,896.74	0.02266	0.02921	1,808.03	0.02456	0.02289
SPNO (SPP North)	1,799.45	0.02081	0.02862	1,951.83	0.02515	0.02690
SPSO (SPP South)	1,580.60	0.02320	0.02085	1,436.29	0.02794	0.01210
SRMV (SERC Mississippi Valley)	1,029.82	0.02066	0.01076	1,222.40	0.02771	0.00663
SRMW (SERC Midwest)	1,810.83	0.02048	0.02957	1,964.98	0.02393	0.02965
SRSO (SERC South)	1,354.09	0.02282	0.02089	1,574.37	0.02652	0.02149
SRTV (SERC Tennessee Valley)	1,389.20	0.01770	0.02241	1,873.83	0.02499	0.02888
SRVC (SERC Virginia/Carolina)	1,073.65	0.02169	0.01764	1,624.71	0.03642	0.02306
US Average	1,232.35	0.02414	0.01826	1,520.20	0.03127	0.01834

Source: EPA Year 2010 eGRID 9th edition Version 1.0 February 2014.
Note: Total output emission factors are used for quantifying emissions from purchased electricity. Non-baseload emission factors are used for quantifying the emission reductions from purchased green power.

This is a representational map; many of the boundaries shown on this map are approximate because they are based on companies, not on strictly geographical boundaries.
Source: EPA Year 2010 eGRID 9th edition Version 1.0 February 2014.

Table 7 Business Travel Emission Factors

Vehicle Type	CO_2 Factor (kg / unit)	CH_4 Factor (g / unit)	N_2O Factor (g / unit)	Units
Passenger Car [A]	0.368	0.018	0.013	vehicle-mile
Light-duty Truck [B]	0.501	0.024	0.019	vehicle-mile
Motorcycle	0.197	0.070	0.007	vehicle-mile
Intercity Rail (i.e. Amtrak) [C]	0.144	0.0085	0.0032	passenger-mile
Commuter Rail [D]	0.174	0.0084	0.0035	passenger-mile
Transit Rail (i.e. Subway, Tram) [E]	0.133	0.0026	0.0020	passenger-mile
Bus	0.058	0.0007	0.0004	passenger-mile
Air Travel - Short Haul (< 300 miles)	0.275	0.0091	0.0087	passenger-mile
Air Travel - Medium Haul (>= 300 miles, < 2300 miles)	0.162	0.0008	0.0052	passenger-mile
Air Travel - Long Haul (>= 2300 miles)	0.191	0.0008	0.0060	passenger-mile

Source:
CO_2, CH_4, and N_2O emissions data for highway vehicles are from Table 2-15 of the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2012. Vehicle-miles and passenger-miles data for highway vehicles are from Table VM-1 of the Federal Highway Administration Highway Statistics 2012.
Fuel consumption data and passenger-miles data for rail are from Tables A.14 to A.16 and 9.10 to 9.12 of the Transportation Energy Data Book: Edition 32. Fuel consumption was converted to emissions by using fuel and electricity emission factors presented in the tables above.

Notes:
[A] Passenger car: includes passenger cars, minivans, SUVs, and small pickup trucks (vehicles with wheelbase less than 121 inches).
[B] Light-duty truck: includes full-size pickup trucks, full-size vans, and extended-length SUVs (vehicles with wheelbase greater than 121 inches).
[C] Intercity rail: long-distance rail between major cities, such as Amtrak
[D] Commuter rail: rail service between a central city and adjacent suburbs (also called regional rail or suburban rail)
[E] Transit rail: rail typically within an urban center, such as subways, elevated railways, metropolitan railways (metro), streetcars, trolley cars, and tramways.

Table 8 Product Transport Emission Factors

Vehicle Type	CO_2 Factor (kg / unit)	CH_4 Factor (g / unit)	N_2O Factor (g / unit)	Units
Medium- and Heavy-duty Truck	1.456	0.018	0.011	vehicle-mile
Passenger Car [A]	0.368	0.018	0.013	vehicle-mile
Light-duty Truck [B]	0.501	0.024	0.019	vehicle-mile
Medium- and Heavy-duty Truck	0.296	0.0036	0.0022	ton-mile
Rail	0.026	0.0020	0.0007	ton-mile
Waterborne Craft	0.042	0.0004	0.0027	ton-mile
Aircraft	1.301	0.0000	0.0400	ton-mile

Source:
CO_2, CH_4, and N_2O emissions data for highway vehicles are from Table 2-15 of the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2012. Vehicle-miles and passenger-miles data for highway vehicles are from Table VM-1 of the Federal Highway Administration Highway Statistics 2012.
CO_2e emissions data for non-highway vehicles are based on Table A-116 of the U.S. Greenhouse Gas Emissions and Sinks: 1990–2012, which are distributed into CO_2, CH_4, and N_2O emissions based on fuel/vehicle emission factors.
Freight ton-mile data for non-highway vehicles are from Table 1-50 of the Bureau of Transportation Statistics, National Transportation Statistics for 2012.

Notes:
Vehicle-mile factors are appropriate to use when the entire vehicle is dedicated to transporting the reporting company's product. Ton-mile factors are appropriate when the vehicle is shared with products from other companies.
[A] Passenger car: includes passenger cars, minivans, SUVs, and small pickup trucks (vehicles with wheelbase less than 121 inches).
[B] Light-duty truck: includes full-size pickup trucks, full-size vans, and extended-length SUVs (vehicles with wheelbase greater than 121 inches).

Table 9 Global Warming Potentials (GWPs)

Gas	100-year GWP
CO_2	1
CH_4	25
N_2O	298
HFC-23	14,800
HFC-32	675
HFC-41	92
HFC-125	3,500
HFC-134	1,100
HFC-134a	1,430
HFC-143	353
HFC-143a	4,470
HFC-152	53
HFC-152a	124
HFC-161	12
HFC-227ea	3,220
HFC-236cb	1,340
HFC-236ea	1,370
HFC-236fa	9,810
HFC-245ca	693
HFC-245fa	1,030
HFC-365mfc	794
HFC-43-10mee	1,640
SF_6	22,800
NF_3	17,200
CF_4	7,390
C_2F_6	12,200
C_3F_8	8,830
$c\text{-}C_4F_8$	10,300
C_4F_{10}	8,860
C_5F_{12}	9,160
C_6F_{14}	9,300
$C_{10}F_{18}$	>7,500

Source:
100-year GWPs from IPCC Fourth Assessment Report (AR4), 2007. IPCC AR4 was published in 2007 and is among the most current and comprehensive peer-reviewed assessments of climate change. AR4 provides revised GWPs of several GHGs relative to the values provided in previous assessment reports, following advances in scientific knowledge on the radiative efficiencies and atmospheric lifetimes of these GHGs and of CO_2. Because the GWPs provided in AR4 reflect an improved scientific understanding of the radiative effects of these gases in the atmosphere, the values provided are more appropriate for supporting the overall goal of organizational GHG reporting than the Second Assessment Report (SAR) GWP values previously used in the Emission Factors Hub.
While EPA recognizes that Fifth Assessment Report (AR5) GWPs have been published, in an effort to ensure consistency and comparability of GHG data between EPA's voluntary and non-voluntary GHG reporting programs (e.g. GHG Reporting Program and National Inventory), EPA recommends the use of AR4 GWPs. The United States and other developed countries to the UNFCCC have agreed to submit annual inventories in 2015 and future years to the UNFCCC using GWP values from AR4, which will replace the current use of SAR GWP values. Utilizing AR4 GWPs improves EPA's ability to analyze corporate, national, and sub-national GHG data consistently, enhances communication of GHG information between programs, and gives outside stakeholders a consistent, predictable set of GWPs to avoid confusion and additional burden.

Table 9b GWPs for Blended Refrigerants

ASHRAE #	100-year GWP	Blend Composition
R-401A	16	53% HCFC-22 , 34% HCFC-124 , 13% HFC-152a
R-401B	14	61% HCFC-22 , 28% HCFC-124 , 11% HFC-152a
R-401C	19	33% HCFC-22 , 52% HCFC-124 , 15% HFC-152a
R-402A	2,100	38% HCFC-22 , 6% HFC-125 , 2% propane
R-402B	1,330	6% HCFC-22 , 38% HFC-125 , 2% propane
R-403B	3,444	56% HCFC-22 , 39% PFC-218 , 5% propane
R-404A	3,922	44% HFC-125 , 4% HFC-134a , 52% HFC 143a
R-406A	0	55% HCFC-22 , 41% HCFC-142b , 4% isobutane
R-407A	2,107	20% HFC-32 , 40% HFC-125 , 40% HFC-134a
R-407B	2,804	10% HFC-32 , 70% HFC-125 , 20% HFC-134a
R-407C	1,774	23% HFC-32 , 25% HFC-125 , 52% HFC-134a
R-407D	1,627	15% HFC-32 , 15% HFC-125 , 70% HFC-134a
R-407E	1,552	25% HFC-32 , 15% HFC-125 , 60% HFC-134a
R-408A	2,301	47% HCFC-22 , 7% HFC-125 , 46% HFC 143a
R-409A	0	60% HCFC-22 , 25% HCFC-124 , 15% HCFC-142b
R-410A	2,088	50% HFC-32 , 50% HFC-125
R-410B	2,229	45% HFC-32 , 55% HFC-125
R-411A	14	87.5% HCFC-22 , 11 HFC-152a , 1.5% propylene
R-411B	4	94% HCFC-22 , 3% HFC-152a , 3% propylene
R-413A	2,053	88% HFC-134a , 9% PFC-218 , 3% isobutane
R-414A	0	51% HCFC-22 , 28.5% HCFC-124 , 16.5% HCFC-142b
R-414B	0	5% HCFC-22 , 39% HCFC-124 , 9.5% HCFC-142b
R-417A	2,346	46.6% HFC-125 , 5% HFC-134a , 3.4% butane
R-422A	3,143	85.1% HFC-125 , 11.5% HFC-134a , 3.4% isobutane
R-422D	2,729	65.1% HFC-125 , 31.5% HFC-134a , 3.4% isobutane
R-423A	2,280	47.5% HFC-227ea , 52.5% HFC-134a ,
R-424A	2,440	50.5% HFC-125, 47% HFC-134a, 2.5% butane/pentane
R-426A	1,508	5.1% HFC-125, 93% HFC-134a, 1.9% butane/pentane
R-428A	3,607	77.5% HFC-125 , 2% HFC-143a , 1.9% isobutane
R-434A	3,245	63.2% HFC-125, 16% HFC-134a, 18% HFC-143a, 2.8% isobutane
R-500	32	73.8% CFC-12 , 26.2% HFC-152a , 48.8% HCFC-22
R-502	0	48.8% HCFC-22 , 51.2% CFC-115
R-504	325	48.2% HFC-32 , 51.8% CFC-115
R-507	3,985	5% HFC-125 , 5% HFC143a
R-508A	13,214	39% HFC-23 , 61% PFC-116
R-508B	13,396	46% HFC-23 , 54% PFC-116

Source:
100-year GWPs from IPCC Fourth Assessment Report (AR4), 2007. See the source note to Table 9 for further explanation. GWPs of blended refrigerants are based on their HFC and PFC constituents, which are based on data from http://www.epa.gov/ozone/snap/refrigerants/refblend.html.

EXHIBIT 25

Questions and Answers

Frequently Asked Questions from Owners and Operators of Nonroad Engines, Vehicles, and Equipment Certified to EPA Standards

The U.S. Environmental Protection Agency (EPA) has adopted emission standards for nearly all types of nonroad engines, vehicles, and equipment. This page describes how EPA emission standards affect individual owners and operators of these products.

Why does EPA adopt emission standards for nonroad engines, vehicles, and equipment?

Nonroad engines contribute significantly to air pollution. The emission standards address emissions of oxides of nitrogen (NOx), hydrocarbons (HC), particulate matter (PM), and carbon monoxide (CO). These emissions help form smog and include toxic compounds such as benzene, so reducing them will benefit our health and environment. In the Clean Air Act, Congress requires us to set emission standards that address these problems.

Does my current nonroad engine, vehicle, or equipment need to meet these regulations?

Manufacturers must ensure that each new engine, vehicle, or equipment meets the latest emission standards. Once manufacturers sell you a certified product, no further effort is required to complete certification. If products were built before EPA emission standards started to apply, they are generally not affected by the standards or other regulatory requirements. See Table 1 for a listing of when EPA emission standards started to apply. We never require owners to retire their old engines, vehicles, or equipment.

United States Environmental Protection Agency

Office of Transportation and Air Quality
EPA-420-F-12-053
August 2012

What requirements apply to owners and operators of certified products?

One of the most important part of the regulations that applies to you is the tampering prohibition—you may not disable any emission controls installed on certified engines, vehicles, or equipment. This would apply for removing emission control devices, adding or modifying hardware or software that increases emissions (of any pollutant), reprogramming onboard computers, or operating engines without any needed supplies such as Diesel Exhaust Fluid. Manufacturers explain in their owner's manual what type of emission controls exist for each model; they may also specify some minor maintenance that must be done to keep emission controls working properly. For restrictions and recordkeeping requirements that apply for rebuilding engines and performing maintenance on certified products, see "How to Maintain or Rebuild Engines Certified to EPA Standards," EPA-420-F-12-052 (available at www.epa.gov/nonroad/).

Similarly, EPA regulations prohibit defeat devices—you may not make, sell, or install any part that bypasses, impairs, defeats, or disables the control of emissions of any regulated pollutant.

Since manufacturers have the primary responsibility to meet emission standards for their products, you generally have no requirements to achieve a certain level of emission control or to re-certify. However, you must meet additional requirements in two special circumstances:

- You may need to use certified kits or systems when remanufacturing locomotive engines or marine diesel engines.
- In the case of Marine SI engines (40 CFR part 1045), Recreational vehicles (40 CFR part 1051), and Small SI engines (40 CFR part 1054), you must re-certify if you upgrade your engine to operate on a different fuel. For fuel conversions with other types of nonroad engines, vehicles, or equipment, you may need to do testing to show that the conversion is not considered tampering, but you do not need to re-certify.

What kind of emission controls does EPA require?

We don't tell manufacturers what emission controls to use to comply with the regulations, but we rely on testing information from engines equipped with specific technologies to establish the emission standards. Manufacturers may use these anticipated technologies, or they may find better ways to meet emission standards.

Manufacturers of diesel engines have typically met the standards with more careful control of intake air and fuel injection, with some exhaust gas recirculation. Long-term standards for many of these engines will generally involve additional use of aftertreatment devices such as diesel particulate filters (DPF) and selective catalytic reduction (SCR).

Most Large SI engines and many Marine SI engines use automotive-type technologies, including closed-loop fuel injection and three-way catalytic converters. For other engines, manufacturers will optimize air-fuel mixtures and make other internal engine changes. We expect continued use of two-stroke engines in the following cases: (1) outboard and personal watercraft marine engines may use direct-injection two-stroke engine technology, which avoids the most problematic aspects of two-stroke combustion; (2) to maintain lightweight performance, Handheld

Small SI engines will typically continue to use two-stroke engines, though these engines will generally have catalysts to reduce the amount of unburned fuel from escaping through the exhaust as hydrocarbon emissions; and (3) some two-stroke snowmobile engines will likely continue to be available, depending on ongoing efforts to improve the performance characteristics of four-stroke snowmobile engines.

For gasoline-fueled products, we have also adopted requirements to control permeation emissions from fuel systems. We expect these requirements to lead to the use of improved materials to prevent fuel from escaping through fuel tanks and hoses into the atmosphere. This should noticeably reduce the smell of gasoline around these vehicles and equipment.

How will these controls affect performance and safety?

As part of the rulemaking process, we evaluate potential safety issues related to new standards to make sure not to adopt emission standards that would cause manufacturers to use emission controls that add new risks to operating vehicles or equipment. As always, it is important to take proper precautions when using engine-powered vehicles or equipment.

Meeting emission standards adds to the engine designer's challenge. This might lead to some trade-offs with respect to power or efficiency; however, there are many examples of design engineers coming up with ways to add emission controls in a way that significantly improves engine power and efficiency while reducing emissions. Over time, engineers will work to improve designs to reduce or eliminate any remaining trade-offs.

Do EPA regulations affect where I can use my nonroad vehicle or equipment?

No. These regulations do not include any specific restrictions about where you can use your nonroad vehicle or equipment. They address only the permissible emission rates from new, certified products.

State and local governments have limited authority to set emission standards for new products; however, they may adopt regulations that restrict the use and operation of most products that are no longer new. EPA generally has no involvement with such restrictions.

Do EPA regulations apply in California?

California has adopted its own emission standards for certain types of new nonroad engines, vehicles, or equipment. In those cases, manufacturers must certify their products with the California Air Resources Board; these products are also certified with EPA even though no additional requirements apply.

EPA's prohibitions against tampering and defeat devices apply to certified products throughout the United States, including products that are certified to meet emission standards that apply uniquely in California.

For More Information

You can access documents related to emission standards for nonroad engines, vehicles, and equipment on EPA's Office of Transportation and Air Quality (OTAQ) web site at:

www.epa.gov/nonroad

You can also contact the OTAQ library for document information at:

U.S. Environmental Protection Agency
Office of Transportation and Air Quality Library
2000 Traverwood Drive
Ann Arbor, Michigan 48105
(734) 214-4311 & 214-4434
Email: Group_AALibrary@epa.gov

Table 1
Schedule for Application of New Emission Standards for Certifying Engines and Vehicles

Engine category	Engine subcategory	Manufacturing date after which emission standards start to apply
A. Heavy-duty highway engines	—	Model year 1970
B. Locomotives or locomotive engines	—	January 1, 1973
C. Marine compression-ignition engines at or above 37 kW	**Commercial:** displacement < 0.9 L/cyl	Model year 2005
	Commercial: 0.9 ≤ displacement < 2.5 L/cyl	Model year 2004
	Commercial: displacement ≥ 2.5 L/cyl	Model year 2007
	Recreational: displacement < 0.9 L/cyl	Model year 2007
	Recreational: 0.9 ≤ displacement < 2.5 L/cyl	Model year 2006
	Recreational: 2.5 ≤ displacement < 5.0 L/cyl	Model year 2009
D. Other nonroad compression-ignition engines.	**Marine compression-ignition engines:** Power < 19 kW	January 1, 2000
	Marine compression-ignition engines: 19 kW ≤ Power < 37	January 1, 1999
	Nonroad engines: Power < 19 kW	January 1, 2000
	Nonroad engines: 19 kW ≤ Power < 37	January 1, 1999
	Nonroad engines: 37 kW ≤ Power < 75	January 1, 1998
	Nonroad engines: 75 kW ≤ Power < 130	January 1, 1997
	Nonroad engines: 130 kW ≤ Power ≤ 560	January 1, 1996
	Nonroad engines: Power > 560 kW	January 1, 2000
E. Marine spark-ignition engines.	Outboard	Model year 1998
	Personal watercraft	Model year 1999
	Sterndrive/inboard	Model Year 2010
F. Recreational spark-ignition engines and vehicles	—	Model year 2006
G. Other nonroad spark-ignition engines at or below 19 kW	—	Model year 1997
H. Other nonroad spark-ignition engines above 19 kW	—	Model year 2004

EXHIBIT 26

Best Practices for Clean Diesel Construction

Successful Implementation of Equipment Specifications to Minimize Diesel Pollution

by Northeast Diesel Collaborative

Northeast Diesel Collaborative
www.northeastdiesel.org

Best Practices for Clean Diesel Construction

Successful Implementation of Equipment Specifications to Minimize Diesel Pollution

Overview

Specifications for operating cleaner diesel equipment have become more prevalent as states, local governments, public agencies, and private entities have begun to require that clean diesel construction technologies and strategies be used on their sites. This document provides recommendations for successful implementation of specifications to minimize diesel pollution and exposure during construction. Such specifications are often referred to as Clean Diesel Equipment, Clean Diesel Construction or Clean Construction. In this document you will find steps to ensure effective communication and engagement by all parties associated with the construction project, links to resources, and checklists for the project owner/sponsor, construction manager and contractor.

Background

Diesel exhaust is a complex mixture of pollutants including particulate matter (soot), nitrogen oxides and volatile organic compounds which contribute to smog, acid rain, climate change, premature death and a range of health problems. Construction workers may have an increased risk of health related issues from occupational exposure to diesel exhaust. Additionally, diesel emissions may negatively impact communities around the construction site. Information about the health effects of diesel exhaust can be found at: http://www.mass.gov/dep/air/diesel/healthenv.htm

Equipment rolling off production lines today emits dramatically less pollution than 10 years ago due to EPA regulations restricting the emissions from new engines. However, construction equipment often lasts more than 30 years. It is estimated that 2 million pieces of diesel equipment currently in use do not meet newer standards. Fortunately, in addition to the option to buy or rent new equipment that meets current standards, actions can be taken to reduce emissions from existing equipment. These actions include but are not limited to:

- Replacement of older equipment with equipment meeting the latest emission standards
- Repowering equipment (i.e. replacing older engines with newer, cleaner engines and leaving the body of the equipment intact)
- Retrofitting engines and equipment with exhaust control technologies
- Proper equipment maintenance
- Application of idle reduction strategies
- Utilizing cleaner fuels

Elements of Success

In order to successfully develop and implement Clean Diesel Equipment specifications, several elements should be considered:

- Well Written Specifications in the Bid Package
  - Objective, clear, and concise
  - Reporting systems are clearly delineated
  - Model contract specifications developed by the Northeast Diesel Collaborative can be found at: *http://northeastdiesel.org/pdf/NEDC-Construction-Contract-Spec.pdf*

- Organizational Support Across all Involved Entities
  - Visible and consistent support throughout all levels of management and workers at each level
  - Inclusion of clean diesel implementation metrics in performance reviews for personnel involved in clean construction to help ensure accountability

- Effective Communication
  - Creation and implementation of a communication plan to support effective clean diesel activities
  - Align strategy, process and personnel to meet the Clean Diesel Equipment requirements
  - Assurance that specifications are feasible and technology is reliable, such that:
    - Required Diesel Particulate Filters (DPF) or other technologies are available either through purchasing or renting new equipment or retrofitting existing vehicles/equipment
    - Required DPF or other technologies is verified by the US Environmental Protection Agency (USEPA) or the California Air Resources Board (CARB):
      USEPA: http://epa.gov/cleandiesel/verification/verif-list.htm
      CARB: http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm
    - Resources are available to help determine the best retrofit technology available for cleaning up existing diesel equipment
      - Clean Diesel Clearinghouse http://www.cleandieselclearinghouse.org/
      - Diesel Engine Retrofits in the Construction Industry: A How To Guide www.mass.gov/dep/air/diesel/conretro.pdf
      - Construction Fleet Inventory Guide http://www.epa.gov/cleandiesel/documents/420b10025.pdf
      - Diesel Emissions Reduction Program (DERA): Technologies, Fleets and Projects Information http://www.epa.gov/cleandiesel/documents/420p11001.pdf

- An Action Plan for Effective Implementation that Includes:
  - Creating a "Clean Diesel Team" with representatives from the Project Owner/Sponsor organization to coordinate from the pre-bid phase through to completion of the project
  - Implementing a timeline with action items for designated personnel
    - Pre-bid phase
    - Post-award phase
  - Leveraging opportunities and co-benefits to promote success, such as:
    - Regulations
    - Occupational exposure issues
    - Community health considerations
    - Positive image for company
    - Addressing community concerns including Environmental Justice issues

  - Cost savings for idle reduction etc.
- Identifying and addressing possible barriers to success, such as:
  - Cost
  - Lack of knowledge (don't know the health risks)
  - Fear of new technology
  - Misinformation
  - Past practice/habit – disinclination to embrace change
- Delineating the roles of key personnel with Clean Diesel Responsibilities (see below)

The Process

All parties need to fully understand the Clean Diesel Equipment specifications and maintain ongoing communications from the development of the bid to the completion of the project. Early and consistent dialogue with key project personnel throughout the construction project increases the likelihood of successful implementation. It may also be helpful to acknowledge that Clean Diesel Equipment requirements typically represent a change from business as usual, and with the prospect of change often comes resistance. Implementing the best practices outlined in this document can help overcome that resistance.

<u>Phase I: Pre-Award Phase</u>

Together, the Project Owner/Sponsor and Construction Manager need to communicate the Clean Diesel Equipment requirements to potential contractors before the award. Prior to formally issuing a contract specification, the Project Sponsor/Owner may want to reach out to contracting associations to inform them of their commitment to Clean Diesel Equipment requirements.

The Project Owner/Sponsor and Construction Manager may also invite potential contractors to a pre-bid meeting to review the scope of work and project-specific requirements including Clean Diesel Equipment. The Project Owner/Sponsor can delineate the expectations for Clean Diesel Equipment to bidders at this time.

Project Owner/Sponsors can also ask for and obtain acceptance from the Contractor for the specification. All bids will then be submitted by Contractors with signed letters confirming that they have read and understand the clean diesel construction requirements.

Once a short list of potential contractors is determined, the Construction Manager can perform a scope review with the potential contractors to ensure they understand the Clean Diesel Equipment contract requirements. This process is similar to the pre-bid meeting; however, it consists of a more detailed review and would be done with each potential contractor separately. If possible, Clean Diesel Equipment should warrant a separate scope review meeting.

<u>Phase II: Post-Award Phase</u>

Once a qualified contractor is selected, he or she can hold a Clean Diesel Equipment kick-off meeting with the construction crew to review the clean construction requirements and go over the expectations of the Project Owner/Sponsor. The Contractor will want to include laborers, equipment operators and supervisors in this meeting.

After the kick-off meeting, the Construction Manager can work with the Contractor to ensure that all available information regarding emission control equipment vendors has been gathered, including the most current lead times necessary to obtain and install the required emission control equipment. This information will help ensure that the Contractor, Construction Manager and Project Owner/Sponsor are all on the same page and allow everyone to determine a realistic timeline to meet the Clean Diesel Equipment requirements. Resources such as those listed in the previous section are available to help determine the best retrofit technology available for reducing emissions from existing diesel equipment.

Developing a tracking system to ensure all equipment on site meets the specifications is also important. Creating scannable barcodes for each piece of equipment can prove to be very effective for large projects.

Roles of Key Personnel[1]

- **Project Owner/Sponsor organization** *(See appendix A for sample Project Owner Checklist)*
  - Develops the Clean Diesel Equipment requirements
  - Includes Clean Diesel Equipment specifications in the bid package
  - Develops an action plan for effective implementation of Clean Diesel Equipment requirements
  - Hires/appoints a Construction Manager to monitor/enforce the Clean Diesel Equipment requirements
  - Conveys expectations to Construction Manager regarding Clean Diesel Equipment requirements
  - Works with the Construction Manager to develop a communication plan to ensure that the Construction Manager communicates effectively with the Contractor
  - Works with the Construction Manager to determine circumstances that can be leveraged to support implementation and barriers that need to be overcome
  - Responds to and resolves concerns raised during the project
  - Designates staff member(s) from the Project Owner/Sponsor organization to walk the site once a week with the Construction Manager and Contractor to ensure compliance. The representatives from the Project Owner/Sponsor organization may ask about any Clean Diesel Equipment construction or safety concerns that may have been raised on the site
  - Holds a meeting with the Construction Manager once a week to review tracking system and discuss the compliance status of Clean Diesel Equipment requirements
  - Requires Contractor to certify that staff and workers are properly trained in Clean Diesel Equipment requirements
  - The Project Owner/Sponsor organization can require a detailed tracking plan to demonstrate that the specifications are being met

- **Construction Manager** *(See Appendix B for sample Construction Manager Checklist)*
  - Demonstrates complete understanding of the Project Owner/Sponsor's requirements and expectations
  - Presents Clean Diesel Equipment requirements to potential contractor
  - Performs a scope review with potential Contractors to ensure they understand Clean Diesel Equipment contract requirements
  - Understands and responds to all of the comments and questions raised by the Contractor
  - Works with the Project Owner/Sponsor to determine circumstances that can be leveraged to support implementation and barriers that need to overcome

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[1] Please note that this document should be used as a general guide, as the roles and responsibilities of the key personnel can vary based on the specific configuration of the involved parties.

- ➢ Oversees and enforces Clean Diesel Equipment requirements on site
- ➢ Participates in an internal meeting with his or her supervisors once a week to discuss the compliance status of Clean Diesel Equipment construction requirements
- ➢ Holds a meeting with the Contractor once a week to ensure compliance with the Clean Diesel Equipment requirements and to address any related issues that may have occurred on site
- ➢ Conducts daily site inspections

- **Contractor** *(See Appendix C for sample Contractor Checklist)*
  - ➢ Reviews the Clean Diesel Equipment requirements thoroughly
  - ➢ Procures the necessary equipment to minimize diesel emissions for each covered piece of construction equipment
  - ➢ Requests clarification on any unclear specifications
  - ➢ Consistently reinforces to the crew the importance of the Clean Diesel Equipment site policy
  - ➢ Conducts training for all staff and workers as required in the contract documents
  - ➢ Includes Clean Diesel Equipment practices in daily 'tool box' talks
  - ➢ Includes Clean Diesel Equipment practices in means and methods
  - ➢ Submits reports on the Clean Diesel Equipment requirements and equipment inventories as listed in the specifications

For further information, please visit: http://northeastdiesel.org/construction.html

Appendix A: Sample Project Owner/Sponsor Checklist

Pre-Award Phase Tasks	
Has support been secured from management for Clean Diesel Equipment specifications?	
Has a set of Clean Diesel Equipment requirements been agreed upon by management and staff?	
Have the Clean Diesel Equipment requirements been determined to be achievable? (i.e., equipment, technology and/or vendor availability)	
Have all state or local regulatory requirements for Clean Diesel Equipment been identified?	
Has a clear, concise Clean Diesel Equipment specification been written and included in the bid package?	
Have circumstances been leveraged to support implementation and barriers to be overcome been identified?	
Has a Construction Manager with Clean Diesel Equipment compliance responsibilities been chosen?	
Does the Construction Manager have adequate knowledge and experience with Clean Diesel Equipment requirements?	
Has a pre-bid meeting been held to communicate requirements to potential contractors?	
Have all potential contractors submitted signed letters confirming that they have read and understand the Clean Diesel Equipment construction requirements?	
Post-Award Phase Tasks	
Has a kick-off meeting been held to review the Clean Diesel Equipment requirements?	
Has a team of representatives been assembled to perform weekly site visits and hold weekly meetings with the Construction Manager?	
Has a tracking system been developed and is it being properly implemented?	
Has Clean Diesel Equipment training been conducted for all staff and workers?	
Are all issues on site regarding Clean Diesel Equipment requirements being adequately addressed by the construction manager?	
Is the construction manager collecting reports on Clean Diesel Equipment requirements from the Contractor?	

Appendix B: Sample Construction Manager Checklist

Pre-Award Phase Tasks	
Has the Project Owner/Sponsor clearly defined the Clean Diesel Equipment requirements and expectations for this project?	
Can the Clean Diesel Equipment requirements be presented to contractors in a clear and concise manner?	
Have local vendors for Clean Diesel Equipment and technology been identified?	
Have local vendors indicated any issues or extended lead times for obtaining and installing emission control technologies?	
Has a pre-bid meeting been held to communicate requirements to potential contractors?	
Have all of the potential contractors' questions or concerns regarding the Clean Diesel Equipment requirements been addressed?	
Has a scope review been performed on the potential contractors to ensure understanding of the Clean Diesel Equipment requirements?	
Post-Award Phase Tasks	
Has a kick-off meeting been held to review the Clean Diesel Equipment requirements?	
Have all of the potential contractors' questions or concerns regarding the Clean Diesel Equipment requirements been addressed?	
Has a tracking system been developed and is it being properly implemented?	
Are site inspections being conducted daily?	
Are weekly meetings being held with supervisors to discuss the status of the Clean Diesel Equipment requirements?	
Are weekly meetings being held with the Contractor to discuss the status of the Clean Diesel Equipment requirements?	
Are all issues on site regarding Clean Diesel Equipment requirements being adequately addressed?	
Is the Contractor submitting reports on Clean Diesel Equipment requirements and equipment inventories as listed in the specifications?	
Is the data in the Contractor's reports accurate and consistent with what is present on site?	

Appendix C: Sample Contractor Checklist

Pre-Award Phase Tasks	
Have the Clean Diesel Equipment requirements and expectations for this project been read thoroughly?	
Has a pre-bid meeting been attended?	
Have all questions or concerns regarding the Clean Diesel Equipment requirements been addressed?	
Have local vendors for Clean Diesel Equipment and technology been identified?	
Have local vendors indicated any issues or extended lead times for obtaining and installing emission control technologies?	
Has a signed letter confirming that the Clean Diesel Equipment requirements have been read and understood been submitted?	
Post-Award Phase Tasks	
Has a kick-off meeting been attended to review the Clean Diesel Equipment requirements?	
Have all questions or concerns regarding the Clean Diesel Equipment requirements been addressed?	
Is the tracking system being properly implemented?	
Has Clean Diesel Equipment training for all staff and workers been conducted?	
Are Clean Diesel Equipment practices being included in daily 'tool box' talks?	
Are weekly meetings being held with the Construction Manager to discuss the status of the Clean Diesel Equipment requirements?	
Are all issues on site regarding Clean Diesel Equipment requirements being adequately addressed?	
Is all data on Clean Diesel Equipment requirements and equipment inventories as listed in the specifications being collected?	
Has the data collected been compiled into reports to be submitted to the Construction Manager?	

EXHIBIT 27

Construction

NEDC Clean Construction Workgroup

The NEDC Construction Workgroup brings together government, industry and other stakeholders involved in construction related activities to share information and implement innovative, cost-effective strategies to improve air quality and reduce diesel emissions from construction projects in the northeast states and Caribbean territories. Conference calls are held on the 4th Thursday of every month. *For more information about the workgroup or how to join contact Gary Rennie at rennie.gary@epa.gov.*

- The construction industry uses more diesel engines than any other sector. Of the 2 million diesel engines currently used in construction equipment across the nation, 31 percent were manufactured before the introduction of emissions regulations.
- These backhoes, cranes, and bulldozers account for 32 percent of all nitrogen oxide and 37 percent of fine particle emissions from mobile sources, and their reputation for remaining in service for decades creates a pollution problem for years to come.

Reducing Diesel Emissions from Construction

In the Northeast, public agencies and industry have partnered on pioneering emission control technologies and strategies for these workhorses of the economy. Among the successes are:

- LEED Clean Construction Pilot Credit Available. To minimize the health and climate impacts to local communities from diesel engine emissions associated with construction activities, the US Green Building Council announces that a Clean Construction Pilot Credit can be used toward Leadership in Energy and Environmental Design (LEED) certification.
- The 7 World Trade Center reconstruction in New York City included the first retrofit of a large tower crane, demonstrating the effectiveness of combining after-treatment devices and ultra-low sulfur diesel fuel in construction equipment. Several public agencies — Connecticut Department of Transportation, Massachusetts Highway Department, New York Transit Authority, and Massachusetts Bay Transportation Authority — now require retrofits on construction projects.
- Boston's Central Artery (Big Dig) was the country's first major construction retrofit project; 200 engines were retrofitted with oxidation catalysts or PM filters, resulting in a reduction of 8 tons of PM and hydrocarbons annually.
- Through the I-95 Q-Bridge reconstruction project in Connecticut, the state's Department of Transportation has retrofitted 105 vehicles to date.

The Collaborative is working to expand retrofit requirements for construction contracts to other municipalities, counties, government agencies, and major institutions. NEDC partners are also working with state and local agencies to lead by example by retrofitting their construction vehicles and equipment and participating in demonstrations of new technology.

» View EPA and CARB Verified Nonroad Retrofit Technologies

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Federal Regulations

EPA's Nonroad Diesel Rule sets more stringent emissions standards for diesel construction vehicles and equipment beginning with those manufactured in 2008. The rules require clean diesel fuel with a sulfur content capped at 15 parts per million and the use of advanced emission control technology. New engines will be more than 90 percent cleaner than construction equipment in use today. However, these standards will affect only newly manufactured construction vehicles and equipment and will not reduce emissions from current vehicles and equipment.

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State and Local Regulations

- New York City's Local Law 77, signed into law December 22, 2003, requires "that any diesel-powered nonroad vehicle, fifty horsepower and greater, that is owned by, operated by or on behalf of, or leased by a City agency be powered by ultra low sulfur diesel fuel and utilize the best available technology for reducing the emission of pollutants. Additionally, this legislation requires that any solicitation for a public works contract and any contract entered into as a result of such solicitation include specifications that all contractors in the performance of such contract use ultra low sulfur diesel fuel and the best available technology for reducing the emission of pollutants for diesel-powered nonroad vehicles."

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State Contract Requirements

To encourage cleaner air around local construction sites, many agencies, organizations, businesses and institutions have initiated construction retrofit programs and are using contract specifications to call for emission control technologies. For specific language used by state agencies, see below:

- The Connecticut Department of Transportation
- The Massachusetts Highway Department
- New York State Department of Transportation

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Model Contract Language & Best Practices

NEDC Model Construction Contract Specification
The NEDC Steering Committee in coordination with representatives from state air agencies, US EPA, emission control manufacturers, environmental organizations, and the construction industry have developed NEDC's newly revised model contract specification. The model contract specification offers guidance to private institutions and public entities interested in addressing pollution from construction sources through future construction contracts. The goal of this document is to encourage institutions and agencies to adopt contract specifications and to promote the widespread use of emission controls in the construction sector.

NEDC Best Practices for Clean Diesel Construction
"Best Practices for Clean Diesel Construction--Successful Implementation of Equipment Specifications to Minimize Diesel Pollution". The document provides recommendations for states, local governments, public agencies, and private entities to successfully implement clean diesel specifications on construction sites.

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Related Resources

Breathing Clean by Building Green:
Clean Diesel Construction

Diesel Engine Retrofits in the Construction Industry: A How To Guide
In January 2008, the Massachusetts Department of Environmnental Protection issued a comprehensive "how to" guide for retrofiting diesel construction equipment with advanced pollution control technologies. The 56 page document includes the following: an overview of the health and air quality concerns associated with diesel pollution, the Massachusetts state agency construction retrofit requirements, available retrofit technologies, a retrofit "roadmap", and case studies of successful projects.

Low-Cost Ways to Cleaner Construction
National Clean Diesel Campaign fact sheet on cost effective ways to reduce emissions from construction equipment for: Construction company owners; Equipment rental companies; and Equipment operators.

Emission Reduction Incentives for Off-Road Diesel Equipment Used in the Port and Construction Sectors (ICF/EPA 2005)
This report describes and assesses incentive programs to reduce emissions from off-road diesel engines used in the construction industry and port sector. The report focuses primarily on grant programs, tax incentives, modified contracting procedures, and non-monetary incentives implemented at the federal, state, regional, and local level.

Evaluating the Occupational and Environmental Impact of Nonroad Diesel Equipment in the Northeast (NESCAUM 2004)
This evaluates the potential health risks from nonroad sources by monitoring selected hazardous air pollutant and particulate matter exposures in the cabin of operating nonroad diesel equipment and at the perimeter of the active work site.

Off-Highway Diesel Engine Emissions Overview, Jerry Stewart, Bell Power Systems (February, 2014)

MassDOT Diesel Retrofit Program for Non-road Construction Equipment (May, 2014)

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EXHIBIT 28

White Paper: An Industry Perspective on the California Air Resources Board Proposed Off-Road Diesel Regulations

Overview & History

The California Air Resources Board (CARB) is currently considering regulations to reduce Particulate Matter (PM) and NOx emissions from off-road diesel equipment operated by the construction and many other industries in the state.

The Board first announced its intention to promulgate these regulations in 2000. The Board's original plan called for an 18-year timeline to meet the state's goals of reducing particulate matter emissions only. Now, after seven years of delays in developing these rules, that timeline has been reduced to 13 years. In addition, the regulation of NOx emissions has been added to the rule – which significantly alters the technology needed for companies to be in compliance.

Throughout this process, the construction industry voluntarily has begun to retrofit and replace older, high-polluting equipment with new, cleaner burning engines. In addition, the industry has demonstrated a willingness to work with CARB to develop a fair regulation that achieves the state's air quality goals while providing contractors adequate time to meet the standards. Despite these efforts, the rules before the Board in their current form are not viable from an economic or technological perspective and cut off access to critical funding for retrofitting older equipment under the Carl Moyer Program. In addition, they threaten to seriously reduce the buying power of the $43 billion in bonds to build roads, schools, housing and improve the state's flood control system approved by voters in November.

The industry maintains its commitment to working with CARB, environmental organizations, the Legislature and other stakeholders to find a feasible solution that achieves the state's air quality goals while allowing contractors to meet the standards in a reasonable timeframe. By maintaining the original 18-year timeline for implementation of these rules, we have the opportunity to ensure California's economy, workforce, businesses, infrastructure and environment all win.

Moving Toward The Goal

The Construction Industry Air Quality Coalition (CIAQC) has been keenly aware of the concern over PM, NOx and visible emissions from construction equipment for many years. The public has also expressed a desire for cleaner burning, heavy duty, off-road construction equipment working in their neighborhoods.

The industry shares this concern and has taken action to proactively replace or retrofit older, higher-polluting off-road diesel equipment with cleaner models. A critical part of the industry's efforts is funding available through the state's Carl Moyer program for re-powering older construction engines.

The equipment most suitable for re-power includes scrapers, haul trucks, bulldozers, loaders, water pulls, water trucks, excavators, motor graders and trucks that transport cranes. Replacement engines for smaller equipment such as skid steers, backhoes and a host of other lower horsepower units are simply not available.

Since these funds became available, CIAQC has been encouraging construction companies to pursue an aggressive engine re-powering program. Over the past six years, twenty construction companies in the South Coast and San Diego Districts have re-powered 1,020 machines at a cost of $89 million. Carl Moyer Program provided $71.0 million with the remaining $18 million being provided by the machine owners themselves.

This single industry effort is the largest voluntary emission reduction program in the history of California and represents about 30 percent of the total funding statewide and about 10 percent of the total engines modified. It has resulted in a reduction of 3,797 tons per year of NOx and 126 tons per year of PM emissions. This accounts for 25 percent of the PM and 20 percent of the NOx program emissions reduced statewide.

The Legislature has recently committed $140 million a year, for the next five years, to continue the Carl Moyer Program. Under CARB's proposed rule, however the industry would loose access to these funds almost immediately. While these funds will not make a significant dent (the 1,020 engines re-powered in Southern California accounted for just one-half of one percent of all the engines in the state construction fleet) in meeting the fleet emission targets under the proposed rules, they are nonetheless an important and essential tool in improving air quality.

Construction-Related Off-Road Diesel Emissions

Before discussing the specifics of these regulations, it is important to note both the air quality goals CARB has set for the state and the level of construction related off-road diesel emissions.

These proposed regulations are part of CARB's strategy to reach its overall goal of reducing PM from all diesel fueled engines in California by 75 percent by year 2010, and by 85 percent by year 2020.

Construction-related of-road diesel emissions in California represent 24 percent of the total PM emissions from mobile sources across the state. They represent less than one percent of total man-made PM emissions from all sources.

NOx emissions from construction engines represent about 19 percent of all emissions from off-road sources. They are about 9 percent of all man-made NOx emissions statewide.

Fleet Technology & Size

Estimating the exact number of off-road diesel construction vehicles in operation in California today is difficult because this type of equipment is built to last for decades and there is no vehicle registration program for this machinery. CARB estimates that there are approximately 165,000 pieces of heavy-duty off-road construction equipment in California. CIAQC believes the number may actually exceed 200,000. Whatever the exact number, it is likely that the total fleet will expand over the next decade as the state begins to issue contracts for the transportation, school, housing, and flood protection bonds approved by voters in November.

There are four levels of diesel engines in operation in California today, from the oldest and highest polluting Tier 0 engines to the newer and cleaner Tier 3 models. Cleaner burning Tier 4 engines – which will be the only engines that meet both NOx and PM requirements under CARB's proposed rules - are not expected to come online in significant numbers until 2014. Based on a sampling of a cross-section of construction firms, CIAQC believes that 55 to 65 percent of the statewide fleet are Tier 0 engines (which are responsible for up to 70 percent of all PM emissions), 35 to 40 percent are Tier 1, approximately 7 percent are Tier 2 and less than 1 percent are Tier 3.

The Economics of Retrofitting, Re-Powering & Replacing

Currently there are five possible ways to modify the emission level of engines to achieve CARB's goals by 2020:

- Institute updated engine standards for newly manufactured equipment
- Require the use of cleaner burning diesel fuel
- Retrofit existing engines with emission control devices
- Re-power older machines with new lower-emitting engines
- Retire old equipment and reduce fleet size and workforce

The first two of these options are already in effect in California, the technology is in development for the third and the fourth is possible for certain categories of equipment.

New engine standards for newly manufactured equipment and new fuel standards have already been adopted and agreed to by the engine manufacturers (Tier 4 engines represent the cleanest version of these). Ultra-low sulfur fuel was mandated for use in California beginning in June 2006. Research and development is underway to build particulate filters and catalysts called Verified Diesel Emission Control Systems (VDECS), which can be used to retrofit existing engines, but only one model is certified for use today. Finally, for long lasting heavy-duty off-road equipment the option of re-powering with new engines rather than rebuilding an old engine can be economically feasible.

In order to achieve the emission reduction goals established by CARB, 77 percent of all Tier 0 equipment (approximately 75,000 engines) would have to be re-powered to Tier 3 by 2010 and 90 percent by 2020. The cost of re-powering a single engine averages about $300 per horsepower. This means a duel engine, 1000-hp scraper will cost $300,000 to re-power with Tier 3 engines. In addition, nearly all of this equipment will also require after-treatment (retrofitting) with VDECS in order to meet the 2020 goal. The cost for retrofitting with a certified VDECS device is approximately $100 per horsepower, or more than $50,000 for a 500-hp engine, not including the cost of expensive ongoing maintenance costs and ash disposal.

It also appears unlikely that most existing equipment can be re-powered with Tier 3 engines due to the sophistication of the technology and challenges with integrating the transmission and hydraulic systems with the engine. If a Tier 2 re-power is used instead of a Tier 3, level 3 VDECS must also be used in order to meet the year 2020 standard. This would require an additional expenditure of $25,000 to $50,000 per engine.

Replacing the equipment altogether is also very expensive, with a new scraper costing in excess of $1,000,000. In addition, Tier 4 engines are the clear choice for contractors replacing their equipment, but they will not be available in significant numbers until 2014.

CIAQC believes the full cost to achieve the targets under the current timeframe set by CARB through replacing, re-powering and retrofitting would be at least $9 billion.

In addition, this equipment is the primary asset-base of most construction companies, and is often used as collateral in financing the start-up of construction contracts. Therefore, regulations requiring early retirement of the equipment by a date certain, or a prohibition on resale, can reduce the value of the equipment and severely impact company finances and borrowing ability. As companies struggle to replace their primary assets, many will be forced to downsize or cease to operate altogether, which means the significant loss of high-wage construction jobs.

THE LIMITS OF TECHNOLOGY

In addition to the enormous financial burden the Board's proposed regulations will place on contractors, there are also several significant technological barriers to meeting the standards. First, there are currently no devices on the market to reduce both PM and NOx emissions that meet CARB's standards. This means construction companies will have to invest in and "touch" many pieces of equipment twice with costly retrofits to comply with the rule.

The annual emission goals established by CARB in would also require the use of level 3 VDECS to retrofit virtually every piece of equipment. Most manufacturers have not developed a device to reduce emissions to that level. In fact, there is currently only one level 3 VDECS available for retrofitting heavy-duty off-road construction equipment and no certainty that it will ever be work reliably for many engine families. This system is also "active," requiring a burner to achieve the proper exhaust temperature and special handling to dispose of the ash material created by the PM filter. And, its cost exceeds the assumption used by CARB in evaluating the economic impact of their proposed rule.

In addition, the Board's process for VDECS certification is lengthy and costly. Some engine families may simply not be large enough to warrant the investment in producing an effective VDECS. Those engines would be unable to meet the new standards even if they are the newest available models.

Another challenge is the availability of a sufficient number of engines to re-power or replace the state's existing fleet and meet the goal. Not only are not enough engines or equipment in existence, the capacity to produce them does not exist. To compound the situation, most new engines are used in the production of new equipment. The equipment manufacturers have been clear that they are interested in selling new equipment, not new engines – which will seriously diminish the opportunities for contractors to re-power their machines.

Given these facts, CIAQC has proposed several alternatives for consideration by CARB. First, by implementing this rule based on an 18-year timeline, as it originally said it would, CARB would allow technology and manufacturing to meet the demands for cleaner engine production.

Second, building on the success of the Carl Moyer program, CIAQC has offered a "fleet averaging" formula that would provide an incentive to every contractor to achieve emission reductions as quickly as possible. A fleet average would allow contractors to operate older specialty equipment by reducing emissions from other equipment ahead of schedule. A project based fleet average calculation would also accommodate the needs of smaller contractors who may be unable to meet vigorous compliance schedules.

Since most contractors know the size of their year 2000 fleets, each would be able to calculate their own baseline for purposes of establishing an 85 percent emission reduction target. It would offer each contractor maximum flexibility in re-powering, retrofitting or replacing equipment to meet the goal.

A critical part of making this alternative work also involves allowing contractors to use actual emission levels in determining compliance. Under the proposed rules, CARB requires the use of "certified" levels set by the Board which can be two to three times higher than actual levels.

THE CRITICAL ISSUES

Put simply, the rules CARB has put forward are not viable or achievable. There are five primary reasons for this – unattainable annual limits, inadequate clean engine supply, limited clean engine technology, prohibitive cost and the fact that construction is a low-margin business.

Unattainable Annual Limits
Given the available resources and technology, the annual emission limits in the draft proposal released by CARB cannot be achieved by the contractors in the State of California. Even the most progressive firms, who have been re-powering and updating their fleets in anticipation of the regulation, cannot meet the annual goals set forward in the draft rule.

Inadequate Clean Engine Supply
There is an inadequate supply of engines or new equipment to meet the demand these regulations would place on the market. These rules require the purchase of more than 165,000 new pieces of equipment by 2020. Virtually all Tier 0 and Tier 1engines will need to be replaced with Tier 2, 3 and 4 engines in 13 years. The Board consumed valuable and necessary time when they waited seven years to develop these rules and now the market is not able to meet the equipment demands. To put this into perspective, currently 10,000 new pieces of equipment are sold in California every year. Under these regulations, that number would have to grow to 15,000 each year for the next 13 years.

Limited Clean Engine Technology
The addition of NOx reductions to the proposed rule will force companies to re-power more engines (a very costly alternative), and make PM reductions a low priority. First, no retrofit device is available to achieve the NOx emission reduction requirements. This means companies will be forced to re-power or replace equipment – which significantly increased costs. The NOx requirement also makes it impossible for contractors to qualify for the Carl Moyer funding that has propelled the significant voluntary emissions reductions already achieved by the construction industry.

Prohibitive Cost
CARB has significantly underestimated cost of these rules. By assuming an unrealistic "natural" turnover for construction fleets and a lower number of machines covered under this rule, CARB's economic analysis of its proposal does not accurately reflect the real

burden of this proposal. In effect, CARB has inaccurately assumed that the construction industry will spend billions on repowering, replacing and retrofitting equipment in the next 13 years without any new regulation. CARB estimates that the cost of the draft rule is only $3 billion dollars. CIAQC estimates the total real cost to the industry to be at least $9 billion. These costs are likely to be passed on to consumers, including the state as it contracts to build the roads, schools, housing and flood control systems voters authorized $43 billion in bonds to construct.

Construction Is A Low-Margin Business
Contractors do not have the financial resources to fund the program. Construction is a fiercely competitive business and contracts can be won or lost by only a few thousand dollars. Most contractors hope to achieve a profit of 2.5 percent to 7 percent and can on average, do so in three out of five years. After labor, materials, insurance, fuel and overhead, a very small portion of the $60 billion spent on construction every year in California is available for fleet upgrades. To meet these requirements, many businesses will need to downsize, which means construction workers will be laid off and capacity to build projects will decrease.

WORKING TOGETHER TO IMPROVE AIR QUALITY

The industry is committed to working with CARB to develop a solution to this to ensure the state's air quality standards are achieved through the implementation of a viable and achievable rule. By making critical changes related to time, turnover, tender and technology, the Board can make it possible for the construction industry to meet its emissions reduction targets.

TIME: Restoring CARB'S Original Implementation Timeline
CARB's original plan called for an 18-year timeline to meet the 85 percent PM reductions. Delays by the Board in developing a rule have reduced that schedule to 13 years. By adopting a strategy that virtually eliminates Tier 0 and Tier 1 equipment from the fleet, and relies heavily on a Tier 4 inventory, that will not become available from the manufacturers until 2014 for the higher horsepower equipment, there is simply not enough time or Tier 4 equipment before 2020, to replace the existing fleet.

TURNOVER: Lower CARB's Turnover Estimate to Realistic Levels
CIAQC estimates the statewide fleet natural turnover at between 2 and 3 percent, significantly below CARB's estimate. To achieve the CARB 2020 fleet makeup, approximately 140,000 pieces of equipment have to be repowered, retrofitted or replaced. That's means more than 1,000 pieces of equipment, every month, for the next 13 years, that will need to be repowered, retrofitted or replaced. There is not enough manufacturing capacity for that much new equipment or engines for the California market. The major supplier of construction equipment, Caterpillar, ships less than 2,000 pieces of new construction equipment to California each year. Without that new equipment and engines it will be impossible to meet the NOx reductions required by this proposal.

TENDER: Help Alleviate the Cost Burden to Construction Companies
This proposal not only will inflict a $9 billion cost on the construction industry, but it will also end the availability of Carl Moyer funding for re-powering existing equipment. These funds have been an extremely important tool for accelerating the turnover of this equipment and without it many contractors will simply be unable to afford to retrofit or replace their equipment. These tremendous costs will lead many companies to downsize or go out of business completely which means the significant loss of high wage jobs for construction workers and increased costs for all construction projects, including to state and local government for building infrastructure.

TECHNOLOGY: Re-evaluate the Conflict Between NOx and PM Reduction
There is no retrofit device that will reduce both NOx and PM. As a consequence, the strategies proposed by CARB inherently conflict with any rational decisions that would be made by a construction company. Since most of the current fleet will have to be eliminated, no one wants to invest more money in equipment that they will have to dispose of before its useful life is completed. Having to repower one year, and retrofit two years later, and then replace completely five years after that simply makes no economic sense. As a result, it is likely that many small companies will disappear, many large companies will shrink their fleets and the overall ability of the construction industry to meet construction demand will diminish. That means higher prices, longer construction periods and fewer companies to keep prices competitive.

CIAQC believes it is possible to resolve these issues in a way that satisfies CARB's air quality improvement strategy while keeping the industry economically viable, ensuring construction jobs are not lost and making certain the state's historic $40 billion in infrastructure improvement builds as many roads, schools, houses and levees as possible. We look forward to working together to protect our environment and to build a better future for the people of California.

This white paper was prepared by the members of the Construction Industry Air Quality Coalition's Task Force on Off-Road Regulation. Members of the task force include:

AGC America
American Road and Transportation Builders Association
Associated General Contractors of California
Associated General Contractors of San Diego
Building Industry Association of Southern California
California Alliance for Jobs
California Building Industry Association
California Construction and Industrial Materials Association
Engineering Contractors Association
Engineering & Utility Contractors Association
Engineering and General Contractors Association
Mobile Crane Operators Group
Southern California Contractors Association
The California Rental Association

EXHIBIT 29

For the Trenches

TIPS & NEWS FOR EQUIPMENT OWNERS AND OPERATORS

Tier 4 – How it will affect your equipment, your business and your environment.

Wayne Clark
Emissions Business Manager
Milton CAT

First, we need to clarify what "Tier 4" is – and what it is not.

"Tier" regulations are federal standards exclusively focused on manufacturers. They place the responsibility for designing and producing engines that comply with increasingly stricter emission regulations on the engine manufacturers' shoulders, not on equipment owners. "Tier" regulations have been introduced gradually, giving manufacturers a chance to design and produce the new engines in stages, generally depending on engine horsepower.

The first federal standards (Tier 1) for new off-road diesel engines over 50 hp were adopted in 1994. In 1996, a Statement of Principles (SOP) was signed between the EPA, California Air Resources Bureau (CARB) and engine makers (including Caterpillar, Cummins, Deere, Detroit Diesel, Deutz, Isuzu, Komatsu, Kubota, Mitsubishi, Navistar, New Holland, Wis-Con, and Yanmar) and in August 1998, the EPA signed the final rule reflecting the provisions of the SOP.

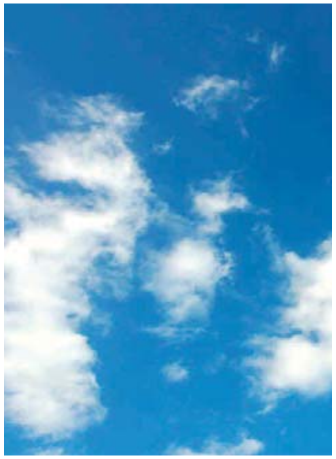
The 1998 regulation introduced Tier 1 standards for equipment under 50 hp as well as increasingly more stringent Tier 2 and Tier 3 standards for all equipment, with phase-in schedules from 2000 to 2008. The Tier 1 to 3 standards are met primarily through improvements in the combustion process with no, or only limited use of exhaust aftertreatment (oxidation catalysts).

In 2004, the EPA signed the final rule introducing Tier 4 emission standards, to be phased-in over the period of 2008 to 2015. Tier 4 standards require that emissions of Particulate Matter (PM) and Nitrogen Oxide (NOx), the prime targets of the Tier regulations, be further reduced by about 90%. From the point of view of engine manufacturers, Tier 4 standards are not easy to meet – actually, this is the stage that will achieve the least drastic reduction levels but is the toughest to reach in terms of engine and machine design. Manufacturers are currently undergoing "Tier 4 interim", a ramp-up period that allows them to focus their resources on producing the larger compliant engines.

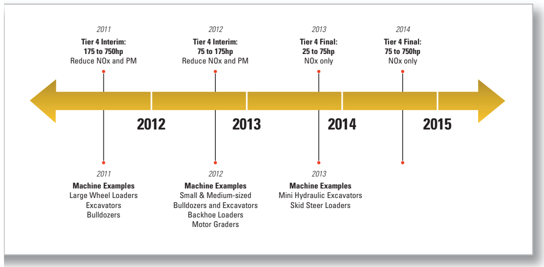
How are manufacturers going to meet Tier 4 regulations?

As of January 1st, 2011, all new machines between 175 and 750 horsepower will have to be Tier 4-compliant. These machines will have engines with advanced emission-control technologies similar to those used to meet the 2007-2010 standard for on-highway trucks and buses.

While the specific approach taken by each engine manufacturer may vary, many Tier 4 interim engines will include a Diesel Oxidation Catalyst (DOC) and/or a Diesel Particulate Filter (DPF) as part of the design. Those types of components were added to some Tier 1 and 2 machines as retrofits, to make them in-line with Tier 3 machines in terms of Particulate Matter, Hydrocarbon and Carbon Monoxide reductions. With Tier 4, however, those components will come as part of the machine, when it leaves the factory. In addition, Tier 4 engines will also include an Open Crankcase Ventilation or OCV filter that captures and controls crankcase emissions.



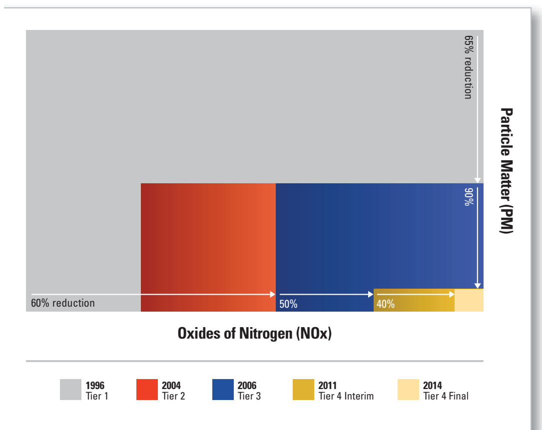
Tier 4 Interim and Tier 4 Final Timeline



Emissions Reduction

Tier 1 (1996) – Tier 4 Final (2014)

Engines rated 130 – 560 bkW (175-750 bhp)



How will this change the equipment itself?

New Tier 4 engines require a new engine oil formulation to operate properly. CJ-4 engine oil is required for proper engine operation, and has been formulated with oil additives necessary to reduce ash deposit.

As you can imagine, these new components being built into the engine, along with a bigger cooling package, will require a larger engine compartment, which translates into a larger machine. To insure good operator visibility, in some cases manufacturers have opted to modify cab and seat design.

With new Tier 4 components and technologies come some new maintenance practices. The Open Crankcase Ventilation filter will need to be replaced every 2,000 hours, and the Diesel Particulate Filter will need to be cleaned every 5,000 hours by your equipment dealer. Belts, hoses, radiators and alternators may also require more frequent inspection due to higher temperatures and operating pressures. In addition, the EPA requires that Ultra Low Sulfur Diesel (ULSD) be used in Tier 4 machines as well as a new engine oil, CJ-4, which has been formulated to reduce ash deposit. Many other maintenance requirements and service intervals will remain unchanged.

In addition, regardless of the manufacturer, you can expect higher purchase costs (8% +/-) for Tier 4 machines. Keep in mind though that by incorporating new reduction technologies in the right way, engine manufacturers have been able to claim up to 5% improved fuel efficiency, as well as boosted power and performance across applications.

How else will owning and operating change with Tier 4 compliant equipment?

To ensure the best performance and longevity, there are important considerations when it comes to Tier 4 machines. They include:

- The operators familiarizing themselves with the technologies, monitoring systems, dashboard symbols and alarms.
- Optimal operating ranges may change for some machines, so be sure to consult with your equipment dealer.

Who will be affected first and most by Tier 4 standards?

If your work involves public sector jobs and/or jobs for universities and other large organizations that have adopted Tier 4 standards, or if you are working in a non-compliance zone which is an area that the EPA has determined has poor air quality, you should expect that

the machines that you plan on using for that job will have to consist exclusively of Tier 4-compliant machines.

If you currently don't work on those type of projects, then for the most part you can avoid being affected by Tier 4 for the near future. In the longer term, of course, Tier 4 will affect every company that owns off-road equipment. Why is that? There will be no new machines available for sale in the United States other than Tier 4-compliant, and unlike with previous Tiers, it is not possible to retrofit a Tier 3 machine to Tier 4 standards with currently available technologies.

How can your equipment dealer help you?

As in most cases, it's a good idea to take as much control as possible; to ask questions and to be ready to demand straight answers.

Inside the DPF, particulate matter, sometimes referred to as "soot" is trapped until it is burned off through regeneration.

The DOC does not require maintenance because it is a "flow-through" device and the pollutants do not get trapped in the component.

For the Trenches

THE CAT CLEAN EMISSIONS MODULE (CEM)

The CEM is a flexible, Caterpillar designed module system that can include the following components: DOC, DPF, CAT Regeneration System, muffler and air cleaner. The CEM protects the components, minimizes the aftertreatment footprint and simplifies maintenance.

• Ask your equipment dealer which technology the manufacturers they represent will be using. Then, learn as much as possible about it.

• Understand what your dealer has done to ready themselves to service Tier 4 fleets, including salesperson and technician training, specialized tooling and inventoried parts.

• Consider having your equipment dealer conduct a fleet audit of your equipment. This is a process that matches your machines and business mix with current and upcoming emissions standards, to make sure that you'll be able to continue working on current projects – and to make sure you are in a position to take advantage of future opportunities.

• Make sure that your dealer has a large inventory of Tier 4-compliant machines, whether for purchase or for rental. You need to know whether you have access to the right equipment, before you win a "Tier 4 job."

• Be active in associations – more voices count and you will have access to resources not available to those who aren't involved.

"It's our turn."

I recently attended an association meeting where the speaker ended his presentations by reminding us that this is not a plot directed to undermine companies doing off-road work; every vehicle running on our roads and highways has had to comply with, and be built to, increasingly stricter emission regulations. Yes, it's our turn now. And let's finish by looking at the big picture – or the big numbers, in this case:

The EPA states that "by 2030, controlling these emissions would annually prevent 12,000 premature deaths, 8,900 hospitalizations, and one million workdays lost, so continued reduction and enforcement measures only make sense."

Milton CAT

This article is part of a series of articles designed to help equipment owners and operators lower owning and operating costs. Other article topics include:

Scheduled Oil Sampling • Parts Options
Machine Evaluations • Certified Rebuilds • Getting the Most from Your PSSR (Parts and Service Sales Representative)
CSAs (Customer Service Agreements)

All articles are available on our web site at www.miltoncat.com/articles

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Scarborough, ME 207-883-9586	Brewer, ME 207-989-1890	Syracuse, NY 315-476-9981	Batavia, NY 585-815-6200	Binghamton, NY 607-772-6500	Clifton Park, NY 518-877-8000

EXHIBIT 30

FEDERAL REGISTER

Vol. 78 Friday,

No. 183 September 20, 2013

Part IV

Environmental Protection Agency

California State Nonroad Engine Pollution Control Standards; Off-Road Compression Ignition Engines—In-Use Fleets; Notice of Decision; Notice

ENVIRONMENTAL PROTECTION AGENCY

[EPA–HQ–OAR–2008–0691; FRL–9901–18–OAR]

California State Nonroad Engine Pollution Control Standards; Off-Road Compression Ignition Engines—In-Use Fleets; Notice of Decision

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of decision.

SUMMARY: The Environmental Protection Agency (EPA) is granting the California Air Resources Board's (CARB's) request for authorization of California regulations applicable to in-use fleets that operate off-road (nonroad or NR), diesel-fueled (compression-ignition or CI) vehicles with engines 25 horsepower and greater. The regulations require such fleets to meet fleet average emissions standards for oxides of nitrogen (NO_X) and particulate matter (PM), or, alternatively, to comply with best available control technology (BACT) requirements for the vehicles in those fleets. This decision is issued under the authority of the Clean Air Act (CAA or Act).

DATES: Petitions for review must be filed by November 19, 2013.

ADDRESSES: EPA has established a docket for this action under Docket ID EPA–HQ–OAR–2008–0691. All documents relied upon in making this decision, including those submitted to EPA by CARB, are contained in the public docket. Publicly available docket materials are available either electronically through *www.regulations.gov* or in hard copy at the Air and Radiation Docket in the EPA Headquarters Library, EPA West Building, Room 3334, located at 1301 Constitution Avenue NW., Washington, DC. The Public Reading Room is open to the public on all federal government working days from 8:30 a.m. to 4:30 p.m.; generally, it is open Monday through Friday, excluding holidays. The telephone number for the Reading Room is (202) 566–1744. The Air and Radiation Docket and Information Center's Web site is *http://www.epa.gov/oar/docket.html*. The electronic mail (email) address for the Air and Radiation Docket is: *a-and-r-Docket@epa.gov*, the telephone number is (202) 566–1742, and the fax number is (202) 566–9744. An electronic version of the public docket is available through the federal government's electronic public docket and comment system. You may access EPA dockets at *http://www.regulations.gov*. After opening the *www.regulations.gov* Web site, enter EPA–HQ–OAR–2008–0691 in the "Enter Keyword or ID" fill-in box to view documents in the record. Although a part of the official docket, the public docket does not include Confidential Business Information (CBI) or other information whose disclosure is restricted by statute.

EPA's Office of Transportation and Air Quality (OTAQ) maintains a Web page that contains general information on its review of California waiver requests. Included on that page are links to prior waiver **Federal Register** notices, some of which are cited in today's notice; the page can be accessed at *http://www.epa.gov/otaq/cafr.htm*.

FOR FURTHER INFORMATION CONTACT: David Dickinson, Attorney-Advisor, Compliance Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue (6405J) NW., Washington, DC 20460. Telephone: (202) 343–9256. Email: *Dickinson.David@epa.gov*.

SUPPLEMENTARY INFORMATION:

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I. Executive Summary

Today, the Environmental Protection Agency (EPA) is granting a California Air Resources Board (CARB) request for authorization of regulations designed to reduce PM and NO_X emissions from in-use nonroad diesel engines. The California In-Use Off-Road Diesel-Fueled Fleets Regulation (Fleet Requirements) applies to fleets with NR CI vehicles or equipment greater than 25 horsepower. The regulation takes effect beginning as early as 2014, depending on fleet size. It requires fleet operators to meet a progressively more stringent combined PM and NO_X standard, or to reduce emissions through technology upgrades such as retrofit or replacement. Today's decision pertains to CARB's request of March 1, 2012, for authorization of the Fleet Requirements as amended in 2010.

The legal framework for this decision stems from the provisions first adopted by Congress in 1967, and later modified in 1977, with respect to state emission requirements for motor vehicles and motor vehicle engines; and from similar language adopted by Congress in 1990 with respect to preemption of state emission requirements for certain nonroad vehicles and eqnipment. Section 209(e)(2) of the Act, 42 U.S.C. 7543(e)(2), specifies that EPA must authorize California to adopt and enforce covered nonroad standards if California determines that its standards are, in the aggregate, at least as protective of the public health and welfare as applicable Federal standards, *unless* EPA makes one of three findings specified under the Clean Air Act: (1) That California's protectiveness finding is arbitrary and capricious; (2) that California does not need such California standards to meet compelling and extraordinary conditions; or (3) that California standards and accompanying enforcement procedures are not consistent with this section. As explained below, EPA interprets the statutory language "consistent with this section" to mean consistent with section 209 (e.g. section 209(a), section 209(e)(1), and section 209(b)(1)(C)) of the Act. EPA's role npon receiving an authorization request is to determine whether it is appropriate to make any of these three specified findings. Opponents of authorization bear the bnrden of proving that at least one of the three bases for denial of authorization has been satisfied. If the Agency cannot make at least one of the three findings, then it must grant the requested authorization. EPA has evaluated CARB's request with regard to each of these three authorization criteria, in light of the evidence in the public record, and is granting CARB its authorization request as required under the Clean Air Act.

This Notice of Decision provides a full discussion of EPA's evaluation of each of the three criteria, including EPA's evaluation of the record and its determination that those opposing the authorization have not met their burden of proof with regard to any of the three criteria in section 209(e)(2)(A).

II. Background

A. California's Nonroad CI In-Use Fleet Requirements

CARB initially approved the Fleet Requirements on July 26, 2007. CARB subsequently amended the regulation after the Board conducted hearings in December 2008, January 2009, July 2009, and most recently in December 2010. As explained below, the December 2010 amendments significantly modified the regulation's compliance dates and in-use performance requirements.

The Fleet Requirements establish statewide in-use performance standards applicable to any person, business, or government agency that owns and operates in-use nonroad diesel vehicles in California with a maximum power of 25 horsepower (hp) or greater. The regulation applies to engines that are used to provide motive power, and in some cases auxiliary power, to nonroad vehicles, which are defined as vehicles that (1) cannot be registered and driven safely on-road, and (2) are not implements of husbandry or recreational off-highway vehicles.

The Fleet Requirements phase in according to fleet size as defined by total fleet horsepower. Requirements begin for large fleets (greater than 5,000 hp) in 2014; for medium fleets (2,500–5,000 hp) in 2017; and for small fleets, 2,500 hp or less, in 2019. The regulation establishes two general compliance pathways. Fleets may either (1) meet fleet average emission targets (based on the combined horsepower of the vehicles in the fleet) that become increasingly stringent over a ten-year period, or (2) satisfy best available control technology (BACT) requirements within a given compliance year. The BACT pathway requires fleets to retire, repower, designate for low use, and/or retrofit a certain percentage of the fleet's total horsepower each year. Fleets demonstrate compliance for a given year by taking a sufficient number of such actions in the prior year or by utilizing previously earned BACT credits associated with these actions. For large fleets, the annual BACT rates (demonstrated either through utilization of credits or through action taken during the previous calendar year) start out at 4.8 percent of the fleet's total horsepower in 2014 and increase to 8 percent for each year from 2015 through 2017, and to 10 percent for each year from 2018 through 2023. For medium fleets, the annual BACT rate is 8 percent in 2017, increasing to 10 percent for each year from 2018 through 2023. Small fleets have an annual BACT rate of 10 percent for each year from 2019 through 2028. After the final compliance year, all fleets must continue to either (1) meet the fleet average emission target rate for the final target year, or (2) satisfy the applicable final annual BACT compliance rate (e.g. 10 percent) each year until the fleet comes into compliance with the fleet average emission target. The Fleet Requirements also restrict fleets from adding older dirtier vehicles to their vehicle inventories.

The regulation EPA is authorizing in this decision reflects amendments that CARB adopted in 2010. Compared to the original Fleet Requirements, the 2010 amendments delay the original compliance schedule by four years. The 2010 amendments also simplified the annual requirements so that in each compliance year a fleet must only meet a single emissions target—a combined NO_X plus PM standard—rather than separate targets for each of these two pollutants. The amendments reduced the annual BACT requirements from a 28 percent turnover and retrofit requirement in the prior version of the regulation, to a combined 4.8 percent to 10 percent requirement (as outlined above). Finally, the amendments removed mandatory retrofitting requirements so that retrofit is now a compliance option under the BACT pathway rather than a mandate. Additional information about the original and amended Fleet Requirements is provided below in the section discussing the consistency of the Fleet Reqnirements with section 202(a) of the Act.

B. Clean Air Act Nonroad Engine and Vehicle Authorizations

Section 209(e)(1) of the Act permanently preempts any state, or political subdivision thereof, from adopting or attempting to enforce any standard or other requirement relating to the control of emissions for certain *new* nonroad engines or vehicles.[1] For all other nonroad engines (including "non-new" engines), states generally are preempted from adopting and enforcing standards and other requirements relating to the control of emissions, except that section 209(e)(2)(A) of the Act requires EPA, after notice and opportunity for public hearing, to authorize California to adopt and enforce such regulations unless EPA makes one of three enumerated findings. Specifically, EPA must deuy authorization if the Administrator finds that (1) California's protectiveness determination (that California standards will be, in the aggregate, as protective of public health and welfare as applicable federal standards) is arbitrary and capricious, (2) California does not need such standards to meet compelling and extraordinary conditions, or (3) the California standards and accompanying enforcement procedures are not consistent with section 209 of the Act. Other states with state air quality implementation plans may also adopt and enforce such regulations if the standards are identical to California's standards.

On July 20, 1994, EPA promulgated a rule interpreting the three criteria set forth in section 209(e)(2)(A) that EPA must consider before granting any California authorization request for nonroad engine or vehicle emission standards.[2] EPA revised these regulations in 1997.[3] As stated in the preamble to the 1994 rule, EPA historically has interpreted the consistency inquiry under the third criterion outlined above (set forth in section 209(e)(2)(A)(iii)) to require, at minimum, that California standards and enforcement procedures be consistent

[1] States are expressly preempted from adopting or attempting to enforce any standard or other requirement relating to the control of emissions from new nonroad engines which are used in construction equipment or vehicles or used in farm equipment or vehicles and which are smaller than 175 horsepower. Such express preemption under section 209(e)(1) of the Act also applies to new locomotives or new engines used in locomotives.

[2] 59 FR 36969 (July 20, 1994).

[3] *See* 62 FR 57733 (December 30, 1997). The applicable regulations are now found in 40 CFR part 1074, subpart B, § 1074.105.

with section 209(a), section 209(e)(1), and section 209(b)(1)(C) (as EPA has interpreted that subsection in the context of section 209(b) motor vehicle waivers) of the Act.[4]

In order to he consistent with section 209(a), California's nonroad standards and enforcement procedures mnst not apply to new motor vehicles or new motor vehicle engines. To be consistent with section 209(e)(1), California's nonroad staudards and enforcement procedures mnst not attempt to regulate engine categories that are permanently preempted from state regulation. To determine consistency with section 209(b)(1)(C), EPA typically reviews nonroad authorization requests under the same "consistency" criteria that are applied to motor vehicle waiver requests under section 209(b)(1)(C). That provision provides that the Administrator shall not grant California a motor vehicle waiver if she finds that California "standards and accompanying enforcement procedures are not consistent with section 202(a)" of the Act. Previous decisions granting waivers and authorizations have noted that state standards and enforcement procednres will be found to be inconsistent with section 202(a) if: (1) There is inadequate lead time to permit the development of the necessary technology, giving appropriate consideration to the cost of compliance within that time, or (2) the federal and state testing procedures impose inconsistent certification requirements.

In light of the similar language of sections 209(b) and 209(e)(2)(A), EPA has analyzed requests for California authorization of standards for nonroad vehicles or engines under section 209(e)(2)(A) using the same principles that it has historically applied in analyzing requests for waivers of preemption for new motor vehicle or new motor vehicle engine standards under section 209(b).[5] These principles include, among other things, that EPA should limit its inquiry to the three specific authorization criteria identified in section 209(e)(2)(A),[6] aud that EPA will give substantial deference to the policy judgments California has made in adopting its regulations. In previous waiver decisions, EPA has stated that Congress intended EPA's review of California's decision-making be narrow. EPA has rejected arguments that are not specified in the statnte as grounds for denying a waiver:

> The law makes clear that the waiver requests cannot he denied unless the specific findings designated in the statute can properly be made. The issue of whether a proposed California requirement is likely to result in only marginal improvement in air quality not commensurate with its costs or is otherwise an arguahly unwise exercise of regulatory power is not legally pertinent to my decision under section 209, as long as the California requirement is consistent with section 202(a) and is more stringent than applicable Federal requirements in the sense that it may result in some further reduction in air pollution in California.[7]

This principle of narrow EPA review has been upheld by the U.S. Court of Appeals for the District of Columbia Circuit.[8] Thus, EPA's consideration of all the evidence submitted concerning an anthorization decision is circumscribed by its relevance to those questions that may be considered under section 209(e)(2)(A).

C. Deference to California

In previous waiver decisions, EPA has recognized that the intent of Congress in creating a limited review based on the section 209(b)(1) criteria was to ensure that the federal government did not second-guess state policy choices. As the agency explained in one prior waiver decision:

> It is worth noting * * * I would feel constrained to approve a California approach to the prohlem which I might also feel unable to adopt at the federal level in my own capacity as a regulator. The whole approach of the Clean Air Act is to force the development of new types of emission control technology where that is needed by compelling the industry to "catch up" to some degree with newly promulgated standards. Such an approach * * * may be attended with costs, in the shape of reduced product offering, or price or fuel economy penalties, and by risks that a wider number of vehicle classes may not be able to complete their development work in time. Since a balancing of these risks and costs against the potential henefits from reduced emissions is a central policy decision for any regulatory agency under the statutory scheme outlined above, I believe I am reqnired to give very substantial deference to California's judgments on this score.[9]

Similarly, EPA has stated that the text, structnre, and history of the California waiver provision clearly indicate hoth a congressional intent and appropriate EPA practice of leaving the decision on "ambiguous and controversial matters of public policy" to California's judgment.[10] This interpretation is supported by relevant discussion in the House Committee Report for the 1977 amendments to the Clean Air Act.[11] Congress had the opportunity throngh the 1977 amendments to restrict the preexisting waiver provision, but elected iustead to expand California's flexibility to adopt a complete program of motor vehicle emission controls. The report explains that the amendment is intended to ratify and strengthen the preexisting California waiver provision and to affirm the underlying intent of that provision, that is, to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens and the public welfare.[12]

D. Burden and Standard of Proof

As the U.S. Conrt of Appeals for the D.C. Circuit has made clear in *MEMA I,* opponents of a waiver request by California bear the burden of showing that the statutory criteria for a denial of the request have been met:

> [T]he language of the statute and its legislative history indicate that California's regulations, and California's determinations that they must comply with the statute, when presented to the Administrator are presumed to satisfy the waiver requirements and that the burden of proving otherwise is on whoever attacks them. California must present its regulations and findings at the hearing and thereafter the parties opposing the waiver request bear the burden of persuading the Administrator that the waiver request should be denied.[13]

The Administrator's burden, on the other hand, is to make a reasonable evaluation of the information in the record in coming to the waiver decision. As the court in *MEMA I* stated: "here, too, if the Administrator ignores evidence demonstrating that the waiver should not be granted, or if he seeks to overcome that evidence with unsupported assnmptions of his own, he runs the risk of having his waiver decision set aside as 'arbitrary and

[4] *See* 59 FR 36969 (July 20, 1994).

[5] *See Engine Manufacturers Association* v. *EPA,* 88 F.3d 1075 (D.C. Cir. 1996). ". . . EPA was within the bounds of permissible construction in analogizing § 209(e) on nonroad sources to § 209(a) on motor vehicles."

[6] *See* EPA's Final 209(e) rulemaking at 59 FR 36969, 36983 (July 20, 1994).

[7] 36 FR 17458 (Aug. 31, 1971). Note that the more stringent standard expressed here, in 1971, was superseded by the 1977 amendments to section 209, which established that California must determine that its standards are, in the aggregate, at least as protective of public health and welfare as applicable Federal standards. In the 1990 amendments to section 209, Congress established section 209(e) and similar language in section 209(e)(1)(i) pertaining to California's nonroad emission standards which California must determine to be, in the aggregate, at least as protective of public health and welfare as applicable Federal standards.

[8] *See, e.g., Motor and Equip. Mfrs Assoc.* v. *EPA,* 627 F.2d 1095 (D.C. Cir. 1979) ("*MEMA I*").

[9] 40 FR 23102, 23103–23104 (May 28, 1975).

[10] *Id. at* 23104; 58 FR 4166 (January 13, 1993).

[11] *MEMA I,* 627 F.2d at 1110 (*citing* H.R. Rep. No. 294, 95th Cong., 1st Sess. 301–302 (1977)).

[12] *Id.*

[13] *Id.*

capricious.'" [14] Therefore, the Administrator's burden is to act "reasonably." [15]

With regard to the standard of proof, the court in *MEMA I* explained that the Administrator's role in a section 209 proceeding is to:

> consider all evidence that passes the threshold test of materiality and * * * thereafter assess such material evidence against a standard of proof to determine whether the parties favoring a denial of the waiver have shown that the factual circumstances exist in which Congress intended a denial of the waiver. [16]

In that decision, the court considered the standards of proof under section 209 for the two findings related to granting a waiver for an "accompanying enforcement procedure." Those findings involve: (1) Whether the enforcement procedures impact California's prior protectiveness determination for the associated standards, and (2) whether the procedures are consistent with section 202(a). The principles set forth by the court, however, are similarly applicable to an EPA review of a request for a waiver of preemption for a standard. The court instructed that "the standard of proof must take account of the nature of the risk of error involved in any given decision, and it therefore varies with the finding involved. We need not decide how this standard operates in every waiver decision." [17]

With regard to the protectiveness finding, the court upheld the Administrator's position that, to deny a waiver, there must be "clear and compelling evidence" to show that proposed enforcement procedures undermine the protectiveness of California's standards. [18] The court noted that this standard of proof also accords with the congressional intent to provide California with the broadest possible discretion in setting regulations it finds protective of the public health and welfare. [19]

With respect to the consistency finding, the court did not articulate a standard of proof applicable to all proceedings, but found that the opponents of the waiver were unable to meet their burden of proof even if the standard were a mere preponderance of the evidence. Although *MEMA I* did not explicitly consider the standards of proof under section 209 concerning a waiver request for "standards," as compared to a waiver request for accompanying enforcement procedures, there is nothing in the opinion to suggest that the court's analysis would not apply with equal force to such determinations. EPA's past waiver decisions have consistently made clear that: "[E]ven in the two areas concededly reserved for Federal judgment by this legislation—the existence of 'compelling and extraordinary' conditions and whether the standards are technologically feasible—Congress intended that the standards of EPA review of the State decision to be a narrow one." [20]

E. EPA's Administrative Process in Consideration of California's Nonroad CI In-Use Fleet Requirements

EPA has conducted three separate public notice and comment periods associated with three successive versions of CARB's NR CI in-use Fleet Requirements.

On August 8, 2008, CARB requested that EPA authorize California to enforce its original In-Use Off-Road Diesel-Fueled Fleets regulation adopted at its July 26, 2007 public hearing. [21] CARB's original regulations required fleets that operate nonroad, diesel fueled equipment with engines 25 hp and greater to meet separate fleet average emission standards for NO_X and PM, respectively. Alternatively, the regulations required the vehicles in those fleets to comply with BACT requirements. Based on this request, EPA noticed and conducted a public hearing on October 27, 2008, and provided an opportunity to submit written comment through December 19, 2008. [22] CARB amended the regulations between December 2008 and mid-2009. On February 11, 2010 CARB requested that EPA grant California authorization to enforce its In-Use Off- Road Diesel-Fueled Fleets regulation as amended. [23] Based on CARB's February 11, 2010 request, EPA noticed and conducted a public hearing on April 14, 2010, and provided an opportnnity to snbmit written comment through May 18, 2010. [24]

CARB again amended its regnlations in December 2010 and these amendments were formally adopted in California on December 14, 2011—resulting in the current version of the Fleet Requirements which are the subject of this authorization decision. On March 1, 2012, CARB submitted a reqnest that EPA grant California authorization to enforce its Fleet Requirements as most recently amended (Authorization Request). [25] Based on CARB's Authorization Request, on August 21, 2012 EPA invited comment on whether (a) CARB's determination that its standards, in the aggregate, are at least as protective of public health and welfare as applicable federal standards is arbitrary and capricious, (b) California needs separate standards to meet compelling and extraordinary conditions, and (c) California's standards and accompanying enforcement procedures are consistent with section 209 of the Act. [26] The Federal Register notice stated that EPA would only consider testimony and comment submitted in response to the current request for comment because the CARB regulations were substantially amended in December 2010. [27] EPA conducted a hearing on the Authorization Request on September 20, 2012, in Washington, DC. [28] The written

[14] *Id.* at 1126.

[15] *Id.* at 1126.

[16] *Id.* at 1122.

[17] *Id.*

[18] *Id.*

[19] *Id.*

[20] *See, e.g.*, 40 FR 21102–22103 (May 28, 1975).

[21] *See* CARB Resolution 07–19) and subsequently modified after supplemental public comment by CARB's Executive Officer by the In-Use Regulation in Executive Order R–08–002 on April 4, 2008 (these regulations are codified at Title 13, California Code of Regulations sections 2449 through 2449.3).

[22] *See* 73 FR 58585 (October 7, 2008) and 73 FR 67509 (November 14, 2008).

[23] CARB's amendments included those of December 2008 (and formally adopted in California on October 19, 2009); January 2009 (and formally adopted in California on December 31, 2009); and, a certain subset of amendments adopted by the Board in July 2009 in response to California Assembly Bill 8 2X (and formally adopted on December 3, 2009). In CARB's February 11, 2010 request letter to EPA it also noted additional amendments adopted in July 2009 and not yet formally adopted by California's Office of Administrative Law. Once this last subset of amendments was formally adopted CARB planned to submit them to EPA for subsequent consideration.

[24] *See* 75 FR 11880 (March 12, 2010).

[25] *See* EPA–HQ–OAR–2008–0691–0270.

[26] 77 FR 50500 (August 21, 2012).

[27] "Therefore, EPA will not be considering oral testimony or written comments based on the prior **Federal Register** notices, since CARB's December 2010 amendments are likely to affect many of these prior comments. To the extent any entity believes that its prior comments remain pertinent then EPA is requiring such comments be resubmitted or incorporated into new comments." *Id.* at 50502. EPA did not receive any adverse comment or suggestions that it is inappropriate to exclude comments submitted prior to the August 12, 2012 **Federal Register** notice. As noted by AGC, "While the Clean Air Act has not changed, and the questions that EPA must address are one and the same, the rule that CARB now seeks the authority to enforce is very different from the rule that CARB originally submitted to EPA." *See* EPA's Hearing transcript at 84 (EPA–HQ–OAR–2008–0691–0298). CARB reincorporated by reference all of its prior submissions regarding the Fleet Requirements.

[28] The written transcript of this hearing is at EPA–HQ–OAR–2008–0691–0298 (Hearing Transcript). EPA received testimony from CARB, the Pacific Legal Foundation (PLF), the American Road and Transportation Builders Association (ARTBA), the Manufacturers of Emission Controls Association (MECA), the Associated General Contractors of America (AGC), the Construction Industry Air Quality Association (CIAQC), and the California Construction Trucking Association (CCTA).

comment period closed on October 22, 2012. [29] In addition, to provide further opportnnity to submit direct verbal comment for affected parties who could not participate in the public hearing, EPA conducted an informal teleconference on October 19, 2012. [30]

III. Discussion

A. California's Protectiveness Determination

Section 209(e)(2)(A)(i) of the Act sets forth the first of the three criteria governing a request for authorization of relevant standards—providing that EPA cannot grant the reqnest if the agency finds that California was arbitrary and capricious in its determination that California standards will be, in the aggregate, at least as protective of public health and welfare as applicable federal standards. [31]

EPA maintains that the phrase "California standards" means California's entire group of standards (i.e. the overall program) that is applicable to nonroad engine emissions. As explained below, while evaluating California's protectiveness determination, EPA compares California's standards to applicable federal standards. That comparison is undertaken within the broader context of the California program applicable to nonroad vehicles and engines, for which EPA previously has granted authorization and which relies upon protectiveness determinations that EPA in its authorization decisions found not to be arbitrary and capricious. [32]

As noted above, EPA is guided in its interpretation of the section 209(e)(2) authorization criteria by the similar language in section 209(b) pertaining to waivers of preemption for new motor vehicle standards. Therefore, the evaluation of the protectiveness of CARB's nonroad standards under section 209(e)(2)(A)(i) follows the instruction of section 209(b)(2), which states: "If each State standard is at least as stringent as the comparable applicable Federal standard, such State standard shall be deemed to be at least as protective of health and welfare as such Federal standards for pnrposes of [209(b)(1)]." EPA evaluates the stringency of California's standards relative to comparable EPA emission standards. To review California's protectiveness determination under section 209(e)(2)(A)(i), EPA conducts its own analysis comparing the newly adopted California standards to comparable applicable Federal standards. EPA traditionally makes a quantitative comparison of relevant numeric emission standards to determine whether the California standards are more or less protective than the Federal standards. [33]

As explained above in the section on burden and standard of proof, any finding that California's determination was arbitrary and capricious under section 209(b)(1)(A) must be based upon "'clear and compelling evidence' to show that proposed [standards] undermine the protectiveness of California's standards." [34] Accordingly, even if EPA's own analysis of comparable protectiveness, or one submitted by a commenter, might diverge from California's analysis, that alone would not provide a sufficient basis for EPA to make a section 209(b)(1)(A) finding that California's protectiveness finding is arbitrary and capricious.

1. Based on EPA's Traditional Analysis, is California's Protectiveness Determination Arbitrary and Capricious?

In adopting the initial version of the Fleet Requirements, CARB approved Resolution 07–19, in which it declared:

> Be it further resolved that the Board hereby determines, in accordance with CAA section 209(e)(2), that to the extent the regulations approved herein affect nonroad vehicles or nonroad engines as defined in CAA section 216(10) and (11), the emission standards and other requirements related to the control of emissions in the regulations approved herein are, in the aggregate, at least as protective of public health and welfare as applicable federal standards, California needs its nonroad emission standards to meet compelling and extraordinary conditions, and the standards and accompanying enforcement procedures approved herein are consistent with CAA section 209. [35]

With the most recent Fleet Requirements amendments in 2010, the Board reaffirmed its protectiveness finding in Resolution 10–47. [36] CARB maintains that there is no basis for EPA to find the Board's determination (which applies solely to standards for *in-use* nonroad engines) is arbitrary and capricious since EPA's authority, under the CAA, is limited to *new* engines, vehicles, and equipment. As a result, EPA has not adopted any federal standards or requirements for in-use nonroad engines. CARB notes that there is no question that its Fleet Requirements are at least as protective of public health and welfare as

[29] EPA received written comment from: Airlines for America (A4A)—EPA–HQ–OAR–2008–0691–0297; Manufacturers of Emission Controls Association (MECA) (Copy of oral testimony)—EPA–HQ–OAR–2008–0691–0300; Steve Milloy (Copy of oral testimony)—EPA–HQ–OAR–2008–0691–0301; Pacific Legal Foundation (PLF) (copy of oral testimony)—EPA–HQ–OAR–2008–0691–0302; Associated General Contractors of America (AGC) (Copy of oral testimony)—EPA–HQ–OAR–2008–0691–0303; PLF—EPA–HQ–OAR–2008–0691–0304; Altfillisch Contractors (ACI)—EPA–HQ–OAR–2008–0691–0305; Savala Equipment Company—EPA–HQ–OAR–2008–0691–0306; Dr. Matthew Malkan—EPA–HQ–OAR–2008–0691–0307; Dr. James Enstrom—EPA–HQ–OAR–2008–0691–0308; Dr. Phalen—EPA–HQ–OAR–2008–0691–0313; California Construction Trucking Association (CCTA)—EPA–HQ–OAR–2008–0691–0309; American Road & Transportation Builders Association (ARTBA)—EPA–HQ–OAR–2008–0691–0310; Bay Cities Paving and Grading (Bay Cities)—EPA–HQ–OAR–2008–0691–0311; Nick Silicz—EPA–HQ–OAR–2008–0691–0313; Granite Rock—EPA–HQ–OAR–2008–0691–0314; Delta Construction—EPA–HQ–OAR–2008–0691–0315; United Contractors—EPA–HQ–OAR–2008–0691–0316; Construction Industry Air Quality Coalition (CIAQC)—EPA–HQ–OAR–2008–0891–0317; California Air Resources Board—EPA–HQ–OAR–2008–0691–0318 (CARB Written Comments) and EPA–HQ–OAR–2008–0691–0319 (CARB Supplemental Comments); PLF Request to Reopen Comment Period, etc—EPA–HQ–OAR–2008–0691–0320.

[30] EPA–HQ–OAR–2008–0691–0321. As discussed below, EPA believes that interested parties have adequate opportunity to present their views through both the public hearing and by submitting written comment.

[31] As explained above, EPA's authorization analysis is guided by precedent related to both section 209(e)(2) and to section 209(b), which contains similar, and in some cases identical, language. *See Engine Manufacturers Ass'n* v. *EPA (EMA)*, 88 F.3d 1075, 1085–87 (D.C. Cir. 1996).

[32] In situations where there are no Federal standards directly comparable to the specific California standards under review, the analysis then occurs against the backdrop of previous waivers which determined that the California program was at least as protective of the federal program. In a prior EPA waiver pertaining to California's zero-emission vehicle program (ZEV) for which there are no comparable Federal standards, EPA also took into consideration California's existing low-emission vehicle program (LEV II) and greenhouse gas emission standards (GHG) applicable to light-duty vehicles. ((LEV II + ZEV) + GHG). *See* 71 FR 78190 (December 28, 2006), Decision Document for Waiver of Federal Preemption for California Zero Emission Vehicle (ZEV) Standards (December 21, 2006).

[33] In situations where there are no Federal standards directly comparable to the specific California standards under review, the analysis then occurs against the backdrop of previous waivers which determined that the California program was at least as protective of the federal program ((LEV II + ZEV) + GHG). See 71 FR 78190 (December 28, 2006), Decision Document for Waiver of Federal Preemption for California Zero Emission Vehicle (ZEV) Standards (December 21, 2006).

[34] *MEMA I*, 627 F.2d at 1122.

[35] CARB Authorization Request at 17.

[36] "BE IT FURTHER RESOLVED that the Board hereby determines, in accordance with CAA section 209(e)(2), that the proposed amendments as they affect nonroad vehicles or nonroad engines as defined in CAA section 216 (10) and (11), do not undermine the Board's previous determination that the regulation's emission standards, other emissions related requirements, and associated enforcement procedures are, in the aggregate, at least as protective of public health and welfare as applicable federal standards, are necessary as part of ARB's off-road emission program to meet compelling and extraordinary conditions existing in the state, and are consistent with CAA section 209." CARB Resolution 10–47EPA–HQ–OAR–2008–0691–0283.

applicable federal standards, given the lack of any comparable EPA standards.[37]

As described above, EPA's traditional analysis has been to evaluate California's protectiveness determination by comparing the newly adopted California standards to applicable EPA emission standards for the same pollutants from the industry sector. CARB is correct that EPA's authority to adopt emission standards and other requirements related to the control of nonroad emissions is limited to new engines, vehicles, and equipment,[38] and that as a result EPA has not adopted any standards or requirements for in-nse nonroad engines.

EPA already has determined that California was not arbitrary and capricious in its determination that California standards applicable to *new* nonroad CI engines are at least as protective as comparable Federal standards.[39] The in-use Fleet Requirements will achieve emission reductions in addition to those achieved by the previously authorized new nonroad engine standards, for which CARB made a protectiveness finding that EPA found not to be arbitrary and capricious. According to CARB, the Fleet Requirements are expected to result in a reduction of 0.5 tons/day of NO_X in the South Coast and 0.3 tons/days in San Joaquin Valley in 2014, along with 3.2 tons/day and 1.9 tons/day in these respective areas in 2023.[40] As such, the Fleet Requirements achieve additional emission rednctions beyond those attained under CARB emission standards applicable to new nonroad CI engines, which EPA has already determined to be as protective, in the aggregate, as applicable federal standards. Accordingly, there is no basis for determining that CARB's protectiveness finding with regard to the in-use Fleet Requirements is arbitrary and capricions.

Further, as noted above, EPA is guided in its interpretation of 209(e)(2)(A)(i) by section 209(b)(2). Section 209(b)(2) states: "If each State standard is at least as stringent as the comparable applicable Federal standard, such State standard shall be deemed to be at least as protective of public health and welfare as such Federal standards for purposes of paragraph (1)." In this instance there is no comparable applicable Federal standard for in-use nonroad CI engines and thus there is no basis for determining the CARB's protectiveness finding is arbitrary and capricious through the application of section 209(b)(2).

Finally, EPA received no comments or evidence suggesting that CARB's protectiveness determination, under EPA's traditional analysis, is arbitrary and capricious. In particular, no commenter disputes that California standards, whether looking at the particular California standards being authorized in this proceeding or the entire suite of California standards for nonroad engines, are at least as stringent, in the aggregate, as applicable federal standards.

In light of the foregoing, EPA finds that CARB's Fleet Requirements achieve additional emission reductions beyond CARB's requirements applicable to new nonroad CI engines, and further finds that the opponents of authorization have not presented evidence to show that CARB's protectiveness determination is arbitrary and capricious. Accordingly, applying the traditional comparative analysis, we cannot find that CARB's protectiveness determination is arbitrary and capricious.

2. Is CARB's Protectiveness Determination Arbitrary and Capricious Based on Other Effects of California's Fleet Requirements?

Having addressed the protectiveness inquiry under EPA's traditional analysis, we turn now to the question whether we should use a different analytical approach and, if so, whether a different approach would yield a different outcome. EPA received one comment suggesting that EPA's analysis under section 209(e)(2)(A)(i) should be based on a broader inquiry into the effects of CARB's Fleet Requirements.[41] Relatedly, EPA received one other comment specifically questioning whether CARB's Fleet Requirements are as protective of applicable Federal requirements in light of the Fleet Requirements' alleged adverse impacts on needed transportation and infrastructure development across the country as well as in California.[42] The latter commenter suggested, for example, that CARB's rule "could" severely impact efforts at improving the nation's infrastructure because transportation projects by necessity involve moving construction equipment across state lines. The commenter stated that equipment associated with such national projects would necessarily have to meet CARB's Fleet Requirements, increasing costs, unless fleet operators were able to differentiate such equipment that would only be nsed for California projects.[43] The commenter argues that increased costs as a result of the Fleet Requirements could in turn prevent or delay needed construction of infrastructure such as roads, schools, housing and levees, and that such delay or prevention could adversely affect public health and safety impacts in California and in other states.[44] EPA received further comment suggesting that CARB is prioritizing one public health issue (air quality) over another (safe roads and infrastructure improvements) and thus California's protectiveness determination is "arbitrary and capricious."[45]

EPA also received a series of comments from general contracting companies and others that highlighted what they believe to be the adverse economic impacts of the Fleet Requirements. For example, several commenters stated that the regulation wonld have some combination of the following impacts: Significant layoffs, increased unemployment, and disadvantage to family-owned and other small businesses. Such impacts, the commenters argue, would have negative rather than the intended positive effects on public health.[46] One commenter asserted that the correlation between poor health and poverty or lack of employment is much stronger than the correlation between poor health and air pollution. The commenter claims that because of such economic and social impacts, regulations such as the Fleet Requirements will be harmful to California's citizens and that the health benefits from CARB's regulation are dubious if not counterproductive.[47] These comments, by and large, do not refer specifically to CARB's protectiveness determination or section 209(e)(2)(A)(i) and it is not clear whether commenters are referring to EPA's analysis under that section.

Finally, EPA received comment that does refer to CARB's protectiveness determination, suggesting it was arbitrary and capricious, but basing this claim on a variety of concerns that do not directly relate to CARB's actual protectiveness determination (e.g.

[37] Authorization Request at 18, citing *Engine Manufacturers Association* v. *EPA*, (D.C. Cir. 1996) 88 F.3d at 1075, 1089–1090.

[38] *See* 42 U.S.C. 7547 (Section 213 of Clean Air Act).

[39] 75 FR 8056 (February 23, 2010).

[40] CARB Written Comments at 10.

[41] *See* Delta Construction.

[42] *See* Hearing Transcript and written comment (ARTBA).

[43] *Id.*

[44] *Id.*

[45] *Id.*

[46] *Id, see also* CCTA, Savala Equipment Rentals, Delta Construction.

[47] *See* Delta Construction. This comment is also addressed below under the second authorization criterion of whether California needs its standards to meet compelling and extraordinary conditions.

alleged flaws in CARB's emission modeling—including CARB's estimates of economic recovery scenarios—as well as concerns with the alleged impact of the Fleet Requirements on fleet operator assets leading to more unemployment and associated poor health, and concerns related to the health effects of $PM_{2.5}$).[48]

CARB's written comments note that the Board has repeatedly determined that its in-use off-road regulations are, in the aggregate, at least as protective of public health and welfare as applicable federal standards. In addition to the fact that EPA only has authority to adopt standards related to the control of emissions for *new* nonroad engines, CARB notes that EPA has previously stated that the phrase "state standards" as used in the protectiveness determination means the entire California set of standards (i.e. program) applicable to the relevant category of vehicles or engines. Further, CARB asserts that EPA has previously granted authorization to California's emission standards for new nonroad engines, and the in-use Fleet Requirements will yield emission reductions in addition to the new nonroad engine standards that were the subject of prior protectiveness findings, thus ensuring that the Fleet Requirements are of necessity more stringent than those covered by federal new engine emission standards alone.[49]

CARB responds to criticisms that it prioritized air quality health benefits and did not consider dis-benefits (e.g. increased costs for, and possible delay of, needed highway safety projects and improvements or other infrastructure) by stating that the latter set of concerns falls outside the scope of a section 209 protectiveness determination. CARB maintains that the plain language and intent of section 209(e)(2)(A)(i) is that review of California's protectiveness determination should be based exclusively on whether its "standards will be, in the aggregate, at least as protective of public health and welfare as applicable Federal standards." Since this language is almost identical to the protectiveness criterion language in section 209(b)(1), CARB maintains that EPA should thus follow the directive of Congress in section 209(b)(2) that:

> If each State standard is at least as stringent as the comparable applicable Federal standard, such State standard shall be deemed to be at least as protective of bealth and welfare as such Federal standards for purpose of paragraph (1).

CARB points to EPA's 2009 waiver of California's light-dnty greenhouse gas standards (EPA's 2009 GHG Waiver) where EPA concluded that, in considering whether California's protectiveness determination is arbitrary and capricious under section 209(b)(1)(A), the agency "has always interpreted 'applicable Federal Standards' as limiting EPA's inquiry to motor vehicle emission standards established by EPA under the Clean Air Act that apply to the same cars and the same air pollutants or group of pollutants as considered by California's aggregate protectiveness finding."[50] CARB argues that same analysis should apply to nonroad authorizations. CARB maintains that if EPA were to require the Board to consider factors other than aggregate emission standards in making the Board's protectiveness determination, this would undermine the broad discretion that Congress intended to provide California in making policy decisions on how best to address California's severe air pollution.[51]

CARB also disagrees with opponents' argnments that the Fleet Requirements will delay highway safety improvements. CARB notes that, even before the 2010 amendments, the regulations' expected maximum costs were projected to be so small (less than one percent) compared to overall construction spending, that they would not be expected to decrease or delay constructions projects. With the 2010 amendments, CARB expects compliance costs to be significantly lower and even less likely to delay construction projects, including highway safety projects.[52]

EPA agrees that the phrase "California standards" means the entire California nonroad emissions program (i.e. the set of all nonroad standards), or at the very least all of California's standards for nonroad CI engines, which is the category of engines being regulated hy California in the Fleet Requirements. Therefore, as explained above, when evaluating California's protectiveness determination, EPA compares the California requirements to federal standards applicable to the relevant category of engines. Again, that comparison is undertaken within the broader context of the previously authorized California standards for the relevant category of engines, which rely upon protectiveness determinations that EPA previously has found were not arbitrary and capricious. Finally, as discussed above, no commenter disputes that California standards, whether looking at the particular standards being authorized in this proceeding or the entire suite of standards for nonroad engines, are more stringent than federal standards.

The only issue in dispute is whether other information provided by commenters, outlined at the beginning of this section, provides clear and compelling evidence that California was arbitrary and capricious in finding its standards are in the aggregate at least as protective of public health and welfare as applicable federal standards.

EPA previously has considered whether its traditional analysis is sufficient to properly review CARB's protectiveness determination with regard to the "in-use effects" of CARB's regulations. Analysis of such in-use effects remained focused on the actual emission reductions/benefits expected from CARB's regulation.[53] In EPA's 2009 GHG Waiver Decision granting a waiver of preemption for CARB's greenhouse gas (GHG) standards for light duty vehicles, we noted that, given the legislative history and text of section 209(b)(2), EPA would need a concrete factual basis to examine the in-use effect of California's GHG standards on its broader LEV II program as compared to the Federal Tier II program. EPA did not take a position as to the validity of the suggestion that the type of analysis discussed in EPA's traditional protectiveness analysis is insufficient. Rather, EPA reached the conclusion that commenters who opposed the GHG waiver did not meet their burden of proof in presenting clear and compelling factual evidence (in the context of the regulatory effect on real-world in-use emissions) that CARB's protectiveness determination was arbitrary and capricions.

We recount this history to contrast it with the comments received opposing the Fleet Requirements authorization on the basis of various safety, economic, and health arguments. In the instant proceeding, EPA received no comments indicating why EPA's review of CARB's protectiveness determination with regard to the Fleet Requirements should be broader than past reviews, and/or should be based on anything other than an examination of the stringency of comparable applicable federal standards.

[48] *See* CCTA.

[49] *See* CARB's Written Comments.

[50] *See* EPA's greenhouse gas waiver decision issued in 2009 (2009 GHG Waiver Decision) at 74 FR 32743 (July 8, 2009).

[51] *Id.* at 4–5 (*citing MEMA I*, 627 F.2d at 1122 ["(C)ongressional intent to provide California with the broadest discretion in setting regulations it finds protective of the public health and welfare."]); *see also* 40 FR 23102, 23104 (May 28, 1975).

[52] *Id.*

[53] *See* (2009 GHG Waiver Decision) at 74 FR 32743, 32758.

Further, the opponents of the Authorization Request provide no analysis of the statutory language or history of section 209(e)(2)(A)(i) to support their view that the review of the "protectiveness" finding should be broader than EPA's traditional review. Nor do they provide any significant analysis or calculus as to how EPA should or would weigh these competing interests (i.e. those that go beyond the comparative stringency of applicable state and federal emission standards) in making its determination. While EPA recognizes that commenters have expressed significant concerns regarding the potential bnsiness impacts of the Fleet Requirements on individual contractors aud on employment, a review of CARB's protectiveness determination based upon such factors would be inconsistent with the broad discretion that Congress intended to provide California in making policy decisions on how best to address California's severe air pollution.[54] As EPA has previously concluded:

> [Congressional] sponsors of the (waiver) language eventually adopted referred repeatedly to their intent to make sure that no "Federal bureaucrat" would be able to tell the people of California what auto emission standards were good for them as long as they were stricter than the Federal standards.[55]

In our view, the statutory language of section 209(e)(2)(A)(i)—both on its face and as read together with 209(b)(2)—reflects Congress's intention that EPA evaluate only the comparative stringency of the relevant California and EPA emission standards. As discussed above, the text, structure, and history of the California waiver provision clearly indicate a congressional intent that EPA leave the decision on "ambiguous and controversial matters of public policy" to California's judgment. That has been EPA's consistent practice under section 209. As the court stated in *MEMA I*, Congress's intent in amending the protectiveness determination language in 1977 was to afford California the broadest possible discretion in selecting the best means to protect the health of its citizens. EPA therefore considers it inappropriate, in the context of reviewing CARB's protectiveness determination, to second-guess CARB's policy choices or to weigh competing health and welfare interests that are best left to California.

As explained below under the third authorization criterion—consistency with section 209 (including consistency with 202(a))—EPA interprets the "cost of compliance" in section 202(a) to refer to the direct economic costs of CARB's standards and the timiug of a particular emission control regulation rather than to its social implications.[56] Similarly, EPA believes it appropriate to limit our examination for purposes of the protectiveness comparison to the specific effects the California and EPA emission standards have on emissions rather thau performing an analysis of social impacts or other secondary implications. Policy decisions with regard to how various potential non-emissions impacts of an emission regulation can or should be weighed against one another is inherently and properly within the sphere of the state regulatory authority promulgating the regulation. Such decisions should uot be made or reviewed by EPA, which Congress has given the limited role of reviewing the regulations based on the three specified and relatively narrow statutory criteria, consistent with Congress's intent to uphold California's broad regulatory discretion in this sphere.

For all these reasons, EPA declines to depart from its traditional analysis of the protectiveness criterion under section 209(e)(2)(A)(i), as discussed above. Even if there were a valid basis for considering the types of non-air quality impacts alleged by the opponents of the Authorization Request, the opponents did not meet their burden to provide clear and convincing evidence that CARB's analysis of the effects of the Fleet Requirements is unreasonable. For EPA to make a section 209(e)(2)(A)(i) finding that California's protectiveness determination is arbitrary and capricious, it is not enough for authorization opponents to provide competing analysis or alternative policy considerations and arguments. To support a denial of authorization under this criterion, commenters must show that California's analysis, or the assumptions on which California relied to support its protectiveness determination, were *arbitrary and capricious*. In this instance, the opponents of the authorization have suggested that CARB's Fleet Requirements *could* make construction projects more expensive and this could lead to delays. But they have not introduced any actual evidence that such projects will be suspended due to the costs associated with the Fleet Requirements, and certaiuly not that the projected increase in costs, as estimated by CARB after the 2010 amendments, will be significant enough to delay or prevent such projects. Similarly, the opponents of the waiver have not introduced substantial evidence that the Fleet Requirements themselves—as opposed to a host of other factors, including the economic downturn, that have affected the economy over the last several years—will result in a loss in the number of employees or actual business. In the absence of any such evidence, EPA could not find California's protectiveness determiuation to be arbitrary and capricious even if these alleged impacts were an appropriate subject for analysis under section 209(e)(2)(A)(i).

Regarding the comment that CARB's regulation could adversely affect health and welfare in other states, EPA does not find the comment to be a basis for judging California's protectiveness determination to be arbitrary and capricious for two reasons. First, a change in emissions outside of California would not lead to a different conclusion regarding the relative protectiveness of the Fleet Requirements to federal requirements within California. Second, the commenters do not provide any substantive or factual evidence to show significant emissions impacts in other states. We would also note that other states may decide iudependently to adopt California's regulations.

In response to the comment that California's *regulations* are arbitrary and capricious, we note that EPA's sole review under section 209(e)(2)(A)(i) is whether California's *protectiveness determination* was arbitrary and capricious. Congress did not give EPA wide-ranging authority to examine the overall reasonableness of California's regulations. As discussed above, the policy decisions made by CARB in enacting its regulations are not reviewed generally by EPA, and, as Congress intended, EPA leaves such policy decisions to California.

3. Section 209(e)(2)(A)(i) Conclusion

In light of the foregoing, based on the record before us, EPA finds that opponents of the authorization have not shown that California was arbitrary and capricious in its determination that its standards are, in the aggregate, at least as protective of public health and welfare as applicable federal standards.

[54] *See MEMA I*, 627 F.2d at 1122 ["(C)ongressional intent to provide California with the broadest possible discretion in setting regulations it finds protective of the public health and welfare."]; *see also* 40 FR 23102, 23104 (May 28, 1975).

[55] 40 FR 23101, 23102 (May 28, 1975).

[56] *See* S. Rep. No. 192, 89th Cong., 1st Sess. 5–8 (1965); H.R. Rep. No. 728, 90th Cong., 1st Sess. 23 (1967), U.S. Code Cong. & Admin. News 1967, p. 1938.

B. Does California need its standards to meet compelling and extraordinary conditions?

Section 209(e)(2)(A)(ii) instructs that EPA cannot grant an authorization if the Agency finds that California "does not need such California standards to meet compelling and extraordinary conditions . . . ." EPA's inquiry under this second criterion (found both in paragraphs 209(b)(1)(B) and 209(e)(2)(A)(ii)) has been to determine whether California needs its own mobile source pollution program (i.e. set of standards) for the relevant class or category of vehicles or engines to meet compelling and extraordinary conditions, and not whether the specific standards that are the subject of the authorization or waiver request are necessary to meet such conditions.[57] In a 2009 waiver action, for example, EPA examined the language of section 209(b)(1)(B) and reiterated its longstanding traditional interpretation that the better approach for analyzing the *need* for "snch State standards" to meet "compelling and extraordinary conditions" is to review California's need for its program (i.e. set of standards) as a whole, for the class or category of vehicles being regulated, as opposed to its need for the individual standards that are the subject of a waiver or authorization request.[58]

As noted above, CARB first adopted its Fleet Requirements in 2007. CARB designed the 2007 regulation to address its determination that legacy fleets—and particularly nonroad CI vehicles—were responsible for significant PM and NO_X emissions. CARB's Initial Statement of Reasons (ISOR) states, in part:

> Off-road vehicles are a significant source of diesel particulate matter, as well as NO_X emissions that lead to ozone and ambient PM. Statewide, they are responsible for nearly a quarter of the total PM emissions from mobile diesel sources and nearly a fifth of the total NO_X emissions from mobile diesel sources. Although increasingly stringent new engine standards are reducing emissions from off-road diesel vehicles over time, because of their durability, most vehicles operate for several decades before being retired. Thus, in-use off-road diesel vehicles would continue to pose significant health risk for many years if this proposed regulation is not adopted. . . . without reductions from this large source category, the South Coast and San Joaquin Valley would be unable to attain the federal ambient air quality standards.
>
> . . . [E]missions would trend naturally down as the fleet gradually turned over to newer, cleaner engines. However, these reductions are not sufficient for many areas of the state to meet clean air standards. Because of this, the proposed regulation accelerates this anticipated reduction in emissions.[59]

The 2010 amendments affirmed CARB's longstanding position that California continues to need its own nonroad engine and vehicle program to address serious air pollution problems the state still confronts.[60] CARB's Authorization Request notes that California and particularly the South Coast and San Joaquin Valley air basins continue to experience some of the worst air quality in the nation and continue to be in non-attainment with national ambient air quality standards (NAAQS) for fine particulate matter ($PM_{2.5}$) and ozone.[61] "The nnique geographical and climatic conditions, and the tremendous growth in California's on- and off-road vehicle population, which moved Congress to authorize the State to establish on-road motor vehicle standards in 1970 and off-road engine standards in 1990, still exist today. . . . Nothing in these conditions has changed to warrant a change in this determination. Accordingly, there can be no doubt of the continuing existence of compelling and extraordinary conditions justifying California's need for its own mobile source emissions control program."[62]

CARB's Authorization Request also notes the continuing importance and need to address the NAAQS for pollutants considered to be harmful to public health, including $PM_{2.5}$ and ozone.[63] For areas in California that exceed the NAAQS, CARB is responsible under CAA section 110 for developing a State Implementation Plan (SIP) that describes how the state will attain the standards by certain deadlines. The South Coast Air Basin and the San Joaquin Valley Air Basin are in nonattainment for both $PM_{2.5}$ and the 8-honr ozone standard. Significant rednctions in NO_X emissions are needed to attain the standards because NO_X leads to formation in the atmosphere of both ozone and $PM_{2.5}$. Diesel PM emissions reductions are also needed because diesel PM contributes to ambient concentrations of $PM_{2.5}$. The South Coast and San Joaquin Valley air basins are both required to be in attainment with the $PM_{2.5}$ standard by 2014. The San Joaquin Valley and South Coast air basins are required to be in

[57] *See* 74 FR 32744, 32761 (July 8, 2009); 49 FR 18887, 18889–18890 (May 3, 1984).

[58] *See* EPA's 2009 GHG Waiver Decision wherein EPA rejected the suggested interpretation of section 209(b)(1)(B) as requiring a review of the specific need for California's new motor vehicle greenhouse gas emission standards as opposed to the traditional interpretation (need for the program as a whole) applied to local or regional air pollution problems.

[59] *See* STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING (ISOR) at EPA–HQ–OAR–2008–0691–0002, attachment A at 7–10. EPA notes that while CARB has incorporated by reference its earlier submissions to EPA docket EPA–HQ–OAR–2008–0691 we recognize that CARB has modified its emission inventory modeling. Nevertheless, the NR CI legacy fleet in California continues to present California with serious air quality issues according to CARB.

[60] *See* CARB Resolution 10–47 at EPA–HQ–OAR–2008–0691–0283. Specifically, the Board stated, in part:

WHEREAS, in-use off-road diesel vehicles operating in the state, as a class, continue to be a significant source of air pollution emissions in California that contribute to continuing violations of the national ambient air quality standards (NAAQS) for both particulate matter (PM) less than 2.5 microns ($PM_{2.5}$) and ozone, and to continuing localized health risk, including premature death, associated with exposure to $PM_{2.5}$;

WHEREAS, Staff Report 2007 further discussed the results of ARB staff's evaluations of the non-cancer health effects of exposure to primary and secondary PM emissions from the vehicles subject to the initially proposed Off-Road regulation, and these evaluations indicated that exposure to these emissions can be associated with premature deaths and other non-cancer health impacts;

WHEREAS, the United States Environmental Protection Agency (U.S. EPA) in a recently published review of the PM-related health science literature, which is the first part of an ongoing review of the national ambient air quality standards for PM, concluded that long-term exposure to $PM_{2.5}$ is causally associated with premature mortality, and that premature deaths caused by $PM_{2.5}$ occur at levels as low as 5.8 micrograms per cubic meter, which is considerably lower than the current national standard of 15 micrograms per cubic meter;

WHEREAS, the U.S. EPA risk assessment methodology is the basis for ARB's estimate that 9,200 (7,300 to 11,000, 95 percent confidence interval) premature deaths occur annually in California and that reducing emissions to meet the Federal standard would result in 2,700 fewer premature deaths annually;

WHEREAS, the Board further finds based on its independent judgment and analysis of the entire record before it that:

In-use off-road diesel vehicles and engines that operate in the State—whether based in California or not—continue to be significant contributors of diesel PM and NO_X emissions, which California must reduce to attain the ozone and $PM_{2.5}$ NAAQS and to reduce the health risks associated with such pollutants;

Even with the amendments and economic relief proposed, the proposed amended regulation would significantly reduce diesel PM and NO_X emissions and associated cancer, premature mortality, and other adverse health effects statewide, such that emission reductions from the proposed amended regulation are expected to prevent 470 premature deaths from 2014 to 2029.

[61] CARB Authorization Request at 18, *citing* 7 FR 4052, 4054 (July 11, 2011).

[62] CARB Authorization Request at 18, *citing* 74 FR 32744, 32762 (July 8, 2009); 76 FR 77515, 77518 (December 13, 2011).

[63] CARB notes: Ambient $PM_{2.5}$ is associated with premature mortality, aggravation of respiratory and cardiovascular disease, asthma exacerbation, chronic and acute bronchitis and reductions in lung function. Ozone is a powerful oxidant. Exposure to ozone can resnlt in reduced lung function, increased respiratory symptoms, increased airway hyper-reactivity, and increased airway inflammation. Exposure to ozone is also associated with premature death, hospitalization for cardiopulmonary causes, and emergency room visits for asthma.

attainment of the 8-hour ozone standard hy 2023.[64]

The SIP for the South Coast and San Joaquin air basins demoustrates attainment of the $PM_{2.5}$ standard by 2014, but only based on projected achievement of $PM_{2.5}$ emission reductions of nearly 15 percent in the South Coast Air Basin and 25 percent in the San Joaquin Valley Air Basin. CARB's Authorization Request states that NO_X emissions must be reduced by approximately 50 percent to meet the $PM_{2.5}$ standard in the South Coast and the San Joaquin Valley air basins. Even greater NO_X reductions, on the order of 75 to 88 percent, will be needed to achieve the 8-hour ozone standard by 2023. California's 2007 SIP included the initial version of the Fleet Requirements as a control measnre. CARB's legal commitment to achieve the emission reductions specified in the SIP relies upon the emission reductions from the Fleet Reqnirements regulation in the South Coast and the San Joaquin Valley.[65] In its ISOR, CARB notes "Despite the major economic recession and revisions to the off-road regulation inventory, the in-use off-road diesel vehicle category remains an important source of emissions. In 2010, staff estimates the off-road vehicles subject to the off-road regulation are the fourth largest source of diesel PM in California (7 percent of total) and the sixth largest source of NO_X from all sources (4 percent of total)."[66]

1. Should EPA Review this Criterion Based on the Need for California's Nonroad Program or the Need for the Fleet Requirements?

In addressing whether California needs "such State standards to meet compelling and extraordinary conditions," we must first address the question whether it is appropriate for EPA to evaluate this criterion based on California's need for its nonroad emission program as a whole, or whether we instead should evaluate only the particular standards being addressed in this authorization proceeding.

As noted above, CARB maintains that the relevant inquiry is whether California needs its own emission control program as opposed to the need for any given standard as necessary to meet compelling and extraordinary conditions. CARB notes that in prior decisions the Administrator has determined that:

> "[C]ompelling and extraordinary conditions" does not refer to levels of pollution directly, but primarily to the factors that tend to produce them: Geographical and climatic conditions that, when combined with large numbers and high concentrations of automobiles create serious air pollution problems.[67]

EPA has also consistently held that the phrase "the need for California emission standards" refers to the need for California's program (i.e. set of standards) applicable to the relevant category of vehicles or engines, and not the need for the particular standards that are the subject of an authorization request. In the instaut proceeding, EPA received comments disputing this approach, which we discuss below.

a. Comment From Pacific Legal Foundation

EPA received comment from the Pacific Legal Foundation (PLF) challenging both California's and EPA's interpretation of the "compelling and extraordinary conditions" criterion in section 209(e)(2)(A)(ii). PLF asserts that based on both the plain language of the provision and its legislative history, the word "standards" should be read to refer only to particular standards, and not to the entire California program for the relevant category of engines or vehicles.[68]

PLF contends that California must apply for a waiver or authorization on a case-by-case basis[69] and that the Clean Air Act requires EPA not grant California any waiver or authorization unless California makes a showing that it has "compelling and extraordinary conditions" necessitating the particular standards for which a waiver or authorization is sought. PLF argues that CARB has put little evidence in the record about the need for the Fleet Requirements. Further, PLF asserts that "Congress intended the word 'standard' in section 209 to mean quantitative level of emissions"[70] and that there is no indication in the text or legislative history that by using the term "standard" Congress really meant "program" or anything other than "standard." PLF states that Congress could have used the term "program" rather than the term "standards" in the statute and delegated to EPA the responsibility to make case by case decisions on whether a particular standard was required or needed.

In addition, PLF cites the legislative history of section 209 to support its position that standards need to be justified on an individual basis. Specifically, PLF cites the Senate Committee report for the 1967 legislation, which in discussing section 208 (the predecessor to what is now section 209) refers to California's "compelling and extraordinary circumstances" that are "sufficiently different from the nation as a whole to justify standards . . . [that] may, *from time to time*, need to be more stringent than national standards."[71] PLF argues that this language indicates that Congress intended California to justify *specific* standards "from time to time," and that it intended EPA to deny a waiver if California does not require or need particular standards. PLF claims that if Congress wanted to apply a need tests based on California's need for a program as a whole then it could have stated so.

PLF further contends that in 1977, when Congress amended section 209(b)—Congress continued to focus on "standards" but with two important additions. First, Congress amended the language relating to the protectiveness determination to clarify that California's standards need only be at least as protective as federal standards "in the aggregate"—making clear that California did not need to determine that each individual standard would be more protective or stringent than applicable federal standards. PLF asserts that this clarification, however, applied only to the protectiveness determination. Second, Congress tightened section 209(b)(1)(B) to provide that "*no* such waiver shall be granted if EPA finds that California . . . does not *need* such *standards* to meet compelling and extraordinary conditions . . .." (emphasis added). PLF asserts that the preexisting 1967 language had provided that EPA "shall" grant a waiver unless it finds California did "not require" the underlying standards, whereas the 1977 amendments expressly *prohibited* EPA from granting a waiver where California did not "need" a particular emissions standard. Based on the foregoing, PLF argues that the 1977 amendments created two separate tests for "standards." The "protectiveness" test (under the first waiver criterion), which

[64] CARB Authorization Request at 3–4.

[65] *Id.*

[66] EPA–HQ–OAR–2008–0691–0002 Attachment A, at 13.

[67] CARB Authorization Request at 18.

[68] As explained below, EPA believes it important to examine the language of section 209(e)(2)(A)(ii) precisely as Congress set it forth. Therefore, to be clear, the phrase "the need for California emission standards" does not appear in this section. Rather, the language is "No such authorization shall be granted if the Administrator determines that—(ii) California does not need such California standards to meet compelling and extraordinary conditions." EPA's interpretation of this section includes an examination of the significance of the word "such" before "California standards."

[69] PLF at 1.

[70] PLF cites *MEMA I* at 1112–1113.

[71] S Rep No 90–403 at 33 (1967) (emphasis added).

applies to the protectiveness of California's aggregate set of standards, and the "needs" test (under the second waiver criterion), which is based on a need for the particular standards for which a waiver is sought and focuses on whether there are compelling conditions in the state necessitating that particular standard.

PLF also maintains that EPA's traditional interpretation is contrary to plain meaning of the CAA. PLF asserts that the term "program" is not used in section 209 and that the phrase "such California standards" in 209(e)(2)(A)(ii) does not refer to the entire California mobile source emissions program. PLF states that the phrase "in the aggregate" appears only ouce in section 209 and only under the first waiver prong added in the 1977 amendments. "In the aggregate" is set off by commas, PLF argues, providing evidence that it pertains only to protectiveness under the first waiver criterion, and does not apply to the "needs" inquiry under the second waiver criterion. PLF maintains that the outcome of the protectiveness test depeuds on California making a determination, whereas the outcome of the needs tests depends on EPA making a finding. Further, PLF argues that the protectiveness test affirmatively mandates that EPA approve the waiver application if California makes the protectiveness determination, while the "needs test" expressly prohibits EPA from granting a waiver if EPA makes the requisite finding. Thus, PLF argues, the first prong is written to broaden the likelihood of issuing a waiver, whereas the second prong is written to narrow it.

PLF maintains that the two waiver prongs were intended to address entirely different issues. Congress gave EPA greater authority to approve waivers under the first prong, PLF asserts, but lesser authority to approve waivers under the independent needs test. PLF highlights that the sentence regarding "protectiveness" applies to both "standards and other requirements," whereas the sentence establishing the needs test refers only to standards. This makes sense, according to PLF, because Congress intended EPA to look holistically at protectiveness and not at whether an individual standard was as protective. To ensure CARB did not abuse the privilege, PLF argues, Congress provided under the "needs" criterion that California could not adopt any standard that it did not need or that was not specifically designed to address California's "peculiar" conditions.

Finally, PLF maintains that EPA's traditioual interpretation leads to absurd resnlts. PLF states that EPA itself has acknowledged that conditions in California may improve, thereby eliminating the need for the authority to waive preemption of California standards.[72] Under EPA's traditional interpretation, PLF argues, EPA would be forced to deny a waiver request based on a finding that there is no longer a need for the California program. PLF argues that such a finding would put in jeopardy past waivers, as the positive (program-wide) "needs" finding underpinning those past waivers would no longer be valid. PLF further comments that a broad negative finding with regard to "needs" would eliminate CARB's ability to maintain its own mobile source emission standards program, separate from the federal program. In such circumstances, PLF argues, EPA would be substituting its policy jndgment for that of Congress. If one interpretation leads to absurd results and another does not, PLF argues, then the former must be rejected.

b. EPA Response

EPA examined these same issues at length in the Agency's 2009 decision granting California's request for a waiver of preemption of its GHG standards for light duty vehicles.[73] Consistent with that examination, EPA continues to believe that the traditional approach to the compelling and extraordinary conditions criterion is appropriate. That is, EPA believes it is proper to review California's need for its emission program (i.e. set of standards) applicable to the relevant category of vehicles or engines as a whole, rather than to follow an intarpretation that applies this criterion to specific standards that are the subject of an authorization request.

EPA's traditional interpretation is the most straightforward reading of the text and legislative history of section 209(b) and section 209(e). First, EPA disagrees with PLF's assertions regarding the original language of the preemption provision promulgated in 1967. The critical language in section 208(b) of the 1967 legislation required that EPA's predecessor department grant California a waiver of section 208(a) preemption unless it found that California "does not require standards more stringent than applicable Federal standards to meet compelling and extraordinary conditions . . .." This language did not suggest a searching review of every California standard. Rather, it required a waiver of preemption unless the agency determined that California did not require more stringent "standards"—a term that is both general and plural—to meet compelling and extraordinary conditions. This langnage is fully consistent with a review of California's general need for more stringent standards and thus for its own program (i.e. its own set of standards).

PLF's emphasis on the word "standards," as opposed to "program" in this section is inapposite. EPA's use of the word "program" in this context is simply meant to describe the *group of standards* applicable to the engines and vehicles in question under California's regulatory program, compared to those under the federal program. The "program" in this context is merely the standards being considered together. It is fully consistent with the language of the statute to review the need for the program (i.e. the set of relevant standards) as a whole, rather than the need for individual standards. PLF's reference to legislative history is consistent with EPA's view that the relevant issue in determining whether a waiver is justified is California's "circumstances" being "sufficiently different", rather than the specific need for any particular standard.[74]

Beginning prior to the 1977 amendments, EPA has consistently interpreted the "compelling and extraordinary conditions" criterion to apply to the full California program (i.e. set of standards).[75] When Congress re-evaluated this provision in 1977, it could have revised the criterion to make clear that California must show each standard is necessary. Instead, as discussed below, Congress went out of its way to indicate that California is to be given even more flexibility in designing its own motor vehicle program.[76]

PLF, moreover, does not take proper account of the critical statutory change Congress made in 1977, which allowed California to promulgate individual standards that are not as stringent as comparable federal standards, as long as the standards are "in the aggregate, at least as protective of public health and welfare as applicable federal standards." This decision by Congress requires EPA to waive preemption of individual California standards that, in and of themselves, might not be considered needed to meet compelling and extraordinary circumstances, but are part of California's overall approach to reducing vehicle emissions to address air pollution problems.

Although PLF is correct that the 1977 amendments formally separated the "protectiveness" criterion from the "need" criterion, the latter continues to

[72] *See* 74 FR 32744, 32762 (July 8, 2009).

[73] 74 FR 32744, 32759–32762 (July 8, 2009).

[74] PLF at 4.

[75] *See* 38 FR 30136 (November 1, 1973).

[76] *MEMA I*, 627 F.2d at 1110.

refer back to the language regarding protectiveness, by using the term "*such* state standards." In addition, contrary to PLF's comments, the creation of the "in the aggregate" test for protectiveness is supportive of the argument that EPA is not to look at the need for each individual standard. If EPA were required to look independently at the need for each individual standard, any individual standard that was less stringent than a federal standard might be considered unnecessary. This would obviate the rationale for looking at the protectiveness of California's standards "in the aggregate" under the first criterion—effectively requiring EPA to give back in the second criterion what Congress explicitly gave California in its revision to the first criterion. Finally, it bears emphasis that the 1977 amendments continued to require that EPA grant a waiver of preemption unless it makes one of the findings in section 209(b)(1), thus continuing to put the burden of proof on those opposing the waiver.[77]

Congress, in 1990, added language in section 209(e)(2)(A) creating criteria for EPA authorization of California nonroad engine standards that are essentially identical to the criteria for EPA waiver of preemption of California's standards for new motor vehicles in section 209(b). In particular, Congress provided California with the discretion to create a broad emissions program (i.e. "California standards") that needs only to be as stringent as applicable EPA standards, in the aggregate. Further, section 209(e)(2)(A)(ii) refers to whether "*such* California standards" are needed to meet compelling and extraordinary conditions, referring back to the general and plural term "California standards" in the protectiveness finding.

The language of section 209(e)(2)(A) regarding the "protectiveness" determination by California refers only to "California standards," not to each California standard individually. Moreover, the use of the term "in the aggregate" makes clear that the set of standards to be reviewed is the aggregate set of standards applicable to the engines and vehicles being regulated. EPA is to determine whether California's determination is arbitrary and capricious under section 209(e)(2)(A)(i), and is to determine whether California does not need "such California standards" to meet compelling and extraordinary conditions. The natural reading of these provisions leads EPA, in addressing the "needs" criterion, to consider the same group of standards that California considered in making its protectiveness determination. While the words "in the aggregate" are not specifically applicable to section 209(e)(2)(A)(ii), this criterion does refer to the need for "such California standards," rather than "each California standard" or otherwise indicate a standard-by-standard analysis. The text thus indicates that the proper analysis is to review the aggregate set of standards (i.e. the program) applicable to the regulated vehicles and engines.[78]

PLF's discussion of case law interpreting the term "standard" is inapposite. For example, although PLF points to both *MEMA I* and *EMA*, those decisions address an entirely different issue relevant to section 209—i.e., whether the regulation set by California is, in fact, a "standard," as opposed to another type of provision, like an enforcement provision. These cases do not illuminate the issue of whether EPA reviews each standard individually under sections 209(b)(1)(B) and 209(e)(2)(A)(ii), or whether it reviews California's standards as a group (i.e. California's program for such engines) under those provisions.

EPA's 2009 decision waiving preemption of California's GHG standards for light duty vehicles considered the plain language and legislative history of section 209(b)(1)(B) and determined that for all pollutants, it was appropriate to review section 209(b)(1)(B) by reviewing the need for California's motor vehicle program, rather than individual standards. We incorporate that discussion into this decision by reference because, as explained above, the language of section 209(e)(2)(A)(ii) is substantively the same as that in section 209(b)(1)(B) on this issue.

The 2009 GHG waiver decision included the following discussion, which in particular addressed a 1984 decision waiving preemption for earlier California PM standards:

> [I]n the legislative history of section 209, the phrase "compelling and extraordinary circumstances" refers to "certain general circumstances, unique to California, primarily responsible for causing its air pollution problem," like the numerous thermal inversions caused by its local geography and wind patterns. The Administrator also noted that Congress recognized "the presence and growth of California's vehicle population, whose emissions were thought to be responsible for ninety percent of the air pollution in certain parts of California." EPA reasoned that the term compelling and extraordinary conditions "do not refer to the levels of pollution directly." Instead, the term refers primarily to the factors that tend to produce higher levels of pollution—"geographical and climatic conditions (like thermal inversions) that, when combined with large numbers and high concentrations of automobiles, create serious air pollution problems."
>
> The Administrator summarized that under this interpretation the question to be addressed in the second criterion is whether these "fundamental conditions" (i.e. the geographical and climate conditions and large motor vehicle population) that cause air pollution continued to exist, not whether the air pollution levels for PM were compelling and extraordinary, or the extent to which these specific PM standards will address the PM air pollution problem.[79]

The structure of section 209, as adopted in 1967 and as amended in 1977 and 1990, is notable in its focus on limiting the ability of EPA to deny a waiver or authorization. This limitation preserves discretion for California to construct its motor vehicle and nonroad programs as it deems appropriate to protect the health and welfare of its citizens. The legislative history indicates Congress quite intentionally restricted and limited EPA's review of California's standards, and that its express legislative intent was to "provide the broadest possible discretion [to California] in selecting the best means to protect the health of its citizens and the public welfare." [80] The D.C. Circuit recognized that "[t]he history of the congressional consideration of the California waiver provision, from its original enactment up through 1977, indicates that Congress intended the State to continue and expand its pioneering efforts at adopting and enforcing motor vehicle emission standards different from and in large measure more advanced than the corresponding federal program. In short to act as a kind of laboratory for innovation. * * * For a court [to limit

[77] *Id.*

[78] To the extent the provision is ambiguous, EPA's interpretation is, at minimum, one that is reasonable and entitled to deference under *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837 (1984). It certainly is not "unambiguously precluded" by the language of the statute. See *Entergy Corp. v. Riverkeeper, Inc.*, 129 S.Ct. 1498 (2009) ("That view governs if it is a reasonable interpretation of the statute—not necessarily the only possible interpretation, nor even the interpretation deemed most reasonable by the courts. *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 843–844 (1984).") ("It seems to us, therefore, that the phrase "best available," even with the added specification "for minimizing adverse environmental impact," does not unambiguously preclude cost-benefit analysis."). *Carrow v. Merit Systems Protection Board*, 564 F.3d 1359 (Fed. Cir. 2009) ("[W]e are obligated to give controlling effect to [agency's] interpretation if it is reasonable and is not contrary to the unambiguously expressed intent of Congress", citing *Entergy Corp.*).

[79] 74 FR 32744, 32759 (July 8, 2009) (citations omitted).

[80] 105 H.R. Rep. No. 294, 95th Cong., 1st Sess. 301–302 (1977). *See MEMA*, 627 F.2d at 1110–11.

California's authority] despite the absence of such an indication would only frustrate the congressional intent." [81]

In this context, it is fully consistent with the expressed intention of Congress to interpret section 209(e)(2)(A)(ii) in a manner that allows California the policy discretion to set its emission program as it sees fit, subject to the limitation that its standards remain, in the aggregate, as protective of public health and welfare as applicable federal standards and that California continue to experience compelling and extraordinary conditions. Congress intended to provide California the broadest possible discretion to develop its nonroad emissions program. Neither the text nor the legislative history of section 209(b) or 209(e) indicates that Congress intended to limit this broad discretion by requiring EPA to determine, on a case-by-case basis, whether each specific standard is necessary or appropriate for California. EPA's longstanding interpretation, accordingly, is directly in line with the purpose of Congress.

This approach does not make section 209(b)(1)(B) or section 209(e)(2)(A)(ii) a nullity. EPA must still determine whether opponents of authorization have met their burden to establish that California does not need its nonroad program to meet the compelling and extraordinary conditions. As discussed below, EPA does not believe that burden has been met in this instance. We acknowledge, however, that conditions in California may one day improve such that it no longer has the need for a separate nonroad program to address certain air quality problems. The statute contemplates that such improvement is possible. PLF is incorrect in concluding that EPA's approach would lead to an absurd outcome. EPA would not deny an authorization request under section 209(e)(2)(A)(ii) unless it determined that the regulatory program was not needed because compelling and extraordinary conditions no longer exist in California. Furthermore, the basis for previously waived or authorized standards would remain valid unless EPA determined that the compelling and extraordinary conditions would not exist even without those standards in place. This is consistent with the intent of Congress to permit California to maintain separate emission standards when compelling and extraordinary conditions exist. Thus, there would be no absurd results regarding such standards.

Congress has directed EPA to exercise its technical judgment with regard to all three authorization criteria, but has not authorized EPA to substitute its policy judgment for California's judgment with regard to which of its specific standards are or are not needed to meet its compelling and extraordinary conditions. Those who oppose California regulations for reasons other than the three criteria that Congress specified in the statute have the ability to raise their legal, policy, and other concerns in the state administrative process, or through judicial review of the regulations themselves.

For these reasons, EPA believes that the better approach for analyzing the need for "such State standards" to meet "compelling and extraordinary conditions" is to review California's need for its program, as a whole, for the class or category of vehicles being regulated, as opposed to its need for the individual standards that are the subject of an authorization request.

2. Does California Need its Nonroad Program to Meet Compelling and Extraordinary Conditions?

Applying the traditional approach to application of the compelling and extraordinary circumstances criterion under section 209(e)(2)(A)(ii), EPA cannot deny the authorization of the Fleet Requirements on this basis.

CARB has repeatedly demonstrated the need for its nonroad program to address compelling and extraordinary conditions in California. As noted above, in its Authorization Request, CARB stated that the unique geographical and climatic conditions and the tremendous growth in California's onroad and nonroad vehicle population, giving rise to serious air quality problems and NAAQS nonattainment in California, still exist today and that nothing in these conditions has changed to warrant a change in this determination. As such CARB notes that there can be no doubt of the continuing existence of compelling and extraordinary conditions justifying California's need for its own mobile source emissions control program.

EPA received some comment from those that otherwise oppose the authorization but implicitly recognize the underlying compelling and extraordinary conditions in California. For example, the American Road and Transportation Builders Association (ARTBA) notes that it is "very supportive of both EPA and ARB's goal of reducing PM and NO_X emissions," but "does not believe ARB has considered fully some of the air quality improvements already occurring in California and the nation. These improvements in air quality undercut the need for a measure as severe as the ARB proposal." [82] ARTBA notes that the air quality is significantly improving without the Fleet Requirements.[83] However, EPA received no evidence to suggest that California's air quality is improving to the point that it will attain the NAAQS for PM and ozone without the Fleet Requirements or that California continues to experience serious air quality concerns based on continuing compelling and extraordinary conditions, as EPA and CARB have outlined in this and previous actions. Based on the record, EPA is unable to identify any change in circumstances or any evidence to suggest that the conditions that Congress identified as giving rise to serious air quality problems in California no longer exist. As noted by CARB, there continue to be underlying compelling conditions in California giving rise to a significant number of California air basins that continue to be in nonattainment with NAAQS for $PM_{2.5}$ and ozone.

To the degree that commenters question the stringency of the Fleet Requirements or whether the emission reductions projected from this rule are needed, EPA received no comment that addressed the fundamental question of whether California continues to experience compelling and extraordinary conditions giving rise to the need of a nonroad emissions program. The design, or stringency of such an emission program, is irrelevant to EPA's review of section 209(e)(2)(A)(ii). Such review would be inconsistent with the express indication from Congress to provide California with the "broadest possible discretion" in selecting the best means to protect the health of its citizens and the public welfare. Accordingly, applying the traditional approach of reviewing the need for a separate California nonroad program to meet compelling and extraordinary conditions, EPA cannot deny the authorization based on this criterion.

3. In the alternative, does California need its nonroad Fleet Requirements to meet compelling and extraordinary conditions?

As discussed above, EPA is maintaining its interpretation of section 209(e)(2)(A)(ii) as requiring a review of whether compelling and extraordinary conditions give rise to a need for a California nonroad emission program. Nevertheless, because EPA received

[81] *MEMA*, 627 F. 2d at 1111.

[82] ARTBA at 2.

[83] *Id.*

comment urging an alternative interpretation (based on a review of whether the Fleet Requirements are per se needed to meet compelling and extraordinary conditions) and because we received other comments concerning the specific need for or benefits of the Fleet Requirements, EPA has also evaluated this criterion in the alternative by reviewing the Fleet Requirements separately.

Although EPA received a wide variety of comments questioning the "need" for CARB's Fleet Reqnirements, we did not receive any comments or explanation as to how an evaluation of "need" shonld be performed by EPA. As discussed below, in light of the lack of criteria by which to judge such need (including how to weigh or balance evidence and provide CARB with the requisite policy deference described above), the lack of any explanation of the relevant facts that EPA must or could consider, and the failnre of commenters to satisfy their burden of proof to overcome CARB's stated need for its Fleet Requirements, even if EPA were to apply the alternative interpretation proposed by commenters, the agency would be unable to make an affirmative finding under section 209(e)(2)(A)(ii). Therefore, EPA is unable to deny CARB's reqnest on this basis.

a. California's Air Quality Today and Moving Forward

The Agency received a number of comments suggesting that California's air quality is improving on its own. ARTBA notes that levels of $PM_{2.5}$ and NO_X have declined significantly since 1980 and since 2001, while nnmerous economic indicators have increased. The Associated General Contractors of America (AGC) note the significant decline in emissions from off-road diesel equipment due to a decline in activity and other factors. The Construction Industry Air Quality Coalition (CIAQC) claims that emissions from the existing fleet are naturally declining and that additional regulation is not needed to reach the emission levels CARB attribntes to implementation of the Fleet Requirements. The California Construction Trucking Association (CCTA) and CIAQC state that CARB's emission modeling was overstated and continues to be inaccurate because it presumes too optimistic a scenario of economic recovery and therefore more activity and emissions from nonroad fleets than there actually has been. We also received comments that the cost of CARB's regulation compared to the benefits supports a finding that such standards are not needed, and that the health benefits are either overstated or non-existent. In related comments, commenters stated that the Fleet Requirements are likely to do harm to the public health of Californians and that the economic impacts of the regulation are likely to lead to significant adverse health effects.[84] We also received comment from Altfillisch Contractors (ACI) suggesting that the California Environmental Quality Act (CEQA) renders the Fleet Requirements unnecessary.

CARB explains in its comments that for areas that exceed the NAAQS, California is responsible under the CAA section 110 for developing a state implementation plan (SIP) that describes how the state will attain the standards by certain deadlines.

CARB notes that its Fleet Requirements are part of an integral strategy to attain the NAAQS in both the San Joaquin Valley Air Basin and Sonth Coast Air Basin. CARB notes there is no question that areas of California continue to be in nonattainment for $PM_{2.5}$, as well as for ozone, and that the Fleet Requirements and other regulations and incentives are needed to achieve attainment.[85] Additionally, CARB states that despite the economic recession and downward revisions to the in-use off-road emissions inventory, off-road diesel vehicles remain a significant source of emissions.[86] Thus, CARB states, there continues to be a strong need for further regulation of all emission source categories, including off-road vehicles. "As EPA has long-confirmed, questions of what sources to regulate and how to regulate them are policy questions that Congress has determined is best left to the State."[87]

CARB also notes, and the EPA agrees, that the CEQA does not render the Fleet Reqnirements nnnecessary. The purposes of the CEQA and the Fleet Requirements are different. The CEQA, which is applied in only a few air districts, is essentially designed to identify when projects will result in significant harm and to mitigate that harm (to make sure air quality does not worsen), whereas the Fleet Requirements are proactive measures applicable statewide as part of coordinated strategy designed to improve air qnality thronghout the state.

EPA believes that CARB's initial filings and additional snbmissions to the record, responding to arguments that the Fleet Requirements are not needed because of the economic downturn and because of CARB's overestimation of inventory and emissions, are reasonable. Mere assertions by commenters that CARB's most recent emission modeling is inaccurate do not meet the burden of proof to demonstrate otherwise. As noted above, CARB has submitted npdated estimates of projected emission reductions expected from the Fleet Requirements, and there is no evidence in the record to demonstrate that CARB's projections are unreasonable. EPA further finds that the opponents have not met their burden of demonstrating that such considerations would render the Fleet Requirements unnecessary. In adopting the 2010 amendments, CARB acknowledged that past and future emissions from in-use nonroad CI vehicles were significantly lower than originally projected, and CARB states that the amendments for

[84] Those comments are addressed in the "protectiveness" or section 209(e)(2)(i) discussion above. As discussed in that section, the Agency believes it appropriate to limit our examination to the specific effects the California and EPA emission standards have on emissions rather than performing an analysis of social impacts or other secondary implications. The determination of how numerous possible impacts of emission regulation can or should be weighed in determining public policy is one inherently directed to the regulatory authority promulgating the regulation, not to an authority whose limited role is to review the regulations based on three narrow criteria and who has been directed by Congress to provide broad discretion in its review.

[85] CARB notes in its Authorization Request that two air basins in California—South Coast Air Basin and San Joaquin Valley Air Basin—are in nonattainment for both $PM_{2.5}$ and the 8-hour ozone standard. This nonattainment is based on the 2006 NAAQS for PM (71 FR 61144, October 17, 2006) and which EPA has subsequently made more stringent in 2012 (78 FR 3086, January 15, 2013). The nonattainment for ozone is based on EPA's 2008 NAAQS 8-hour ozone standard (73 FR 16436, March 27, 2008). CARB notes that significant emission reductions of NO_X are needed because it leads to formation in the atmosphere of ozone and $PM_{2.5}$, and that diesel PM emission reductions are also needed because diesel PM contributes to ambient concentrations of $PM_{2.5}$.

California submitted a revision to its SIP (State Strategy) in 2007 for the South Coast and San Joaquin Valley Air Basins that demonstrates attainment of the $PM_{2.5}$ standard by 2014 (needed by 2015), but only after achieving significant reductions of $PM_{2.5}$ (and NO_X). In addition, additional reductions of NO_X emissions are needed to achieve the 8-hour ozone standard by 2023. EPA approved the Stated Strategy for both $PM_{2.5}$ and NO_X for the South Coast and San Joaquin Air Basins on November 9, 2011 and March 1, 2012, respectively. CARB projects that the Fleet Regulations will achieve a 17 percent reduction in NO_X emissions and a 21 percent reduction in $PM_{2.5}$ emissions in 2023 that would not occur without the regulation and that Fleet Requirements are an integral part of the SIP and are laid ont in EPA's proposed rulemaking to approve the State Strategy and that no "margin of safety" otherwise exists.

[86] CARB notes in its Written Comments at 10–11 that the Fleet Requirements are part of the approved SIP for the South Coast and San Joaquin valley, both extreme nonattainment areas for ozone and nonattainment for $PM_{2.5}$ and that specific emission benefits from the Fleet Requirements are laid out in EPA's proposed rulemaking to approve the State Strategy.

[87] CARB Written Comments at 12–13.

which authorization is requested provide economic relief to fleets while still achieving the emission reductions necessary to attain federal ambient air quality standards (NAAQS). CARB indicates that despite the smaller inventory contribution from in-use nonroad CI engines than CARB projected in the initial rulemaking, emissions from these engines still represent a significant portion of the overall emissions inventory. The opponents provide no evidence to refute CARB's assertion that despite the economic recession and revised inventory, the in-use nonroad CI fleet remains a significant source of emissions.

Moreover, as CARB notes, there continues to be a strong need for emission reductions from all emission categories, including the in-use nonroad CI fleet, to meet the $PM_{2.5}$ and ozone NAAQS. As CARB notes, it is not for EPA to decide which types of sources to regulate and in what manner to do so.[88] Congress intended to leave such policy questions in the hands of the state. As discussed below, EPA finds that CARB has promulgated the Fleet Requirements, in part, to satisfy its $PM_{2.5}$ and 8-hour ozone NAAQS requirements and no evidence exists in the record to explicitly demonstrate why the emission reductions projected hy CARB are not needed in order to meet California's NAAQS obligations.

Lastly, CARB restates its legal obligation to achieve PM emission reductions and the expected benefits associated with the Fleet Requirements:

> ARB adopted the Off-Road regulation, in part, to meet California's legal obligations under federal law to achieve attainment with the NAAQS for $PM_{2.5}$ by 2014. The emission reductions in the regulation are critical to attaining federally mandated air quality standards. Primary diesel PM emissions are a significant contributor to overall $PM_{2.5}$. In 2008, 20,600 tons of diesel PM were emitted in California. The present amendments to the Off-Road regulation have been adopted to accommodate the economic hardship of affected businesses while still meeting the legal requirements and protecting the public health of all Californians.[89]

In order to properly evaluate whether California has a need for its Fleet Requirements under the alternative approach to section 209(e)(2)(A)(ii) described above, EPA believes it would be necessary only to examine whether the identified "compelling and extraordinary conditions" in California are giving rise to an air quality problem that CARB seeks to address with the Fleet Requirements. EPA has received no comment suggesting that EPA's historically recognized "conditions" in California (e.g. geographic and climatic conditions, number of vehicles operating in California, etc.) do not continue to give rise to elevated concentrations of particulate matter and NO_X. In addition, EPA has received no comment rebutting CARB's statement that it is legally required to demonstrate compliance with the CAA's NAAQS requirements (for $PM_{2.5}$ and 8-hour ozone) and that CARB is currently committed to achieve such compliance in part through the promulgation of emission standards such as its Fleet Requirements. As noted by CARB, the Fleet Requirements were initially set in response to the NAAQS requirements for $PM_{2.5}$ and the 8-hour ozone set in 2006 and 2008, respectively. The state of California has a greater level of nonattainment under those NAAQS than other states. Since that time, EPA in 2012 has completed review of the PM NAAQS and has strengthened the primary annual standard for $PM_{2.5}$, and California continues to set regulations in response to snch requirements.[90] EPA believes that to the extent that a review of the need for the Fleet Requirements (as opposed to CARB's nonroad program) is required, that CARB has reasonably demonstrated such need due to its obligation to comply with federal law (including section 110 of the CAA); CARB needs its Fleet Reqnirements and a host of other regulatory measures in order to adequately meet its SIP obligations. Because EPA has received additional comment suggesting that the PM conditions in California are not a serious air quality issne the Agency addresses those comments below.

b. PM Health Effects

EPA received several comments that question the public health benefits associated with the Fleet Requirements. EPA received comment stating that $PM_{2.5}$, and specifically $PM_{2.5}$ from diesel combustion, does not present a public health risk in general,[91] and that there is no measurable or detectable relationship between $PM_{2.5}$ and mortality.[92] Separately EPA also received comment that $PM_{2.5}$ from diesel combustion located in California does not present a public health risk.

With regard to the suggestion that $PM_{2.5}$ from diesel combustion does not present a public health risk, EPA received comment stating that "the claimed toxic effects of diesel particulate matter are hundreds of times smaller than, for example, the increased risk of lung cancer caused by cigarette smoking. This commenter asserts that these possible effects are smaller than any previously discovered in medical history, the actual exposure levels are so difficult to estimate, and there are so many confounding health factors (smoking and lifestyle) that are impossible to control, that the entire scientific basis of the regulatory policy needs to be broadly re-assessed before allowing CARB any kind of waiver in $PM_{2.5}$ enforcement."[93]

EPA also received comment questioning whether $PM_{2.5}$ from diesel exhaust is causing cancer, premature death, or other health effects in

[88] Consistent with *MEMA I*, the Agency has evaluated costs in this authorization in the evaluation of the technological feasibility below. The Agency looks at the actnal cost of compliance in the time provided by the regulation, not the regulation's cost-effectiveness. The appropriate cost-effectiveness for a regulation is a policy decision of California that is considered and made when California adopts the regulations, and EPA, historically, has deferred to these policy decisions. EPA has stated in this regard, "the law makes it clear that the waiver request cannot be denied unless the specific findings designated in the statute can be made. The issue of whether a proposed California requirement is likely to result in only marginal improvement in air quality not commensurate with its cost or is otherwise an arguably unwise exercise of regulatory power is not legally pertinent to my decision under section 209. Therefore, EPA declines to review CARB's Fleet Requirements for their cost-effectiveness or the cost-benefits of the regulation in the context of any of the authorization criteria set forth in section 209(e)(2).

[89] *Id.*

[90] 78 FR 3086 (January 15, 2013).

[91] EPA received only one comment suggesting that NO_X and ozone do not pose a public health issue. This comment did not include any data or other evidence to support this assertion. *See* Milloy written testimony.

[92] *See* Milloy. EPA notes that Mr. Milloy, who submitted comment on behalf of the California Construction Trucking Association, separately brought litigation against EPA in which he signed a sworn declaration comparing exposure of human test subjects being voluntarily exposed to forms of particulate matter to Nazi death camp experimentation. Declaration of Steven J Milloy in Case 1:12–cv–01066–AJT–TCB pp. 2–3; *see also* the complaint in the same matter which states that such studies "ris[k] the lives and health of human study subjects" and that "Mr. Milloy is appalled by this inhumanity"(complaint para. 15). Those sworn statements are diametrically at odds with Mr. Milloy's presentation and testimony here that exposure to particulate matter does not pose a public health concern. Needless to say, when a commenter publically espouses positions that are at a 180 degree remove from each other, the credibility of the assertions is greatly diminished. This lawsuit was dismissed as lacking any legal basis. Dr. Eastrom states in his comment "There is now overwhelming epidemiologic evidence that $PM_{2.5}$ and diesel PM are not related to total mortality in California. This evidence has most recently been summarized in my thirteen-page September 28, 2012 paper, "Particulate Matter is Not Killing Californians. This paper was presented on August 1, 2012 at the American Statistical Association Joint Statistical Meeting in San Diego. It is currently posted online and will be published later this year in the 2012 JMS Proceedings (*http://www.scientificintegrityinstitute.org/ASAS092812.pdf*)."

[93] *See* Dr. Malkan.

California. For example, one commenter stated that "we don't know yet" and we "can't rule out" that exposure to diesel PM might statistically be related to zero premature deaths.[94] This commenter suggests that the toxic effects of diesel particulate matter are so small that the scientific basis for concerns about $PM_{2.5}$ impacts on health needs to be re-assessed before EPA authorizes California's regulation. This commenter maintains that science does not know yet if fine particulate matter is causing cancer and the premature death of a measurable number of Californians, and that other factors like smoking and lifestyle may confound any effects.[95] EPA also received comment suggesting that the scientific evidence on the health effects of particulate air pollution (specifically $PM_{2.5}$) in California does not support its further control or regulation at this time. This commenter maintains that "[o]ur $PM_{2.5}$ is different in composition and is less toxic than that in many Eastern regions of the U.S."[96] In addition, two commenters stated that strong epidemiologic evidence shows ambient $PM_{2.5}$ and diesel PM is not related to total mortality in California.[97] The commenters also note studies pnblished in 2005 and 2011 for support.[98] One commenter notes the 2011 study for California-specific evidence regarding $PM_{2.5}$ and diesel PM and mortality and claims it demonstrates no current relationship between $PM_{2.5}$ and mortality in California and may show no scientific or public health justification for this regulation.[99]

Separately, the commenter also takes issue with EPA's Regulatory Impact Analysis for its proposed PM NAAQS rule (which has since been finalized), claiming the Regulatory Impact Analysis is misleading and contains omissions.[100]

Lastly, we received comment from CCTA that references a paper titled "Mortality Among Members of a Truck Driver Trade Association" (Truck Driver study) suggesting that any research on exposure to diesel exhaust should necessarily include truck drivers. CCTA maintains that the study results indicate that those in closest proximity and duration of high levels of exposure to diesel exhaust don't seem to share the same deleterious effects to exposure claimed in other studies.

In response to claims that the Fleet Requirements are not needed because there is no causal connection existing between $PM_{2.5}$ exposure and premature mortality and other health effects, CARB states:

> Staff carefully reviewed all peer-reviewed studies that have been performed in the United States on the relationship between long-term $PM_{2.5}$ exposure and mortality, as has the U.S. EPA in its recent review of the National Ambient Air Quality Standard for particulate matter. U.S. EPA's 2009 science assessment states "Collectively, the evidence is sufficient to conclude that the relationship between long-term $PM_{2.5}$ exposures and mortality is causal." U.S. EPA and ARB have critically evaluated the methods used in each study so that we can place the most weight on the studies that have used the strongest methodologies . . .. ARB's conclusions about the relationship between long-term exposure to $PM_{2.5}$ and mortality are aligned with the findings of the U.S. EPA, the World Health Organization, Health Canada, and the British government. Those findings have been publicly peer reviewed by multiple independent bodies worldwide.[101]

With respect to the questions about the health effects associated with exposure to diesel exhaust PM, CARB notes:

> Staff agrees that ambient $PM_{2.5}$ arises from many different sources, including diesel exhaust, and there are no established methods for routinely measuring the concentration of $PM_{2.5}$ in ambient air from any specific source. Diesel PM is primarily less than 2.5 microns in diameter, and consequently falls into the $PM_{2.5}$ size category. As discussed above, exposure to PM in this size fraction is strongly associated with premature death. Also, the results of animal exposure studies suggest that diesel PM is at least as toxic as other species within this size range.[102]

Further, with respect to questions about the specific health effects of diesel exhaust PM in California, CARB cites, in its responsive comments during the waiver proceeding, the large body of peer-reviewed scientific studies evaluated by CARB and EPA that have identified a broad range of health effects associated with $PM_{2.5}$ exposures.[103] CARB states that "[t]he national studies reviewed by the U.S. EPA for the NAAQS assessment apply to California. In fact, as part of the federal standards review process, U.S. EPA estimated the premature deaths associated with $PM_{2.5}$ in two California cities—Los Angeles and Fresno."[104] CARB also cites EPA's Quantitative Health Risk Assessment, which estimates that, based on 2005 ambient mean levels of $PM_{2.5}$, approximately 63,000 to 80,000 premature deaths each year are related to $PM_{2.5}$ exposures in the United States. CARB also conducted its own California-focused study, which estimated that in California, exposure to $PM_{2.5}$ results in approximately 9,200 deaths each year.[105] In further comments, CARB states that the pre-2010 studies cited by Drs. Enstrom and Malkan in their comments were reviewed by CARB, as well as hy the EPA in the development of the PM Integrated Science Assessment (ISA).

Separately, CARB also reviewed the 2011 Jerrett et al. study, referenced by commenters.[106] [107] CARB notes that the

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[94] *See* Dr. Malken. This commenter also suggests that the $PM_{2.5}$ from diesel exhaust in California might be inherently different than the PM studied in the eastern half of the United States.

[95] *Id.* at 2.

[96] *See* Dr. Phalen.

[97] *See* Delta and Dr. Enstrom. Delta also comments that the least healthy county in California has low diesel PM air concentrations, but high poverty and unemployment levels. Delta states that California is the fourth healthiest state as measured by premature death rates. EPA notes that Delta makes no attempt to connect these general views on health with the specific issue of whether emissions of $PM_{2.5}$ have any effect on health.

[98] *See* Dr. Enstrom and Dr. Malken. Dr. Malken claims that the CARB-funded Jerrett et al. (2011) study of the LA subset of ACS data was the only one which utilized data from particle monitors and "they found no significant correlation between $PM_{2.5}$ and 'premature deaths.'" This commentar also states that weighing all of the studies that CARB has considered is more a matter of subjective taste than a scientific process and that CARB has "cherry-picked" the few results that have supported their position.

[99] Dr. Enstrom. This commenter maintains that EPA's June 2012 "Regulatory Impact Analysis related to the Proposed Revisions to the National Ambient Air Quality Standards for Particulate Matter" erroneously conclnded that "most of the cohort studies conducted in California report central effect estimates similar to the (nation-wide) all-cause mortality risk estimate" but EPA's Table 5 B–10 was inaccurate or misleading, including the hazard ratio used from his 2005 paper. EPA notes that the proper place to contest the methodology and findings of the Agency in its NAAQS review process is in that federal context. This commenter also claims that "[a] glaring omission was the detailed evidence from the October 28, 2011 CARB-funded Report, "Spatiotemporal Analysis of Air Pollution and Mortality in California Based on the American Cancer Society Cohort: Final Report," by Drs. Michael Jerrett, Richard T. Burnett, C. Arden Pope III, Daniel Krewski, Michael Thun, and nine others *http://www.scientificintegrityinstitute.org/JerrettCriticism102811.pdf*)." This commenter also claims that his September 28, 2012 paper summarizes the epidemiologic evidence that $PM_{2.5}$ and diesel PM are not related to total mortality in California.

[100] *Id.*

[101] *See* CARB Written Comments.

[102] *Id.*

[103] *Id.* at 12, *citing* attachments 1–3.

[104] *Id.*

[105] CARB Written Comments at 12, *citing* attachments 1 and 2 of its October 19, 2012 submissions to EPA, including the "Estimate of Premature Deaths Associated with Fine Particle Pollution ($PM_{2.5}$) in California Using a U.S. Environmental Protection Agency Methodology," August 31, 2010.

[106] CARB Sapplemental Comments.

[107] The Jerrett et al., 2011 report was not included in EPA's PM ISA because it was completed after the ISA was published. It was also not included in the Provisional Science Assessment because it was not a peer-reviewed publication at the time. However, the work conducted by Jerrett et al. was recently published and can now be found in the peer-reviewed literature [*http://www.atsjournals.org/doi/pdf/10.1164/rccm.201303-0609OC*]. EPA will

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study fouud that "[c]ardiovascular disease (CVD) deaths, particularly those from ischemic heart disease (IHD), are consistently and robustly associated with fine particulate and traffic-related air pollution. The effects on CVD and IHD in California are virtually identical to those of the national . . . study." The study also found that "[a]ll-cause mortality is significantly associated with $PM_{2.5}$ exposure, but the resnlts are sensitive to statistical model specification and to the exposure model used to generate the estimates."[108]

CARB also included a copy of the 2011 Jerrett et al. study in its comments and indicated the stndy reached the following conclusion:

> Taken together, the results from this investigation indicate consistent and robust effects of $PM_{2.5}$—and other pollutants commonly found in the combustion-source mixture with $PM_{2.5}$—on deaths from CVD and IHD. We also found significant associations between $PM_{2.5}$ and all causes of death, although these findings were sensitive to model specification. In Los Angeles, where the monitoring network is capable of detecting intra urban variations in $PM_{2.5}$, we observed large effects on death from all causes, CVD, IHD, and respiratory disease. These results were consistent with past ACS [American Cancer Society cohort] analyses and with findings from other national or international studies reviewed in this report. Our strongest results were from a land use regression estimate of NO_2, which is generally thought to represent traffic sources, where significant elevated effects were found on deaths from all causes, CVD, IHD, and lung cancer. We therefore concluded that combustion-source air pollution as significantly associated with premature death in this large cohort of Californians.[109]

EPA will address in turn: (1) Suggestions that $PM_{2.5}$ does not present a public health risk in general; (2) snggestions that $PM_{2.5}$ from diesel combustion does not present a public health risk; and (3) suggestions that $PM_{2.5}$ from diesel combnstion located in California does not present a public health risk.

EPA disagrees with the commenters regarding the evidence associated with PM exposure in the context of all three suggestions noted above.

Regarding the claim that there is no link between health effects, including mortality, and exposure to $PM_{2.5}$, EPA disagrees with this comment and notes the large body of scientific literature that was thoroughly evaluated during the NAAQS review process is discussed in detail in EPA's Integrated Science Assessment (ISA) for Particulate Matter.[110] The ISA characterizes the weight of evidence for different health effects and makes causal determinations for both short-term (i.e., hours to days) and long-term (i.e., months to years) exposures to $PM_{2.5}$, $PM_{10-2.5}$, and ultrafine particles. Specifically in the ISA, the EPA carefully evaluated and integrated the scientific evidence from across epidemiological, toxicological and controlled human exposure stndies to make inferences about causality. The PM ISA considered and assessed an extensive body of scientific information, all of which had nndergone peer-review prior to being pnblished.[111]

Overall, the PM ISA provides a concise evaluation and integration of the policy-relevant science. This inclndes key science judgments npon which EPA based its Quantitative Health Risk Assessment for Particulate Matter (PM RA, U.S. EPA, 2010), and the Policy Assessment for the Review of Particulate Matter National Amhient Air Quality Standards (PM PA, U.S. EPA, 2011).[112] These docnments informed EPA's 2012 rule completing review of the PM NAAQS.[113]

After a thorough evaluation and integration of the evidence across scientific disciplines, the PM ISA made causal determinations for the health effects associated with both short- and long-term exposures to $PM_{2.5}$.[114] For short-term exposures, the PM ISA concludes that cardiovascular effects (e.g., emergency department (ED) visits and hospital admissions for ischemic heart disease (IHD) and congestive heart failure (CHF), changes in cardiovascular function, and myocardial ischemia), and premature mortality are causally associated with short-term exposure to $PM_{2.5}$. It also concludes that respiratory effects (e.g., ED visits and hospital admissions for chronic obstrnctive pnlmonary disease (COPD), respiratory infections, and asthma; and exacerbation of respiratory symptoms in asthmatic children) are likely to be causally associated with short-term exposure to $PM_{2.5}$. For long-term exposures, the PM ISA concludes that there are causal associations between long-term exposure to $PM_{2.5}$ and cardiovascular effects, such as the development/progression of cardiovascular disease (CVD), and premature mortality, particularly from cardiovascular causes. It also concludes that long-term exposure to $PM_{2.5}$ is likely to be causally associated with respiratory effects, such as reduced lung function growth, increased respiratory symptoms, and asthma development. The ISA characterizes the evidence as suggestive of a causal relationship for associations between long-term $PM_{2.5}$ exposure and reproductive and developmental outcomes, such as low birth weight and infant mortality. It also characterizes the evidence as suggestive of a causal relationship between $PM_{2.5}$ and cancer incidence, mutagenicity, and genotoxicity.[115] EPA's evaluation of the

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consider this study in the next round of NAAQS reviews that include PM. We note, however, that the inclusion or exclusion of one report such as Jerrett would not materially change the large hody of scientific evidence indicating an effect of $PM_{2.5}$ exposure on human health.

[108] CARB Supplemental Comments at 13, *citing* "Spatiotemporal Analysis of Air Pollution and Mortality in California Based on the American Cancer Society Cohort: Final Report," Michael Jerrett, Ph.D., 2011, at 6–7.

[109] *Id.*

[110] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F. Docket entry EPA–HQ–OAR–2008–0691–0318–attachments 2.1 through 2.5

[111] *Id.* at 1–22. See *http://www.epa.gov/ttn/naaqs/standards/pm/data/20121214rtc.pdf* at II–9 to II–12 for discussion of EPA's application of its framework for causal determinations and recognition of the distinction betweeu evaluating the relative scientific quality of individual study results and the evaluation of the pattern of results within the hroader body of scientific evidence. This discussion also addresses allegations of cherry-picking studies and ignoring studies that reported no association with $PM_{2.5}$.

[112] *See* EPA–HQ–OAR–2008–0691–0318–attachment 3 and *http://yosemite.epa.gov/sab/sabproduct.nsf/368203f97a15308a852574ba005bbd01/8bee96ad3228eabe85257604007027861OpenDocument.*

[113] EPA incorporates by reference onr 2012 PM NAAQS review and associated rulemaking documents. EPA also notes that the reasoning and conclusions reached in the PM NAAQS review are not being revisited in the context of this authorization decision but are cited for the purposes of demonstrating the vast body of pear reviewed evidence and findings that is not contravened by the few studies submitted by commenters to the authorization docket. EPA also states that to the extent the comments take issue with the determinations made in the context of the PM NAAQS rulemaking, the proper place to bring challenges to those decisions would be in the context of that rule.

[114] *Id.* EPA also noted in this Response to Significant Comments document that "The EPA's evaluation of the scientific evidence and its application of the causal framework used in the current PM NAAQS review was the subject of exhaustive and detailed review by CASAC and the public. Prior to finalizing the ISA, two drafts were released for CASAC and public review to evaluate the scientific integrity of the documents. Evidence related to the substantive issues raised by CASAC and public commenters with regard to the content of the first and second draft ISAs were discussed at length during these public CASAC meetings and considered in developing the final ISA. CASAC supported the development of the EPA's causality framework and its use in the current PM NAAQS review and concluded: The five-level classification of strength of evidence for causal inference has been systematically applied; this approach has provided transparency and a clear statement of the level of confidence with regard to causation, and we recommend its continued use in future Integrated Science Assessments (Samet 2009f, p. 1)." (At II–9).

[115] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report) (ISA). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F. Section 2.3.5 and Table 2–6. EPA also notes that the ISA assessed

studies presented in the ISA, as well as the causal framework and determinations upon which the Assessment is based, have undergone extensive critical review by the EPA, CASAC, and the public during its development. The rigor of the review makes the ISA the most reliable source of scientific information on the subject of PM and health and welfare effects.

Additionally, new health studies published since the completion of the ISA were discussed in EPA's Provisional Science Assessment (U.S. EPA, 2012), which was used to ensure the Administrator was fully aware of the "new" science that developed since 2009 before making final decisions on whether to retain or revise the ambient PM standards. Overall, the new health studies were found not to materially change the conclusions of the 2009 ISA. As in prior NAAQS reviews, the EPA based its final decisions on the studies and related information included in the ISA, RA, and PA which had undergone CASAC and public review. To the extent that the commenters attempt to introduce new arguments or new studies that have not been peer-reviewed, including the 2011 Jerrett study, EPA believes the new science published after the ISA does not materially change the conclusions found within the ISA.[116] As noted above, EPA has recently concluded its PM NAAQS review. No comments submitted in the context of this authorization proceeding lead the Agency to reassess (for pnrposes of this authorization) the findings related to PM exposure and health effects. EPA notes that the study referenced by Mr. Milloy in his comments was never provided to EPA nor has EPA found it in the peer-reviewed literature. Therefore EPA has no basis to review the technical methods used or the summary results.[117]

With regard to suggestions that $PM_{2.5}$ from diesel combustion does not present a public health risk or assertions that $PM_{2.5}$ composition is determinative to risk, EPA believes that the available scientific evidence liuking mortality and morbidity effects with long-and short-term exposures to fine particles continue to be largely indexed by $PM_{2.5}$ mass. In the PM NAAQS review completed in 2012, EPA concluded that it was appropriate to retain $PM_{2.5}$ as the indicator for fine particles due to the inability to differentiate those components or sources that are more closely related to specific health outcomes nor to exclude any component or group of components from the mix of fine particles included in the $PM_{2.5}$ indicator. As EPA previously stated in the ISA "overall, the results indicate that many constituents of PM can be linked with differing health effects and the evidence is not yet sufficient to allow differentiation of those constituents or sources that are more closely related to specific health outcomes." [118]

With regard to suggestions that EPA did not properly consider prior reports (including the 2005 Dr. Enstrom study), EPA notes the Enstrom study was included in summary figures depicting the totality of the evidence for long-term $PM_{2.5}$ exposure and mortality.[119] It is important to note that Dr. Enstrom based his comments solely on statistical significance. Another commenter also asserts that studies looking at associations between PM and premature mortality do not have statistically significant results.[120] EPA responded in the NAAQS rulemaking to the issue of relying on statistical significance and why it is not appropriate to only focus on it when evaluating a body of evidence.[121] Specifically, EPA stated:

Statistical significance is an indicator of the precision of a study's results, which is influenced by a variety of factors including, but not limited to, the size of the study, exposure and measurement error, and statistical model specifications. Statistical significance is just one of the means of evaluating the validity of the relationships determined with epidemiological studies. The EPA can reasonably look to other indicia of reliability such as the consistency and coherence of a body of studies as well as other confirming data to justify reliance on the results of a body of epidemiological studies, even if individual studies may lack statistical significance. *American Trucking Association* v. *EPA*, 283 F. 3d 355, 371 (D.C. Cir. 2002). As a result, in developing an integrated assessment of the health effects evidence for PM, the EPA has emphasized the importance of examining the pattern of results across various studies and their coherence and consistency, and has not focused solely on statistical significance as a criterion of study reliability.

It has been clearly articulated throughout the epidemiological and causal inference literature that it is important not to focus on results of statistical tests to the exclusion of other information. For example, Rothman (1998) stated: "Many data analysts appear to remain oblivious to the qualitative nature of significance testing [and that] . . . statistical significance is itself only a dichotomous indicator. As it has only two values, significant or not significant." As a result, Rothman recommended that P-values be omitted as long as point and interval estimates are available.

The concepts underlying the EPA's approach to evaluating statistical associations reported for the health effects on $PM_{2.5}$ have been discussed in numerous publications, including a report by the U.S. Surgeon General on the health consequences of smoking (Centers for Disease Control and Prevention, 2004). This report cautions against overreliance on statistical significance in evaluating the overall evidence for an exposure-response relationship: Hill made a point of commenting on the value, or lack thereof, of statistical testing in the determination of cause: "No formal tests of significance can answer those [causal] questions. Such tests can, and should, remind us of the effects the play of chance can create, and they will instruct us in the likely magnitude of those effects. Beyond that, they contribute nothing to the 'proof' of our hypothesis" (Hill 1965, p. 299). Hill's warning was in some ways prescient, as the reliance on statistically significaut testing as a substitute for judgment in a causal inference remains today (Savitz et al., 1994; Holman et al., 2001; Poole 2001). To understand the basis for this warning, it is critical to recognize the difference between inductive inferences about the truth of underlying hypotheses, and deductive statistical calculations that are relevant to those inferences, but that are not inductive statements themselves. The latter include p values, confidence intervals, and hypothesis tests (Greenland 1998; Goodman 1999). The dominant approach to statistical inference today, which employs those

the body of scientific evidence regarding particles available through mid-2009, which included over two thousand new studies. The ISA received two rigorous rounds of peer review by the independent Clean Air Scientific Advisory Committee (CASAC) and two draft PM ISAs were made available for public review and comment.

[116] *Id.* EPA is only reviewing the comments submitted to the EPA–HQ–OAR–008–0091 public docket for CARB's authorization reqnest and EPA the responses to such comments are not intended to imply that EPA is engaged in a reexamination of the issues thoroughly examined in the recent PM NAAQS review.

[117] EPA is only reviewing the comments submitted to the EPA–HQ–OAR–2008–0091 public docket for CARB's authorization request and EPA's responses to such comments are not intended to imply that EPA is engaged in a reexamination of the issues thoroughly examined in the recent PM NAAQS review.

[118] *See* ISA at 2–26.

[119] EPA noted that an association was reported for long-term $PM_{2.5}$ exposure with all-cause deaths from 1973–1982. However, no significant associations were reported with deaths in later time periods when $PM_{2.5}$ levels had decreased in the most pollnted counties (1983–2002). The $PM_{2.5}$ data were obtained from the EPA's Inhalation Particle Network (collected 1979–1983), and the locations represented a subset of data used in the 50-city ACS study (Pope et al., 1995, 045159). However, the use of average values for California counties as exposure surrogates likely leads to significant exposure error, as many California counties are large and quite topographically variable. ISA, at 7–85.

[120] *See* Dr.Malkan.

[121] *See* "Responses to Significant Comments on the 2012 Proposed Rule on the National Ambient Air Quality Standards for Particulate Matter (June 29, 2012; 77 FR 38890). *http://www.epa.gov/ttn/naaqs/standards/pm/data/20121214rtc.pdf* at II–9 to II–12 for discussion of EPA's application of its framework for causal determinations and recognition of the distinction between evaluating the relative scientific quality of individual study results and the evaluation of the pattern of results within the broader body of scientific evidence.

statistical measures, obscures this important distinction between deductive and inductive inferences (Royall 1997), and has produced the mistaken view that inferences flow directly and inevitably from data. There is no mathematical formula that can transform data into a probabilistic statement about the truth of an association without introducing some formal quantification of external knowledge, such as in Bayesian approaches to inference (Goodman 1993; Howson and Urbach, 1993). Significance testing and the complementary estimation of confidence intervals remain useful for characterizing the role of chance in producing the association in hand (CDC, 2003, pp. 23 to 24).

Accordingly, the statistical significance of findings from an individual study has played an important role in the EPA's evaluation of the study's results and overall the EPA has placed greater emphasis on studies reporting statistically significant results in making determinations as to the elements of the standard. In particular, as noted in section III.E.4.b.i of the preamble to the final rule, the EPA identified long- and short-term exposure studies considered "key" multi-city studies for consideration for informing the decisions on the appropriate standard levels and included those studies observing effects for which the evidence supported a causal or likely causal association. Figure 4 in the preamble to the final rule (also Figure 4 in the proposal, 77 FR 38933) represents the subset of multi-city studies included in Figures 1 through 3 of the preamble to the final rule (also Figures 1 through 3 in the proposal, 77 FR 38929 to 38931) that provided evidence of positive and generally statistically significant effects associated in whole, or in part, with more recent air quality data, generally representing health effects associated with lower $PM_{2.5}$ concentrations than had previously heen considered in the last review.

The EPA notes that many of these studies evaluated multiple health endpoints, and not all of the effects evaluated provided evidence of positive and statistically significant effects. For purposes of informing the Administrator's decision on the appropriate standard levels, the Agency considers the full body of scientific evidence and focuses on those aspects of the key studies that provided evidence of positive and generally statistically significant effects. However, in the broader evaluation of the evidence from many epidemiological studies, and subsequently during the process of forming causality determinations, the EPA has emphasized the pattern of results across epidemiological studies for drawing conclusions on the relationship between $PM_{2.5}$ and health outcomes, and whether the effects observed are coherent across the scientific disciplines. Thus, in making causality determinations, the EPA did not limit its focus or consideration to just studies that reported positive associations or where the results were statistically significant.[122]

In addition, EPA has previously addressed the issue of what one commenter calls "confounding health factors." In the case of short-term exposure studies, a confounder would need to vary on a day-to-day basis with both air pollution and with the specific health outcome being evaluated (e.g., mortality or hospital admissions or emergency department visits). The confounders that fit these criteria for short-term exposure studies are related to weather (e.g., temperature, dew point, relative humidity). The short-term exposure studies, specifically time-series studies, evaluated in the ISA all included weather covariates in their models to account for their potential confounding effects (U.S. EPA, 2009a, Chapter 6).

With regard to long-term exposure studies, a number of multilevel cohort studies (Naess et al. 2007; Jerrett et al. 2003; Jerrett et al. 2005) have evaluated individual-level and contextual, or ecologic-level variables as potential confounders. As reported in Jerrett et al. (2005), "Contextual effects occur when individual differences in health outcomes are associated with the grouped variables that represent the social, economic, and environmental settings where the individuals live, work, or spend time (e.g., poverty or crime rate in a neighborhood). These contextual effects often operate independently from (or interactively with) the individual-level variahles such as smoking." These studies found that the inclusion of contextual variables tended to attenuate the risk estimates for the association between long-term exposure to $PM_{2.5}$ and mortality, but that an independent effect of $PM_{2.5}$ on mortality remains. For example, Jerrett et al. (2005) found that for $PM_{2.5}$ (controlling for age, sex, and race), the relative risk was 1.24 (95% CI 1.11, 1.37) for a 10 µg/m3 exposure contrast. In a parsimonious model that controlled for 44 different individual covariates and ecological confounder variables that both reduced the pollution coefficient and had associations with mortality, the relative risk was 1.11 (95% CI 0.99, 1.25) for the same exposure contrast. The EPA believes that the results of these studies provide confidence that more recent reports with updated datasets are showing independent effects of $PM_{2.5}$.[123]

One commenter's assertion that the risk from PM is hundreds of times smaller than the increased risk of lung cancer caused by cigarette smoking, and difficult to estimate, has been previously addressed during the PM NAAQS review. The "Responses to Significant Comments on the 2012 Proposed Rule on the National Ambient Air Quality Standards for Particulate Matter" stated:

The comparison of smoking and ambient PM-related effect estimates was not considered relevant for the PM NAAQS review, and thus, was not considered in the ISA. This issue was not raised during the CASAC and public review of the drafts of the ISA. In order to address the comments submitted, the EPA conducted a provisional review of the "new" literature published since the close of the ISA including studies cited by commenters, and identified several relevant studies that compared and evaluated effect estimates determined for relationships between specific health outcomes and ambient particulate matter and active smoking (Pope et al. 2009; Pope et al. 2011). These authors analyzed data from the American Cancer Society cohort in order to evaluate the shape of the exposure-response relationship for $PM_{2.5}$ and both lung cancer mortality (Pope et al. 2011) and cardiovascular disease (CVD) mortality (Pope et al. 2009; Pope et al. 2011). In these studies, the authors evaluated three sources of exposure to $PM_{2.5}$: active smoking, passive smoking, and ambient air pollution.

For lung cancer mortality, the authors observed "a monotonic, nearly linear exposure response relationship with fairly constant marginal increases in RR [relative risk] with increasing exposure" across the full range of observed exposures (Pope et al. 2011). When the authors evaluated CVD mortality, they observed "an exposure-response relationship that is substantially non-linear, that is, much steeper at the very low levels of exposure compared with higher levels of exposure" (Pope et al. 2011). In fact, the study authors noted that "For lung cancer mortality, the RRs steadily increase to nearly 40 at the highest increment of cigarette smoking (>42 cigarettes per day), whereas for CVD mortality, the RRs level off at approximately 2.0–2.5."

Because of the much steeper exposure-response relationship for long-term exposure to $PM_{2.5}$ and CVD mortality at low $PM_{2.5}$ concentrations, which flattens out at higher $PM_{2.5}$ concentrations (i.e., those associated with passive and active cigarette smoking), it is biologically plausible that the risk estimates for CVD mortality due to exposure to ambient concentrations of $PM_{2.5}$ would be similar to risk estimates for CVD mortality due to active cigarette smoking. These results are consistent with the results observed in epidemiological studies of long-term exposure to $PM_{2.5}$ and mortality, and with the conclusions drawn in the ISA. For example, Dockery et al. (1993) found essentially the same risk estimates for CVD mortality associated with both ambient $PM_{2.5}$ concentrations and active cigarette smoking in an area with relatively high levels of ambient $PM_{2.5}$concentration.

Additionally, there could be non-traditional confounders have not been accounted for in epidemiological studies of short- and long-term exposure to air pollution. These confounders include physical and psychological population stress factors. The EPA disagrees with these commenters because: (1) There is very limited evidence of stress affecting the air pollution-health effect relationship upon which to base the commenters assertion; (2) in order for stress to be a true confounder it would need to vary temporally (for short-term exposure studies) and spatially (for long-term exposure studies) with both air pollution concentrations and the health effect of interest, which has not been demonstrated;

[122] *Id.*

[123] *Id.*

and (3) rather than stress acting as a true confounder, more than likely stress is on the causal pathway to the health effects that have been observed to be associated with air pollution. The EPA acknowledges that stress may contribute bias to epidemiological studies; however, stress more than likely would influence the magnitude of individual effect estimates in a single-city or multi-city study and not the trends of positive associations observed across studies conducted in multiple locations."[124]

With regard to the third set of $PM_{2.5}$ health effect comments noted above (suggestions that $PM_{2.5}$ from diesel combustion located in California does not present a public health risk), we note that the isolated studies noted by the commenters are either consistent with past peer-reviewed studies supportive of $PM_{2.5}$-related health effects, or have been considered previously by EPA and were considered as part of the weight of evidence used to make conclusions in the ISA.

Some of the commenters asserted that the composition of PM in California is less toxic than the PM in other areas of the country. One commenter asserted that "[t]he scientific evidence on the health effect of particulate matter air pollution in CA does not support its further control or regulation at this time. Our $PM_{2.5}$ is different in composition and is less toxic than that in many Eastern regions of the U.S."[125] Another commenter states that "[t]he composition of what CARB defines as $PM_{2.5}$ has changed over time, and is not the same as what has been studied in the Eastern half of the United States."[126] EPA responded to questions about heterogeneity in risk estimates in the PM NAAQS Review and that response is included here. EPA finds that no new evidence has been submitted in the context of the authorization proceeding to change this conclusion.

EPA responded in the PM NAAQS review that with respect to understanding the nature and magnitude of $PM_{2.5}$-related risks:

> [T]he EPA agrees that epidemiological studies evaluating health effects associated with long- and short-term $PM_{2.5}$ exposures have reported heterogeneity in responses between cities and effect estimates across geographic regions of the U.S. (U.S. EPA, 2009a, sections 6.2.12.1, 6.3.8.1, 6.5.2, and 7.6.1; U.S. EPA, 2011a, p. 2–25). For example, when focusing on short-term $PM_{2.5}$ exposure, the ISA found that multi-city studies that examined associations with mortality and cardiovascular and respiratory hospital admissions and emergency department visits demonstrated greater cardiovascular effects in the eastern versus the western U.S. (Dominici, et al., 2006a; Bell et al., 2008; Franklin et al. (2007, 2008)). However, the rationale that heterogeneity in risk estimates presents a potential bias as posed by the commenters is simplistic and does not account for a number of factors that have been shown to influence city-specific risk estimates in epidemiologic studies. As discussed in the ISA, the EPA recognizes that there are compositional differences in $PM_{2.5}$ across the country and that the county-level air quality data used in epidemiological studies may result in exposure error, which could in part account for variability in city-specific risk estimates (U.S. EPA, 2009a, section 2.3.2).
>
> There are a limited number of studies that evaluated regional heterogeneity in the association between long-term exposure to $PM_{2.5}$ and mortality. Krewski et al. (2009a) conducted subset analyses of the ACS cohort in Los Angeles, CA and New York City, NY, and observed a relative risk in Los Angeles that was greater in magnitude than what was observed in the full ACS cohort, while the relative risk in New York City was less than what was observed in the full ACS cohort. These observations are likely due to the greater spatial heterogeneity in $PM_{2.5}$ concentrations observed in Los Angeles, and the overall spatial homogeneity of $PM_{2.5}$ concentrations in New York City.
>
> In another retrospective cohort, Zeger et al. (2008) observed associations between long term exposure to $PM_{2.5}$ and mortality for the eastern and central ZIP codes that were similar to those reported in the ACS and Harvard Six Cities studies, though no association was observed in the western region. The lack of the association in the western region is "largely because the Los Angeles basin counties (California) have higher PM levels than other West Coast urban centers, but not higher adjusted mortality rates" (Zeger et al. 2008). The ISA also evaluated studies that provided some evidence for seasonal differences in $PM_{2.5}$ risk estimates, specifically in the northeast. The ISA found evidence indicating that individuals may be at greater risk of dying from higher exposures to $PM_{2.5}$ in the warmer months, and at greater risk of $PM_{2.5}$ associated hospitalization for cardiovascular and respiratory diseases during colder months of the year. The limited influence of seasonality on PM risk estimates in other regions of the U.S. may be due to a number of factors including varying PM composition by season, exposure misclassification due to regional tendencies to spend more or less time outdoors and air conditioning usage, and the prevalence of infectious diseases during the winter months (U.S. EPA, 2009a, p. 3–182).
>
> Overall, the EPA recognizes that uncertainties still remain regarding various factors that contribute to heterogeneity observed in epidemiological studies (77 FR 38909/3). Nonetheless, the EPA recognizes that this heterogeneity could be attributed, at least in part, to differences in $PM_{2.5}$ composition across the U.S., as well as to exposure differences that vary regionally such as personal activity patterns, microenvironmental characteristics, and the spatial variability of $PM_{2.5}$ concentrations in urban areas (U.S. EPA, 2009a, section 2.3.2; 77 FR 38910).
>
> As recognized in the PA, the current epidemiological evidence and the limited amount of city-specific speciated $PM_{2.5}$ data does not allow conclusions to be drawn that specifically differentiate effects of PM in different locations (U.S. EPA, 2011a, p. 2–25). Furthermore, as discussed in section III.E.1 of the preamble to the final rule, the ISA concluded, "that many constituents of $PM_{2.5}$ can be linked with multiple health effects, and the evidence is not yet sufficient to allow differentiation of those constituents or sources that are more closely related to specific health outcomes" (U.S. EPA, 2009a, p. 2–17). CASAC thoroughly reviewed the EPA's presentation of the scientific evidence indicating heterogeneity in $PM_{2.5}$ effect estimates in epidemiological studies and concurred with the overall conclusions presented in the ISA (Pages 6–179–180, Figure 6–25, Figure 6–26).[127]

In the PM ISA EPA has also stated:

> Additionally it is important to point out that there are a few CA-specific time-series studies conducted by Ostro et al. that did find associations with $PM_{2.5}$. These are discussed in the ISA $PM_{2.5}$-Mortality Associations on a Regional Scale: California. Ostro et al. (2006, 087991) examined associations between $PM_{2.5}$ and daily mortality in nine heavily populated California counties (Contra Costa, Fresno, Kern, Los Angeles, Orange, Riverside, Sacramento, San Diego, and Santa Clara) using data from 1999 through 2002. The authors used a two-stage model to examine all-cause, respiratory, cardiovascular, ischemic heart disease, and diabetes mortality individually and by potential effect modifier (i.e., age, gender, race, ethnicity, and education level). The a priori exposure periods examined included the average of 0- and 1-day lags (lag 0–1) and the 2-day lag (lag 2). The authors selected these non-overlapping lags (i.e., rather than selecting lag 1 as the single-day lag) because previous studies have reported stronger associations at lags of 1 or 2 days or with cumulative exposure over three days. It is unclear why the investigators chose these non-overlapping lags (i.e., single-day lag of 2 instead of 1) even though they state they based the selection of their lag days on results presented in previous studies, which found the strongest association for PM lagged 1 or 2 days. Using the average of 0- and 1-day lags Ostro et al. (2006, 087991) reported combined estimates of: 0.6% (95% CI: 0.2–1.0), 0.6% (95% CI: 0.0–1.1), 0.3% (95% CI: −0.5 to 1.0), 2.2% (95% CI: 0.6–3.9), and 2.4% (95% CI: 0.6–4.2) for all-cause, cardiovascular, ischemic heart disease, respiratory, and diabetes deaths, respectively, per 10 µg/m^3.

[124] EPA's Response to Comments: *http://www.epa.gov/ttn/naaqs/standards/pm/data/20121214rtc.pdf at II 23–25.*

[125] *See* Dr. Phalen comment.

[126] *See* Dr. Malkan comment.

[127] *See* "Responses to Significant Comments on the 2012 Proposed Rule on the National Ambient Air Quality Standards for Particulate Matter (June 29, 2012; 77 FR 38890). *http://www.epa.gov/ttn/naaqs/standards/pm/data/20121214rtc.pdf* at II–37–II–38.

> . . . Five of the nine counties examined in the Ostro et al. (2006, 087991) analysis contain cities that are among the 2 cities examined in the Franklin et al. (2007, 091257) analysis for the same period, 1999–2002. While the lags used were different between these two studies, both presented $PM_{2.5}$ risk estimates in individual cities or counties (graphically in the Franklin et al. study (2007, 091257); in a table in the Ostro et al. study (2006, 087991)), which allowed for a cursory evaluation of consistency between the two analyses. In Franklin et al. (2007, 091257), $PM_{2.5}$ risk estimates at lag 1 day for the cities Los Angeles and Riverside were slightly negative, whereas Fresno, Sacramento, and San Diego showed positive values above 1% per 10 µg/m3 increase in $PM_{2.5}$. The 2-day lag result presented in Ostro et al. (2006, 087991) is qualitatively consistent, with Los Angeles and Riverside, both of which show slightly negative estimates, while the other 3 locations all show positive, but somewhat smaller estimates, than those reported by Franklin et al. (2007, 091257). The estimates for the average of 0- and 1-day lags for these five counties in Ostro et al. (2006, 087991), which contain cities examined in Franklin et al. (2007, 091257), were all positive. Thus, these two $PM_{2.5}$ studies showed some consistencies in risk estimates even though they used different lag periods and a different definition for the study areas of interest (i.e., counties vs. cities).[128]

Thus, as noted in EPA's PM NAAQS review and the Response to Comments document referenced above, EPA has stated it agrees that epidemiological studies evaluating health effects associated with long- and short-term $PM_{2.5}$ exposures have reported heterogeneity in responses between cities and effect estimates across geographic regions of the United States. However, EPA believes it critical to understand the issue in context and EPA's overall approach in concluding as it did in the ISA, "that many constituents of $PM_{2.5}$ can be linked with multiple health effects, and the evidence is not yet sufficient to allow differentiation of those constituents or sources that are more closely related to specific health outcomes." EPA finds that no new evidence has been submitted in the context of the authorization proceeding to change this conclusion.

With regard to the claims made by Dr. Phalen in comments on this authorization proceeding, Dr. Phalen does not provide any evidence or studies to support the proposition that $PM_{2.5}$ is not only different in composition in California but as a result is less toxic, or present evidence as to the level of reduced toxicity. With regard to Dr. Enstrom's comments regarding differences in PM health risk in California compared to other locations, as discussed above, EPA has previously reviewed Dr. Enstrom's studies and has responded to his comments, as well as others, on this issue. As explained above, EPA has examined the issue of whether $PM_{2.5}$ composition is determinative and found that the scientific evidence is not yet sufficient to allow differentiation of those components or sources that are more closely related to specific health outcomes nor to exclude any component or group of components from the mix of fine particles included in the $PM_{2.5}$ indicator. EPA similarly concluded that current evidence does not allow conclusions to be drawn that differentiate effects of PM in different locations.

With regard to the claims of omissions in EPA's Regulatory Impact Analysis (RIA) for its proposed PM air quality standards, it is necessary to understand that only the peer-reviewed studies cited in the PM ISA (2009) or PM Provisional Science Assessment (2012) were listed in the RIA table. Furthermore, the inclusion or exclusion of a study published after the Provisional Science Assessment would not materially change the large body of scientific evidence indicating an effect of $PM_{2.5}$ exposure on human health.

With regard to the claims based on the Trucker Study noted above, the study does not attempt to examine air pollution-related health effects or provide any measure of air pollution exposure in the cohort examined. The study looked only at mortality rates for certain deaths within the population studied. EPA notes that the Truck Driver study contains a research abstract that plainly states "[t]he absence of disease mortality deserves careful interpretation, and may be due to both a strong healthy worker effect and a short monitoring period."[129] We note that this study did not include an actual close study of air quality and PM exposure levels and otherwise is not of scientific significance. This type of study as well as the other few studies submitted in isolation does not overcome the significant evidence and scientific evidence that has been peer reviewed and found PM to be associated with health effects.

The comments provided do not provide sufficient evidence to meet the authorization opponents' burden of showing that PM emissions in California do not create any risk to public health, particularly given the substantial body of evidence suggesting such a risk. Therefore, even if EPA were to apply the alternative interpretation of section 209(e)(2)((A)(ii) and examine whether CARB has a specific need for its Fleet Requirements, the opponents of the authorization have not met their burden of proof to demonstrate that California no longer continues to have serious air quality issues related to PM and NO_X, that are created by California's underlying compelling and extraordinary conditions. The evidence submitted to the record, in addition to EPA's own PM NAAQS review and the multitude of studies reviewed therein and conclusions of EPA that were peer reviewed by CASAC, continue to demonstrate requisite health effects due to PM exposure and therefore the authorization cannot be denied on this basis.

Finally, EPA notes that CARB's Fleet Requirements are designed not only to reduce PM emissions and public health consequences, as discussed above, but also to address the harmful effects of ozone by reducing emissions of NO_X, as an ozone precursor, from the in-use fleet.[130] There is no evidence in the record to suggest that ozone pollution is not harmful to public health or that CARB's Fleet Requirements are not needed in that context.

In conclusion, even if EPA were to use the alternative approach outlined above—that of reviewing the need for the Fleet Requirements per se to meet compelling and extraordinary conditions in California—EPA finds that the opponents of the authorization have not met their burden of proof. Therefore, even if EPA were to use this alternative approach, we could not deny the authorization on this basis.

c. Additional PM Comments

EPA also received comment from the PLF focused on the recent decision issued by the United States Court of Appeals for the District of Columbia Circuit in *Natural Resources Defense Counsel* v. *EPA*, No 08–1250, January 4, 2013, (*NRDC* v. *EPA*) concerning implementation regulations applicable to the 1997 $PM_{2.5}$ NAAQS. PLF characterizes the court's decision as requiring EPA itself to adopt stringent

[128] *See* EPA–HQ–OAR–2008–0691–0318-attachment 3 and *http://yosemite.epa.gov/sab/sabproduct.nsf/368203f97a15308a852574ba005bbd01/8bee96ad3228eabe85257604 00702786!OpenDocument* at 6–179.

[129] CCTA; "Mortality Among Members of a Truck Driver Trade Associations" AAOHN Journal Vol. 58. No. 11, 2010 at 473.

[130] *See* CARB Authorization Request at 4 ("Even as amended to provide immediate short-term relief to fleets adversely impacted by the recession, the In-Use Off-Road Regulation is expected to achieve a 17 percent reduction in NO_X emissions and a 21 percent reduction in $PM_{2.5}$ emissions in 2023 from forecasted emissions that would exist without a regulation in place.").

federal implementation standards for $PM_{2.5}$ throughout the nation, including California. Becanse California asserted that it "needs" nonroad diesel PM standards that are more stringent than federal nonroad PM standards, and because (in PLF's view) EPA is now required to use the "stringent, action-forcing provisions" of section 188–188(b) of the Clean Air Act as a result of the Decision, PLF maintains that it is appropriate to complete EPA's administrative proceedings on remand (from the decision) for implementation regulations before EPA is able to determine the extent to which there is a "need" for California to have its own $PM_{2.5}$ nonroad diesel standard for engines and vehicles based on "compelling and extraordinary conditions" in California. In addition, PLF highlights EPA's most recent revision of the primary annual NAAQS for $PM_{2.5}$, which lowered the prior standard from 15.0 micrograms per cubic meter to 12.0 micrograms per cubic meter, and the concomitant revision to the Air Quality Index for $PM_{2.5}$. PLF asserts that these events provide additional reasons to question California's "need" for its own $PM_{2.5}$ nonroad diesel standard.

PLF's reliance on *NRDC* v. *EPA* is misplaced. That decision pertains only to EPA's regulations governing how states should address the statutory requirements for attainment plans. It does not require EPA "to move ahead in implementing strict federal $PM_{2.5}$ controls," through its own regulations as opposed to state regulation of $PM_{2.5}$ and $PM_{2.5}$ precursors. The Clean Air Act generally requires states to have state implementation plans (SIPs) that provide for attainment and maintenance of the NAAQS, and nothing in the Court's opinion obviates or supplants that statutory requirement. Further, the *NRDC* v. *EPA* decision will not result in EPA itself issuing new regulatory controls that impose any specific emission reductions requirements on mobile sources. To the extent that PLF is suggesting that EPA itself is now required to regulate any particular sources more stringently, through national standards, such suggestion is incorrect.

To the extent EPA imposes the "more stringent" NAAQS implementation requirements of sections 188 throngh 190 of the Act on the state (rather than the "less stringent" implementation requirements of sections 171 through 179B of the Act), then the state will still be required to adopt its own regulations (e.g. Fleet Requirements) to get necessary emission reductions to attain and maintain the applicable NAAQS.

While this may create somewhat lesser flexibility for states in developing attainment plan measures in the future, it by no means negates their SIP obligations today. The emission reductions from the Fleet Reqnirements take effect at the beginning of 2014, and California has shown that it needs these reductions as part of the suite of control measnres that are necessary for pnrposes of attaining and maintaining the $PM_{2.5}$ and ozone NAAQS expeditiously. Moreover, states still have a great deal of flexibility in designing their emission control program to achieve needed emission reductions, and nothing in the court's opinion in *NRDC* v. *EPA* indicates any attempt by the court to preclude California from using the specific flexibility provided by section 209(e)(2)(A) to reduce emissions throngh regulation of nonroad engines. Such emission reductions have been instrnmental in California's strategy to meet its NAAQS requirements.

With respect to the revisions to the primary annual $PM_{2.5}$ NAAQS issued in December of 2012, the revisions have increased the stringency of the standard. Thus, if anything, the new $PM_{2.5}$ standard will increase California's need to find reductions in emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors from regulated sources, which should only increase the need for such regulations such as the Fleet Requirements.

For the reasons set forth above, EPA believes that nnder the alternative interpretation of the compelling need criterion discussed above, opponents of authorization have not meet their bnrden of demonstrating that California's Fleet Requirements do not have a rational relationship to contributing to amelioration of serious air quality problems in California, including its $PM_{2.5}$ and ozone. Accordingly, commenters' assertions to the contrary provide no basis for denying authorization.

4. Section 209(e)(2)(A)(ii) Conclusion

With respect to the need for California's standards to meet compelling and extraordinary conditions, after an examination of the text of section 209 and the legislative history, EPA again concludes that the best way to interpret this provision is to apply the traditional interpretation. Under this interpretation, EPA can deny authorization under section 209(e)(2)(A)(ii) only if it finds that opponents of authorization have demonstrated that California does not need a separate nonroad program to address compelling and extraordinary conditions. Under this traditional interpretation, EPA cannot find that opponents of the authorization have demonstrated that California does not need its state standards to meet compelling and extraordinary conditions. The opponents of the waiver have not adequately demonstrated that California no longer has a need for its nonroad emissions program.

Even if EPA were to apply the alternative interpretation advocated by commenters—that EPA is required to review, on a case by case basis, whether the specific standard submitted by CARB is needed to meet compelling and extraordinary conditions—EPA cannot find that the opponents of the waiver have demonstrated that California does not need its Fleet Requirements to meet compelling and extraordinary conditions.

Accordingly, EPA has determined that it cannot deny the authorization request under section 209(e)(2)(A)(ii).

C. Consistency with Section 209 of the Clean Air Act

Section 209(e)(2)(A)(iii) of the Act instructs that EPA cannot grant an authorization if California's standards and enforcement procedures are not consistent with "this section." As described above, EPA's section 209(e) rule states that the Administrator shall not grant authorization to California if she finds (among other tests) that the "California standards and accompanying enforcement procedures are not consistent with section 209." EPA has interpreted the requirement to mean that California standards and accompanying enforcement procedures must be consistent with at least section 209(a), section 209(e)(1), and section 209(b)(1)(C), as EPA has interpreted this last subsection in the context of motor vehicle waivers.[131] Thus, this can be viewed as a three-pronged test.

1. Consistency with Section 209(a)

Section 209(a) of the Clean Air Act prohibits states or any political subdivisions of states from setting emission standards for new motor vehicles or new motor vehicle engines. Section 209(a) is modified in turn by section 209(b) which allows California to set such standards if other statutory requirements are met. To find a standard to be inconsistent with section 209(a) for purposes of section 209(e)(2)(A)(iii), EPA must find that the standard in question actually regulates new motor vehicles or new motor vehicle engines.

In its authorization request, CARB stated that by definition, the section

[131] *See* 59 FR 36969 (July 20, 1994).

209(a) preemption does not apply to vehicles covered by the Fleet Reqnirements because the regulation only applies to non-new, in-use vehicles and engines aud not to new motor vehicles and engines. CARB also stated that with a few limited exceptions—workover rigs, two-engine cranes, and certain other two-engine vehicles—vehicles covered under the Fleets Requirements are not motor vehicles under the Clean Air Act definition of motor vehicles.[132] No commenter argued the contrary or otherwise asserted that the Fleet Requirements are not consistent with section 209(a).

Therefore, EPA cannot deny California's request on the basis that California's Fleet Requirements are not consistent with section 209(a).

2. Consistency with Section 209(e)(1)

To be consistent with section 209(e)(1) of the Cleau Air Act, California's standards or other requirements relating to the control of emissions must not relate to new engines which are used in farm or construction equipment or vehicles and which are smaller than 175 horsepower (hp), aud new locomotives or new engines used in locomotives.

In its Authorization Request, CARB stated that the Fleet Requiremeuts specifically "do not apply to locomotives and do not apply to new farm and construction vehicles and equipment less than 175 hp."[133] CARB notes that "implements of husbandry, regardless of engine size, are expressly excluded from coverage." While CARB acknowledged that nonroad construction vehicles and engines used in such vehicles are covered by the Fleets Requirements, CARB stated that the regulation does not apply to uew construction vehicles or engines.

CARB stated that the Fleet Requirements do not attempt to regulate new construction sources covered by the section 209(e)(1) preemption. New, as it applies to nonroad engines and equipment other than locomotives and engine used in locomotives, means engines and equipment whose legal title has not been transferred to an ultimate purchaser, or in certain cases, to engines or vehicles that have been placed into service.[134] The Fleet Requirements do not regulate engines and vehicles immediately after their titles are transferred or they enter service; instead, the regulation exempts any vehicle that is less than ten years old from the BACT requirements. CARB states that while a fleet owner may elect to comply with the fleet average or BACT requirements by purchasing or repowering a vehicle primarily used in construction with a new nonroad engine under 175 hp, that outcome also does not run afoul of the 209(e)(1) preemption. CARB notes that this new engine is only required to be certified to the existing federal nonroad emission standards.[135] Therefore, the Fleet Requirements do not establish standards for such new engines.

EPA received comment from ARTBA suggesting that CARB's regulations rum afoul of section 209(e)(1)'s preemption for "new engines which are used in construction equipment or vehicles or farm equipment or vehicles and which are smaller than 175 horsepower." ARTBA argues that section 209(e)(1)'s limitation on state standards or emission-related requirements for these engine/equipment categories lasts throughout the useful life of the equipment.[136] ARTBA stated in comment that under this interpretation, California's authorization request should be denied because the Fleet Requirements apply to all in-use off-road diesel construction equipment greater than 25 HP, including equipment in the permanently preempted power range. ARTBA did not provide any further explanation in its written comments or at the public hearing as to why this permanent preemption of certain types of "new" vehicles should be interpreted as extending throughout the useful life of the vehicles.

CARB, in response to comments made by ARTBA at EPA's public hearing, noted that the contention that the preemption under section 209(e)(1) extends throughout the useful life of the new engine is simply wrong. CARB noted that EPA considered and rejected this extended definition of "new" in section 209(e)(1) during the 209(e) rulemaking process.[137] CARB also noted in its Authorization Request that the Court of Appeals in *Engine Manufacturers Association* v. *EPA (EMA)*, affirmed EPA's definition of "new" as it is applied to off-road sources other than locomotives.[138] In *EMA*, the court discussed the issue of whether EPA's definition of new nonroad engines would effectively undermine the section 209(e)(1) preemption that states are prohihited from adopting emission standards for new farm and construction vehicles with less than 175 hp. CARB noted that the court concluded that EPA's definition of new did not undermine the preemption in 209(e)(1).[139]

CARB also notes the more recent history on this issue. In a 2002 petition to EPA, ARTBA requested that EPA revise its regulations such that nonroad engines in the categories covered under section 209(e)(1) are preempted for their useful lives. EPA denied ARTBA's reqnest,[140] and subsequently the United States Court of Appeals for the District of Columbia dismissed ARTBA's petition for review of that denial.[141]

At the outset, we note that no commenter disputes CARB's assertion that its regulations do not violate section 209(e)(1) as EPA's current regulations implement that provision. Rather, ARTBA's comments appear to go to the validity of EPA's longstanding regnlations, as opposed to the validity of California standards currently being reviewed under those regulations. As such, EPA believes ARTBA's comments are peripheral to this proceeding. EPA is not reviewing its authorization regulations in this proceeding, but is instead reviewing the validity of California's Fleet Requirements under those regulations.

In any event, EPA fully considered the scope of preemption issue (the definition of "new") during its 1994 rulemaking which implemented the provisions of section 209(e). The rationale contained in that rulemaking was affirmed by the Court of Appeals in *EMA*.[142] As CARB uotes, EPA fully reviewed its rationale regarding the definition of "new" in the context of ARTBA's earlier petition to reconsider its regulations and EPA denied the petition. No information or argument

[132] CARB Authorization Request. CARB noted that these limited exceptions are provided to afford fleet operators of such vehicles additional flexibility to address both the in-use on-highway requirements associated with the engines designed to propel the equipment and the nonroad engines on the vehicles designed to perform other functions. Since the regulation of such non-new (in use) on-highway vehicles (and the engines designed to propel such vehicles) is not preempted under section 209(a) CARB did not seek a waiver under section 209(b) and instead only sought an authorization under section 209(e) for the in use nonroad engines associated with such on-highway vehicles.

[133] *Id* at 20.

[134] *See* 40 CFR § 1074.5.

[135] CARB's regulations establishing new emission standards for engines less than 175 hp specifically do not cover engines that are primarily used in farm and construction vehicles and equipment.

[136] *See* Hearing Transcript at 51–52, and ARTBA at 2.

[137] 59 FR 31306, 31328–31 (June 17, 1994).

[138] *EMA* 88 F3d 1075, 1082–1086 (D.C. Cir. 1996).

[139] A more recent opinion in the Court of Appeals for the Ninth Circuit agreed with the D.C. Circuit's decision on this issue. *National Association of Home Builders* v. *San Joaquin UAPCD*, 627 F. 3d 730 (9th Cir. 2010).

[140] 73 FR 59034, 59130 (October 8, 2008).

[141] *ARTBA* v. *EPA*, 558 F.3d 1109 (D.C. Cir. 2009), certiorari denied 131 S.Ct. 338, 178 L.Ed.2d 38. A more recent opinion from the Court of Appeals for the D.C. Circuit came to the same conclusion. *ARTBA* v. *EPA*, 705 F.3d 453 (D.C. Cir. 2013)

[142] *EMA*, 88 F3d 1075, (D.C. Cir. 1996).

has been submitted to the record of this proceeding to rebut EPA's interpretation. ARTBA provides no new information or argument in the record of this proceeding to suggest that EPA should change its longstanding interpretation of "new" in section 209(e), [143] and as stated above, EPA is not in any case reviewing its regulations in the context of this proceeding. Moreover, ARTBA does not make any factual argument regarding the consistency with section 209(e)(1) of the particular regulations for which CARB is requesting authorization, even under ARTBA's own definition.

In light of the lack of information in the record, and giving due consideration to the burden of proof being on the opponents of the waiver, EPA cannot make a finding that CARB's Fleet Requirements are inconsistent with section 209(e)(1)(i). Therefore, EPA cannot deny CARB's authorization reqnest on this basis.

3. Consistency With Section 209(h)(1)(C)

The requirement that California's standards be consistent with section 209(b)(1)(C) of the Clean Air Act effectively requires consistency with section 202(a) of the Act. To determine this consistency, EPA has applied to California nonroad standards the same test it has used previously for California motor vehicle standards; namely, state standards are inconsistent with section 202(a) of the Act if there is inadequate lead-time to permit the development of technology necessary to meet those requirements, giving appropriate consideration to the cost of compliance within that timeframe. California's accompanying enforcement procedures would also be inconsistent with section 202(a) if federal and California test procedures conflicted. The scope of EPA's review of whether California's action is consistent with section 202(a) is narrow. The determination is limited to whether those opposed to the authorization or waiver have met their burden of establishing that California's standards are technologically infeasible, or that California's test procedures impose reqnirements inconsistent with the federal test procedures.[144]

EPA does not believe that there is any reason to review these criteria any differently for EPA's evaluation of California's Fleet Requirements. There is nothing inherently different about how the Fleet Requirement control technologies should be reviewed when making a determination about technological feasibility or consistency of text procedures.

a. Technological Feasibility

The legislative history of section 209 (including the "consistency with section 202(a) requirement in 209(b)((1)(C)) indicates that this provision is intended to relate to technological feasibility.[145] Section 202(a)(2) states, iu relevant part, that any regulation promulgated under its authority "shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." Section 202(a) thus requires the Administrator to first determine whether adequate technology already exists; or if it does not, whether there is adequate time to develop and apply the technology before the standards go into effect. The latter scenario also requires the Administrator to decide whether the cost of developing and applying the technology within that time is feasible. Previous EPA waivers are in accord with this position.[146] For example, EPA in a 1976 waiver decision considered California's standards and enforcement procedures to be consistent with section 202(a) because adequate technology existed as well as adequate lead-time to implement that technology.[147] The legislative history of the 1977 amendments to the Clean Air Act iudicates Congress' view that, generally, EPA's construction of the waiver provision had been consistent with congressional intent.[148]

EPA also evaluates CARB's request in light of congressional intent regarding the waiver program generally. This is consistent with the motivation behind section 209(b)—to foster California's role as a laboratory for motor vehicle emission control, in order "to continue the national benefits that might flow from allowing California to continue to act as a pioneer in this field." [149] For these reasons, EPA believes that California must be given substantial deference to adopt not only new motor vehicle emission standards, but to adopt new and in-use nonroad emission standards which may require new and/ or improved technology. This deference was discussed in an early waiver decision when EPA approved the waiver request for California's 1977 model year standards:

> Even on this issue of technological feasibility I would feel constrained to approve a California approach to the problem which I might feel unable to adopt at the Federal level in my own capacity as a regulator. The whole approach to the Clean Air Act is to force the development of new types of emission control technology where that is needed by compelling the industry to 'catch up' to some degree with newly promulgated standards. Such an approach to automotive emission control might be attended with costs, in the shape of reduced product offering, or price and fuel economy penalties, and by risks that a wider number of vehicle classes may not be able to complete their development work in time. Since a balancing of these risks and costs against the potential benefits from reduced emissions is a central policy decision for any regulatory agency, under the statutory scheme outlined above I believe I am required to give very substantial deference to California's judgment on that score.[150]

In *MEMA I,* the court addressed the cost of compliance relative to technological feasibility issue at some length in reviewing a waiver decision. According to the court:

> Section 202's cost of compliance concern, juxtaposed as it is with the requirement that the Administrator provide the requisite lead time to allow technological developments, refers to the economic costs of motor vehicle emission standards and accompanying enforcement procedures. *See* S. Rep. No. 192, 89th Cong., 1st Sass. 5–8 (1965); H.R. Rep. No. 728 90th Cong., 1st Sass. 23 (1967), *reprinted in* U.S. Code Cong. & Admin. News 1967, p. 1938. It relates to the timing of a particular emission control regulation rather than to its social implications. Congress wanted to avoid undue economic disruption in the automotive manufacturing industry and also sought to avoid *doubling or tripling* the cost of motor vehicles to purchasers. It, therefore, requires that the emission control regulations be technologically feasible within economic parameters. Therein lies the intent of the cost of compliance requirement (emphasis added).[151]

[143] ARTBA had previously, though not in this proceeding, provided a fuller explanation of its view regarding the interpretation of 209(e)(1) and we have previously responded that ARTBA's arguments were not persuasive. *See* 73 FR 59034, 59130 (October 8, 2008). The U.S. Court of Appeals for the District of Columbia subsequently dismissed ARTBA's petition for review of EPA's response. *ARTBA* v. *EPA* (2009 D.C. Cir. (588 F.3d 1109, rehearing en banc denied (March 5, 2010), certiorari denied 131 S.Ct. 388, 178 L.Ed2d 38. ARTBA has not made similar or other arguments in this proceeding beyond an unsupported statement regarding bow it interprets the length of the preemption, and we do not address that issue in depth here, except to say that ARTBA makes no attempt to support its assertion.

[144] *MEMA I,* 627 F.2d at 1126.

[145] H.R. Rep. No. 95–294, 95th Cong., 1st Sess. 301 (1977).

[146] *See, e.g.,* 49 FR 1887, 1895 (May 3, 1984); 43 FR 32182, 32183 (July 25, 1978); 41 FR 44209, 44213 (October 7, 1976).

[147] 41 FR 44209 (October 7, 1976).

[148] H.R. Rep. No. 95–294, 95th Cong., 1st Sess. 301 (1977).

[149] 40 FR 23102, 23103 (waiver decision citing views of Congressman Moss and Senator Murphy) (May 28, 1975).

[150] *Id.* at 23103.

[151] *MEMA I* at 1118 (emphasis added). *See also id.* at 1114 n. 40 ([T]he 'cost of compliance' criterion relates to the timing of standards and procedures.

Previous waiver decisions are fully consistent with *MEMA I,* which indicates that the cost of compliance must reach a very high level before the EPA can deny a waiver. Therefore, past decisions indicate that the costs must be excessive to find that California's standards are inconsistent with section 202(a).[152] It should be noted that, as with other issues related to the determination of consistency with section 202(a), the hurden of proof regarding the cost issue falls upon the opponents of the grant of the waiver.

Consistent with *MEMA I,* the Agency has evaluated costs in the waiver and authorization context by looking at the actual cost of compliance in the time provided by the regulation, not the regulation's cost-effectiveness. The appropriate level of cost-effectiveness for any given California regulation is a policy decision that state regulators must consider in adopting the regnlation. EPA, historically, has deferred to these policy decisions. EPA has stated in this regard, "the law makes it clear that the waiver request cannot be denied unless the specific findings designated in the statute can be made. The issue of whether a proposed California requirement is likely to result in only marginal improvement in air quality not commensurate with its cost or is otherwise an arguably unwise exercise of regulatory power is not legally pertinent to my decision under section 209 * * *." [153] Thus, although EPA may evaluate whether compliance costs to manufacturers (or in this case, fleet operators) are so excessive as to implicate the regulation's technological feasibility, EPA does not look at cost-effectiveness when making a waiver decision.

In evaluating the Fleet Requirements' consistency with section 202(a), EPA finds that CARB provided a series of flexibilities in order to address concerns expressed by some about cost and cost-effectiveness. CARB, in its Authorization Request, notes that section 2449.1 of its 2010 amendments, requires all fleets to comply with annual fleet average emission targets or, alternatively, meet the annual BACT requirements for specified percentages of the fleet. The fleet average targets, CARB states, have been set to progressively become more stringent over the years to ensure that fleets modernize to achieve the necessary emission reductions for California to meet the federal NAAQS for NO_X and $PM_{2.5}$ and to meet its 2020 goal set forth in CARB's 2000 Diesel Risk Reduction Plan.[154]

CARB notes that to meet the fleet average targets or the alternative BACT requirements, a large or medium fleet may comply by using a variety of different strategies, including: replacing the engines in existing vehicles with cleaner engines, purchasing newer vehicles with cleaner engines to replace older, higher emitting vehicles, retiring vehicles from service, designating vehicles as permanent low use, or retrofitting engines with verified diesel emission control strategies (VDECS). Compliance with the amended regulation will require most large and medium fleets to phase-out use of Tier 0 and Tier 1 engines through replacement or repowering of vehicles, but CARB also notes that fleets will be able to meet the fleet average targets by replacing such vehicles and engines with a comhination of higher-tiered engines. Therefore, it is not until 2018 that the regulation actually requires large and medium fleets to replace vehicles and engines with only Tier 3 and 4 engines.

CARB states that by 2018, Tier 3 engines will have been available for at least ten years, Interim Tier 4 engines for at least seven years, and Tier 4 engines for at least three years. In addition, CARB notes that the Fleet Requirements provide relief to fleets if there is a delay in the availability of vehicles that would be required to use Tier 3, Tier 4 interim, or final Tier 4 emission standards. Therefore, CARB notes, it is anticipated that large and medium fleet owners with high natural turnover of vehicles will be able to meet the fleet average targets through normal replacement and repowering of vehicles. Fleets may also choose to meet the BACT fleet average requirements by either installing retrofits, or by modernizing the fleet by turning over older, dirtier engines and vehicles to newer (not necessarily new) and cleaner models; by retiring older vehicles or designating them as low use; or by using the other exemptions, compliance extensions, and credit provisions. Additionally, CARB explains that the 2010 amendments provide even further flexibility and relief for the smaller fleets, including, but not limited to, an additional five year delay iu the implementation date (2019) of the fleet average targets beyond that applicable to large fleets, a variety of exemptions from the BACT requirements including an exemption if the vehicle is less than ten years old, or if the vehicle has already heen retrofitted with a level 2 or 3 VDECS that was the highest level PM VDECS at the time of installation, etc. The 2010 amendments also included a new compliance path for small fleets whereby such fleets could comply by phasing out their Tier 0 and Tier 1 vehicles between 2019 and 2029—and if they meet such compliance targets for a specific year then no other compliance requirements would apply.

EPA received multiple comments regarding the cost of the CARB Fleet Requirements. The comments address both the cost to fleet operators and cost-effectiveness of the regulations. Almost all of the comments argue that authorization should be denied because of the high compliance costs for fleet operators. The comments claim that these costs are excessive for an industry characterized by small, independent companies, and they claim that many will be forced out of business by the cost of compliance with the Fleet Requirements. EPA also received comments on other aspects of technological feasibility including technology availability and safety issues. A detailed discussion of these comments is presented below.

EPA received comment from a variety of contractors and associations claiming that while the nation and California continue to experience a sluggish economic recovery, employment in the construction sector has continued to decline. As a result, these commenters argue, the market is less prepared to handle the Fleet Requirements than even before the 2010 amendments.

EPA also received a variety of comments stating that the Fleet Requirements require the use of new equipment that might not be available for purchase until 2014 or later. In this coutext, one commenter noted that, where technology is available, a sudden increase in demand could cause supplies to be exhausted and that contractors may he barred from their work if they are not able to make necessary purchases. As such, the commenter argues that CARB must allow technology to catch up to the point that compliant equipment is broadly available. The comment states that without a period for technology to catch up, contractors will be unable to meet the Fleet Requirements, triggering negative impacts on California's infrastructure rebuilding efforts, the health of the state's construction industry, and its overall economy.

[152] *See, e.g.* 47FR 7306, 7309 (Feb. 18, 1982), 43 FR 25735 (June 14, 1978), and 78 FR 2112, 2134 (Jan. 9, 2013).

[153] 36 FR 17158 (August 31, 1971). *See also* 40 FR 23102, 23104; 58 FR 4166 (January 7, 1993), LEV Waiver Decision Document at 20.

[154] CARB Authorization Request at 21. CARB notes that meeting the 2020 target would reduce diesel PM from all diesel sources by 85 percent from the 2000 baseline and would prevent thousands of premature deaths and medical infirmities.

Similarly, EPA received comment that the eventual elimination of Tier 0 and Tier 1 equipment has significantly diminished the resale value of such equipment and, combined with the recession in California, has forced the sale of this older eqnipment to out-of-state contractors. The commenter claims that this has caused a reduction in the size of the fleet and has probably eliminated up to 15,000 jobs in California and has also diminished the bonding capacity of contractors (equipment is used as collateral) and severely limited the size and number of constrnction projects which a contractor could undertake.

EPA also received a number of comments suggesting that the larger fleet companies may fare better than the smaller companies in terms of compliance with the Fleet Requirements. One commenter noted that larger companies have already begun the process of repowering or retrofitting their equipment: however the smaller companies (less than 10 employees) will be severely hampered by the costs of repowering or retrofitting equipment that, in some cases, is the sole asset of their family-owned businesses. Commenters asserted that many of these smaller companies do not have the resources or access to capital to repower or retrofit their engines and may he forced to park the equipment. Due to the annual emission reduction targets required by the Fleet Requirements, these commenters argue, many contractors will be required to first repower or retrofit an engine, only to have to turn around a few years later and replace the entire piece of equipment when the technology to do the job right finally hits the marketplace.

Another commenter maintains that the ongoing economic recession in conjunction with CARB's "draconian set of diesel regulations that denies normal industry replacement cycles" has placed many businesses in a "catch-22" situation.[155] Many businesses face having to replace and/or modify both on-road and off-road diesel powered equipment, yet the net effect of CARB's regulations has been to devalue their current equipment to the point they have lost eqnity necessary to secure finaucing. To the extent they may secure financing, the comment states, many could not secure enough work to satisfy a mortgage obligation.

EPA also received comment stating that regardless of whether EPA reconsiders its "case-by-case" implementation of section 209 waivers by revisiting what it means for California to need this regulation to meet its air quality goals,[156] the Fleet Requirements still suffer from gross inefficiencies, amortized over a smaller-than-expected market, for smaller-than-expected gains which should defeat the authorization as inconsistent with section 202(a), including technological feasibility, the cost of compliance, safety, aud lead time.

EPA received a variety of comments concerning the reliability and safety of diesel retrofits. One commenter noted that the California Occnpational Health and Safety Board has established safety standards for installation and operation of the retrofits.[157] Another commenter noted that attempts to meet emission levels by using filtering equipment have failed—to the extent that the 2010 amendinents eliminated the retrofit requirement altogether and made diesel particulate filters (DPFs) voluntary only, due to limitations in safety, reliability, and functionality.[158]

In addition to the concerns about retrofits noted ahove, EPA also received comment questioning whether EPA's regulation for replacement engines has eliminated fleets' ability to choose engine replacement or repower compliance strategies, which the commenter claimed to be the only cost effective means to achieve the fleet average emission standards. This commenter noted that one compliance option is to replace equipment with the uewest equipment available but that this is impractical for most contractors due to the cost of new equipment. For example, a new scraper or bulldozer can cost over $1,000,000. The second optiou is to repower an older machine with a new engine (replacing a Tier 0 engine with a Tier 3 engine with a cost of $150,000 or more). The commenter suggested this second option is far more practical as the equipment is designed to last for 30 years or more. The commenter contends that EPA's replacement engine regulation at 40 CFR 1068.240 prohibits the repowering of a machine unless the engine has "prematurely failed." This roadblock makes compliance impossible according to the commenter.[159]

EPA also received comment stating that attempts to repower or replace existing older engines with newer, cleaner technology have encountered the practical issue of compatibility. "The new engines either don't fit the old chassis, or require additional alterations or replacement of other systems (such as cooling units) in the old unit. Thus, cost-effectiveness of modifying such older units becomes problematical." [160] This commenter does not note the availability of retrofit, but instead noted that the alternative to repower is retirement and replacement.

Finally, EPA received a number of comments suggesting that the Fleet Requirements are generally not cost-effective, given the makeup of the current fleet.

EPA received comment in favor of CARB's Authorization Request from the Manufacturers of Emission Control Association (MECA), which supported CARB's original 2007 rule, and contiuues to support the current rnle while requesting that EPA grant this authorization. MECA contends that a number of advanced emission control technologies already exist with the capability to significantly reduce PM and NO_X emissions from the engines subject to CARB's regulation, and that over 250,000 systems (retrofits) have been installed on off-road engines worldwide. MECA also disputes safety concerns surrounding these systems, citing statistics that 35,000 diesel particulate filters have been installed in California, with fewer than 15 safety-related issues, all of which "were shown to be attributed to poor engine or device maiutenance, misapplication of devices, or the ignoring of warning alarms by the operator." MECA does not support the implementation delays built into the CARB's 2010 amendmeuts, but nonetheless asks EPA to grant the request.

In response to comments from opponents of the authorization, CARB states that the opponents have not met their burden of showing that the regulation is inconsistent with section 209(b)(1)(C). CARB continues to rely upon the information presented in its Authorization Request and earlier submissions and maintains that California has amply demonstrated that the performance standards of the regulation are technologically feasible in the lead time provided, giving appropriate consideration to costs. CARB states that its position that the feasibility of the performance standards of the regulation are amply demonstrated is consistent with past EPA authorizations for in-use vehicles

[155] California Construction Trucking Association (CCTA).

[156] To the extent that the "need" for the Fleet Requirements to meet California's air quality goals is relevant to EPA's consideration of CARB's authorization request we examine this under the second authorization criterion of section 209(e)(2)(ii) above.

[157] ARTBA and Allfishch Contractors.

[158] United Contractors.

[159] *See* CIACQ.

[160] *See* United Contractors.

and equipment, in which EPA has stated:

> [S]ection 202(a) consistency calls for a limited review of technological feasibility, including analysis of the cost of new technology, if technology does not currently exist. Section 202(a) does not allow EPA to conduct a more searching review of whether the costs are outweighed by the overall benefits of the California regulations.

CARB notes that the costs of the regulation, which was amended for the express purpose of providing fleets with significant economic relief during the recovery from the nation's economic downturn, cannot be characterized as so prohibitive as to render the regnlation infeasible. In fact, CARB notes the 2010 amendments have significantly reduced the costs of compliance for all fleets by reducing the number of specific compliance actions that a fleet must undertake:

> By delaying initial implementation of the regulation, revising target and BACT compliance rates downward, and by providing fleets with greater compliance flexibility (vehicle exemptions, compliance extensions, and special credits), between 2010 and 2015, the costs for large fleets will he reduced by approximately 97 percent, from over $1 billion to approximately $33 million (2010 dollars). Total costs over the life of the off-road regulation would be reduced by approximately 72 percent, which represents a cost savings of over $1.5 billion (2010 dollars). Peak year costs would be postponed from 2013 to 2019 and reduced almost 73 percent, from $542 million to $146 million (2010 dollars).

With the amendments, CARB maintains fleets are in a better position today to effectively pass on the reduced amortized costs of the regnlation to their customers.

CARB references the testimony of AGC at EPA's puhlic hearing which characterized the regulation's cost as reasonable.[161]

CARB also notes, that to the extent that some companies may be more adversely impacted than others, CARB had previously stated in its authorization request:

> The costs to fleets for compliance varies dramatically, depending upon the size of the fleet, the type of vehicles and equipment used by the fleet, the age of the vehicles in the fleet, the fleet's normal fleet replacement practices, and the compliance pathway chosen. Regarding the last variable, fleets have wide discretion on how they choose to comply; which vehicles should be controlled first, should a [verified diesel emission control strategy] VDECS be installed, or should the vehicle or engine be turned over. If turnover is selected, does the fleet choose to rebuild a vehicle's existing engine, report the engine with a newer, cleaner engine, replace the older vehicle with a newer vehicle with a cleaner engine, etc; does the fleet elect to designate a vehicle as low use. Each of these decisions will determine the actual compliance costs for the fleet.

In the context of responding to fleet contractors who may have the financial inability to meet the compliance costs, CARB states that EPA has previously addressed this general issue in a separate proceeding:

> Regarding small businesses, the Owner-Operator Independent Drivers Association (OOIDA) commented that the transport refrigeration units (TRU) air toxic control measure (ATCM) places a "particularly onerous financial burden on small business truckers" with small fleets (20 or fewer trucks) making np 95% of the industry . . .. EPA believes that the CARB regulations are feasible with respect to cost objectively; i.e., all fleet operators face the same cost per unit to comply. While this cost may have different impacts on fleets of varying sizes, EPA recognizes that it is up to CARB to choose who it will regulate under its standards. Because these TRU engines do emit significant amount of pollution and the cost of compliance are not so large as to render the compliance options objectively out-of-reach, the fact that some operators may have difficnlties with the cost of the program does not make the Program infeasible.

CARB notes that EPA's previous statements regarding feasibility with regard to analyzing cost objectively and CARB's discretion to choose who and how it may regulate under its standards also holds true for its Fleet Requirements. CARB notes that in the context of the Fleet Requirements the technology itself is feasible and has not been questioned; and that the objective costs of the regulation—as conceded by some members of industry—are reasonable.

With regard to ARTBA and other commenters' contention that small companies will be severely affected by the Fleet Requirements becanse of the costs of repowering and retrofitting vehicles and that these companies do not have the resonrces to comply, CARB states that this overlooks the fact that the amended regulations have significantly reduced the costs of compliance and have extended the date of compliance along with a variety of compliance options. CARB notes that the total costs of compliance of the regulation have been reduced by approximately 72 percent. In addition, the compliance costs for smaller fleets are lower than the costs for larger fleets in that small fleets are exempted from having to turnover vehicles to meet the regulation's BACT reqnirements.[162]

CARB also addressed the issue of whether its new engine replacement provisions are inconsistent with EPA's regulations and therefore not a feasible compliance path for fleet operators in California. As CARB notes, and CIAQC's comments maintain, repowering nnder CARB's existing regulatory authority pertaining to new nonroad CI engine regnlations is, in many instances, technologically feasible at a significantly lower cost than replacing an older vehicle with a new one. CARB acknowledges that repowering is not possible in all circumstances but nevertheless is often a cost-effective option for older eqnipment and vehicles. CARB references comment from Altfillisch, as one example, that it has been able to repower at least 71 nonroad vehicles and equipment between 2001 and 2005, years before the Fleet Requirements went into effect.

With respect to whether EPA's replacement engine regulations are inconsistent with CARB's replacement engine regulations, CARB notes that EPA has previously anthorized the CARB nonroad CI emission standards applicable to new engines and eqnipment which inclnded CARB's replacement engine regulations.[163] Therefore California fleet operators are subject to CARB's replacement engine regulations which substitute for EPA's replacement engine provisions in California.[164]

In response to concerns that the Fleet Requirements are not technically feasible due to the unavailability of Tier 4 engines, CARB references its March 1, 2012 Authorization Request wherein it states:

[161] CARB Written Comments at 15, citing to the Hearing Transcript at p. 87. AGC noted that California's construction contractors invested enormous sums in the equipment in the reasonable expectation that they could lawfully operate and use it for the duration of its useful life. AGC also noted, anecdotally, that contractor defaults in 2012 will be higher than in any of the previous three years and thus EPA's review of CARB's most recent amendments is of interest and concern to AGC's members. AGC had requested EPA to delay prior proceedings on California's Fleet Requirements given ongoing announced plans by CARB to revisit at least portions of CARB's rule. AGC had been deeply concerned about the costs and other estimates CARB had made, about the technology that contractors would require to comply, and the lead time provided. AGC noted at EPA's authorization hearing that "reasonable people may disagree about whether the rule merits federal approval, but AGC is not prepared to dispute a resolution that goes either way." "At the time [of the 2010 amendments], from onr members in California [AGC members], . . ., the costs of the amended rule were considered reasonable. We would not have agreed to that package of amendments . . . if they were not considered to be reasonable."

[162] Title 13, CCR, section 2449.1(b)(3)(C).

[163] *See* 75 FR 8056, 8060 (February 23, 2010).

[164] *See* CARB Mail Out # MSC 13–07 (March 11, 2013), *see also* CARB Supplemental Comments.

It is not until 2018 that the regulation requires large and medium fleets to replace vehicles and engines with only Tier 3 and Tier 4 engines. By 2018, Tier 3 engines will have been available for at least ten years, Interim Tier 4 engines for at least 7 years, and Tier 4 engines for at least 3 years. Additionally, the regulation provides relief to fleets if there is a delay in availability of vehicles that would be required to use Tier 3 or Tier 4 Interim of final Tier 4 emission standards.

CARB noted that there is no basis to ARTBA's conjecture regarding Tier 4 engine unavailability during the applicable time frame.[165]

Finally, with respect to the compliance option of VDECS or retrofits, CARB's snpplemental comments clarify that the regulation never required unsafe retrofits to be installed, and retrofit safety is even less of a concern since the regulation, as amended, removes all mandatory installation of VDECS. CARB explains that the regulation, as initially adopted, only required retrofit of a specified percentage of vehicles if the fleet operator could not meet the PM fleet average targets. The amendments have since removed this reqnirement and, in addition, the California Occupational Health Standards Safety Board (OSHSB) has adopted amendments to its construction safety orders (after working with CARB) to ensure that any retrofit will not affect the capacity, structural integrity, or safe performance of the vehicle in which it is installed nor create a risk of fire or operator contact with the exhaust system or impair the vision of the operator. CARB's 2010 amendments to the Fleet Requirements continue to provide that no VDECS are required to be installed if in violation of the amended OSHSB safety order and, as noted above, there is no longer a mandate that a specified percentage of vehicles be retrofitted if the fleet average is not met.[166]

As explained below, EPA agrees with CARB's presentation of how technological feasibility should be evaluated, for purposes of authorization review by EPA, and that CARB has provided ample evidence of the feasibility of the Fleet Requirements overall, and the feasibility with respect to individual compliance options. CARB has presented appropriate evidence of the feasibility and availability of new nonroad CI engines along with appropriate replacement engines and retrofits.

CARB has also properly set forth the role of EPA in reviewing California in-use performance standards which require legacy fleets to achieve challenging emission reductions. EPA is not setting its own standards under section 202(a) of the Clean Air Act, rather EPA's role within its authorization review is more limited and takes place in the context of deference that Congress envisioned for California. This deference was discussed in an early waiver decision when EPA approved the waiver request for California's 1977 model year standards:

> Even on this issue of technological feasibility I would feel constrained to approve a California approach to the problem which I might also feel unable to adopt at the Federal level in my own capacity as a regulator. The whole approach to the Clean Air Act is to force the development of new types of emission control technology where that is needed by compelling the industry to 'catch up' to some degree with newly promulgated standards. Such an approach to automotive emission control might be attended with costs, in the shape of a reduced product offering, or price or fuel economy penalties, and by risks that a wider number of vehicle classes may not be able to complete their development work in time. Since a balancing of these risks and costs against the potential benefits from reduced emissions is a central policy decision for any regulatory agency, under the statutory scheme outlined above I believe I am required to give very substantial deference to California's judgement on that score.[167]

CARB has set forth a series of compliance options to address emissions from its legacy fleet of NR CI engines. Fleet operators may choose from these compliance options. As explained below, EPA does not believe those opposing these regulations have met their burden of showing that the regnlations are not technologically feasible.

Further, while EPA acknowledges the comments it has received that claim that the Fleet Requirements may have significant adverse economic affect on individual fleet operators, the Agency finds no factual basis for determining that the Fleet Requirements are objectively cost prohibitive. To the extent that a balancing of risks attendant with adverse effect on some fleet operators against the benefits of addressing the emission inventory associated with the legacy fleet in California, EPA gives that the same substantial deference (as with past waivers) to California's judgment regarding the balancing of the risks and costs of regulation against the potential benefits from reduced emissions. CARB has gone through several significant rounds of amendments to address in part the economic cost associated with the Fleet Requirements and has afforded the fleet operators a significant number of compliance options and delays in initial compliance in order to objectively address the risks associated with costs.

At the outset, EPA believes it important to note that we agree with CARB's assessment that the Fleet Requirements will be feasible given the technology available today along with the technologies that CARB projects to be available in the lead time provided.

First, several commenters noted their concern that one of the more cost effective compliance options, the replacement of engines or repowering, is precluded as it conflicts with EPA's engine replacement policy at 40 CFR 1068.240. EPA has previously authorized CARB's emission standards applicable to new NR CI engines and the regulations in that authorization included CARB's replacement engine provisions. Therefore, CARB's replacement engine provisions, not EPA's provisions, are the applicable provisions for the purposes of these Fleet Reqnirements. In addition, EPA has recently published a direct final rule and accompanying notice of proposed rulemaking that adopts modifications to the Agency's replacement engine provisions to allow, on a limited basis, the practice of replacing engines with engines that are cleaner, bnt not certified to the most stringent standards, even where the original engines have not failed prematnrely.[168] Therefore, EPA's replacement engine provisions do not prevent use of repowering as a method of complying with CARB's regulations.

Second, with respect to fleet operators choosing to replace their eqnipment with new cleaner vehicles and commenters questioning the availability of snch vehicles (e.g., Tier 3, interim Tier 4, and Tier 4), EPA notes that these standards have already been reviewed by EPA in the context of its own rulemakings, and EPA has found these standards to be feasihle in a timeframe allowing even less lead time than that provided by California. EPA annually certifies new NR CI engines and the certification data to date strongly suggest that engine manufacturers are certifying to meet the newest applicable standards, and tbat these standards are

[165] CARB Written Comments at 17.

[166] *Id.* at 17–18.

[167] 40 FR 23102, 23103 (May 28, 1975); *see also* 78 FR 2112 (January 9, 2013).

[168] *See http://www.epa.gov/otaq/climate/documents/420f13001.pdf*, and *http://www.gpo.gov/fdsys/pkg/FR-2013-06-17/pdf/2013-11980.pdf*. The EPA received adverse comment on a portion of the Direct Final Rule, but no commenter objected to the provision allowing repowering using engines that are not certified to the most stringent standards.

feasible.[169] EPA believes CARB is reasonable in its depiction of cnrrently available emission control technology and with its projection of sufficient lead time being available to ensure that a sufficient supply of newer emission control technologies (meeting newer Tier 3, and interim and final Tier 4 emission standards) is in place to meet the demands of fleet operators. As CARB notes, the comments contending otherwise have not provided any evidence that in 2018 large and medinm-sized fleet operators will not be able to replace vehicles and engines with Tier 3 and Tier 4 engines. In addition, to the extent a fleet operator replaces such vehicles and engines, CARB's Fleet Reqnirements also provide relief to fleets if there is a delay in availability of vehicles that would be reqnired to use Tier 3 or Tier 4 interim or final Tier 4 emission standards. Finally, there is no evidence in the record indicating a shortage of certified engines during the time frame for which they will be needed for this rule, given the flexibilities provided by the amendments. The opponents of the waiver have not met their hurden of proof to demonstrate the lack of commercial availability of appropriate engines to the extent that the regulations would be infeasible.

Third, with respect to the technical feasibility of exhaust retrofits (VDECS) and the safety-related and compatibility concerns expressed by commenters, EPA believes that CARB's 2010 amendments add both the needed flexibility, with respect to not mandating retrofits, and sufficiently clarify when a NR CI vehicle is exempted due to expressed safety concerns. The Fleet Requirements never required unsafe retrofits be installed, and retrofit safety is even less of a concern now that the regulation has been amended to remove all mandatory installation of VDECS, even if fleet average targets are not met.[170] EPA believes that CARB has also appropriately addressed expressed concerns regarding retrofit safety, including referencing the amendments adopted by OSHSB. These amendments, adopted in March 2012, state that a safety order will be provided in order to ensure that a retrofitted VDECS shall not affect the capacity, structural integrity, and safe performance of the vehicle in which it is installed nor create a fire or safety risk or impair the operators' vision.[171] EPA also notes that the CARB staff reviewed retrofit field experience since 2002. Of the 35,000 diesel particulate filters (DPFs) deployed in the state, less than 15 safety-related issues were identified and all of these were shown to be attributed to poor engine or device maintenance, misapplication of devices, or the ignoring of warning alarms by the operator.[172] With regard to the availability of VDECS in general, there is no evidence in the record to refute CARB's view that the Fleet Requirements are likely to continue to increase the demand for retrofits and that CARB's anticipation that an increase in supply will occur as compliance deadlines approach is reasonable. CARB has identified a number of verified Level 3 VDECS and the commenters have not shown that this option does not provide a feasible alternative in many cases to meeting the Fleet Requirements.[173]

EPA also believes it important to note that CARB's fleet average targets have been set so that they progressively become more stringent over the years in order that CARB's emission reductions goals are met while affording fleet operators with necessary flexibility and compliance options. In addition, CARB's four-year delay in compliance (from 2010 to 2014) helps ensure the feasibility of the regulation along with built-in provisions that ensure against noncompliance with the Fleet Requirements due to the unavailability of the highest tiered engines or VDECS. In addition, CARB's BACT credits compliance path includes a number of accommodations (e.g. accrual of credits earned prior to March 1, 2010 may in certain circumstances be applied toward a large fleets' January 1, 2014 compliance deadline; double credits for early installation of VDECS; credit for reduced horsepower of the fleet, etc). There are also a number of exemptions under the BACT requirements applicable to large and medium fleets, and separately for small fleets. For example, vehicles in any size fleet are exempt from the BACT credit requirement calculation if on any given annual compliance date the vehicle is less than ten years old from the date of manufacture, and specialty vehicles are exempt if the fleet has applied BACT to all other vehicles in the fleet and no engine is available to repower the specialty vehicle and instead has the highest level VDECS available installed. In addition, for large and medium fleets, a vehicle is exempt if it had a Level 2 or 3 p.m. VDECS installed within the last six years and for small fleets the vehicle is exempt if has already been retrofitted with a Level 2 or 3 VDECS that was the highest level PM VDECS available at the time of installation. Regarding the claim that the regulations reqnire an initial repower or retrofit and then a replacement of an entire piece of eqnipment shortly thereafter, CARB's 2010 amendments also provide an exemption for vehicles that have had a level 2 or 3 p.m. VDECS installed within the last six years and an exemption for original equipment manufacturer diesel PM equipped vehicles and, with certain limitations, to vehicles that installed highest level VDECS prior to 2013. These further accommodations help assure the feasibility of the Fleet Requirements.

Although certain fleet operators contend that their business will either be severely or irreparably harmed (as reviewed further below), the commenters opposing the authorization have not provided any factual evidence in the record to demonstrate that a mix of available compliance options and flexibilities is not feasible.

EPA believes that CARB has afforded a variety of compliance options (and initial delays of the phase-in periods for compliance) that individual fleet operators can employ in a variety of ways depending on the nature of their business and the composition of their fleets. Accordingly, with regard to the consideration of cost of the Fleet Requirements (inclnding comments that the regulation will diminish the net value of certain fleet operators which will further impair their ability to finance the upgrades necessary to comply with the regulation or to obtain construction bonds), we note at the outset that many factors affect the ability of certain fleet operators to meet the Fleet Requirements. While it is possible that some diminishment in value of certain fleet operator equipment will occur as a result of the Fleet Requirements (while recognizing that CARB has significantly delayed the requirement that such engines be replaced), there is no evidence or data in the record to demonstrate that the loss in value to the fleet operator is the proximate cause of such operations going out of business or that such

[169] *http://www.epa.gov/otaq/certdata.htm#nrci.*

[170] CARB Supplemental Comments at 17–18.

[171] *Id.*

[172] MECA at 4. "Regarding the safe installation of retrofit devices, retrofit manufacturers have shown that off-road retrofits can be installed to comply with the Cal/OSHA retrofit visibility/safety requirements finalized last year. Retrofit manufacturers are using the best engineering judgment and installation practices to ensure the safe installation of devices. In general, retrofit installations in California have had an excellent safety record.

[173] Authorization Request at 24. *See also* EPA's list of currently verified technologies at: *http://www.epa.gov/cleandiesel/verification/verif-list.htm*, and generally: *http://www.epa.gov/cleandiesel/technologies/*.

economic results render the Fleet Requirements infeasible for the broader regulated community. EPA believes that CARB has reasonably responded to concerns expressed about the costs of the Fleet Requirements, including the availability of engine replacements and retrofits. EPA notes that even some commenters otherwise opposed to the authorization have recognized the feasibility of early engine replacement. In addition, there is no evidence in the record to reflect a widespread or significant economic disruption to regulated fleet operators that is proximately caused by the Fleet Requirements.[174]

More importantly, EPA believes that the CARB regulations are feasible with respect to cost objectively; i.e., although fleets are likely to be comprised differently, all fleet operators are nevertheless facing the same cost per unit to comply. While this cost may have different impacts on fleets of varying sizes, EPA recognizes that it is up to CARB to choose who it will regulate under its standards.[175] The fact that some operators may have difficulties with the cost of the program does not make the program infeasible.[176]

In addition, nnder the guidelines of *MEMA I*, EPA believes that it should evaluate costs in authorization requests by looking at the actual costs of compliance in terms of the lead time provided by the regulations, and not at the regulation's cost-effectiveness. It is CARB's responsibility to determine the best way to reduce emissions in its state, and EPA does not reevaluate California's policy decisions in deciding whether to grant authorization, as long as, pursuant to section 209(e), the regulations can be met without making the costs prohibitive. The comments received regarding cost-effectiveness do not show that the costs for fleet operators generally will be prohibitive. California's estimates of the costs of the regulation are reasonable and CARB has rebutted the argument that small fleet operators in general will not be able to meet the requirements.[177] EPA also agrees with CARB's statement that EPA has long deferred to California's policy judgments associated with cost-effectiveness "EPA will not look into the question of cost-effectiveness—that is, whether the overall benefits of the regulation are outweighed by the regulation's costs of compliance." [178] Consequently, based on the record, EPA is unable to make the finding that the Fleet Requiremeuts are not technologically feasible with the available lead time giving consideration to the cost of compliance.

b. Consistency of Certification Procedures

California's standards and accompanying enforcement procedures would also be inconsistent with section 202(a) if the California test procedures were to impose certification requirements inconsistent with the federal certification requirements. Such inconsistency would mean that manufacturers would be unable to meet both the California and federal testing requirements using the same test vehicle or engine.[179] CARB presents that the Fleet Requirements raise no issue regarding incompatibility of California and federal test procedures. "There is no requirement on engine manufacturers or fleet owners to certify engines beyond existing federal and state certification testing for new engines. Additionally, there are no conflicts between federal and California test procedures for verification testing for diesel emission control strategies in that there is no comparable mandatory federal program." [180] EPA received no comments suggesting that CARB's Fleet Requirements pose any test procedure consistency problem. Therefore, based on the record, EPA canuot find that CARB's testing procedures are inconsistent with section 202(a) and cannot deny CARB's request based on this criterion.

D. Additional Issues Raised in Comment

EPA received a series of comments on grounds other than those specified in section 209(e)(2)(A) of the Act. These comments include several administrative concerns including the lack of a public hearing in California and a request to reopen the pnblic comment period (and to stay the issuance of a final EPA decision). We also received a number of comments objecting to the authorization based on other federal law or constitutional claims. As set forth below, EPA has complied with all relevant administrative process reqnirements for this proceeding and none of the comments described above provide any basis for denying CARB's Authorization Request.

1. Request for a Public Hearing in California

EPA received comment during the course of the public comment period associated with EPA's August 12, 2012 **Federal Register** notice requesting that EPA conduct a public hearing or hearings in California in order for those affected by CARB's regulation, the fleet operators, to be directly heard and for those nnable to travel to Washington, DC be afforded the opportunity to express their concerns to EPA.

Section 209(e)(2)(A) states in part that ". . . the Administrator shall, after notice and opportunity for pnblic hearing, authorize California to adopt and enforce standards and other requirements relating to the control of emissions from such nonroad vehicles or engines . . . ." EPA's process for providing an opportunity for public comment on the CARB Fleet Requirements was consistent with the normal process EPA applies in response to this language. EPA has consistently anuounced in the **Federal Register** the opportunity for a public hearing for any authorization request received from CARB. As a general matter EPA has also offered an opportunity for written comment which has opened on the date of the **Federal Register** notice and closed on a date after the public hearing. As part of EPA's public hearings, the presiding officer has consistently stated that the hearing was being conducted in accordance with section 209(e) of the Clean Air Act and that any interested parties have the opportunity to present both oral testimony and written comments. While EPA occasionally has held hearings in California, the vast

[174] Regarding comments that these regulations would stop valuable work to be performed by this industry in California, there is no evidence that this rule has led to the widespread cancelation of projects.

[175] CARB notes that the increased costs, due to the Fleet Requirements, to small fleet operators is on the magnitude of $38,000 for the youngest fleets to $173,000 for the oldest fleets (cite) and such costs have not been countered by opponents of the authorization.

[176] EPA has previously stated that it is up to CARB to choose who it will regulate under its standards, even though such costs may have differing impacts for different fleets. *See* 74 FR 3030 (January 16, 2009), TRU Decision Document at 63.

[177] CARB's Authorization Request at 25. CARB notes that small fleets are expected to be able to fully comply with the regulation if it routinely turns over its vehicles and equipment and meet the emission target rates and have little or no compliance costs associated with the regulation. To the extent normal turnover is insufficient, CARB notes small fleets are expected to comply through installation of VDECS (If a small fleet cannot be retrofitted with a VDECS that vehicle is exempt from the BACT requirements, including turnover), by exercising the special option for fleets with less than 500 total horsepower, designating vehicles as low-use, and by exercising the small fleet vehicle exemptions along various other exemptions, credits, etc.

[178] *Id., citing* 58 FR 4166 (January 7, 1993), Decision Document at 20 ("Since a balancing of these . . . costs against the potential benefits from reduced emissions is a central policy decision [of CARB is adopting the regulation] I believe I am required to give very substantial deference to California's judgments on this score.").

[179] *See, e.g.*, 43 FR 32182 (July 25, 1978).

[180] CARB Authorization Request at 28.

majority of hearings on section 209 proceedings have occurred in Washington, DC. EPA has been conducting its section 209(b) waiver proceedings and section 209(e) authorization proceedings in this manner for decades, and although Congress has amended provisions in section 209 on two separate occasions, Congress has not chosen to alter EPA's administrative requirements.

EPA is guided by the principles of fair public notice and opportuuity for comment. In this instance, EPA published notice of CARB's authorization request in the **Federal Register**, including the Clean Air Act prescribed authorization criteria EPA would review in consideration of CARB's request, and provided more than 30 days of notice before conducting a public hearing. EPA conducted a properly noticed public hearing in Washington, DC which was attended by several trade associations representing numerous members and fleet operators within California.[181] EPA has placed the transcript of the public hearing into the public docket. After the public hearing EPA provided an additional 30 days for interested parties to submit written comment addressing all relevant issues pertaining to California's authorization request. The affected parties have had in their possession the necessary information to adequately comment on whether the Fleet Requirements are technologically feasible as well as CARB's protectiveness determination. Opponents have had access to the necessary information to formulate comments in regard to the second waiver criterion at section 209(e)(2)(A)(ii). All written comments have been placed in the public docket. EPA was responsive to the desire expressed by some commenters to speak directly with representatives to EPA, including the desire to explain the economic impacts the Fleet Requirements may have on their businesses. In response, EPA conducted and made available an informal teleconference phone call for interested parties in California with representatives from EPA.[182] This **Federal Register** notice provides EPA's reasoned response to all oral testimony, written comment, and viewpoints expressed to EPA. All commenters, including opponents of the waiver, have had ample opportunity to comment and meet their applicable burdens of proof. Opponents of CARB's Fleet Requirements and of its authorization request have had ample opportuuity to present their viewpoints duriug the course of CARB's rulemaking and EPA's authorization proceeding. Lastly, as noted above, CARB has engaged in several proceedings and has adopted a series of amendments in response to concerns raised by the regulated parties, including fleet operators.

2. Request for EPA To Reopen the Comment Period

EPA received comment from PLF characterized as a "Notice of New Development and Supplemental Comment" requesting that EPA reopen the comment period associated with the Fleet Requirements authorization request and to hold in abeyance any decision regarding California's authorization request. PLF points to the recent decision issned by the United States Court of Appeals for the District of Colnmbia Circuit in *Natural Resources Defense Counsel* v. *EPA*, No. 08–1250, January 4, 2013, (Decision) for the proposition that the court's decision and CARB's authorization application are inextricably linked. PLF characterizes the Decision as requiring EPA itself to adopt stringent federal implementation standards for $PM_{2.5}$ throughout the nation, including California. Because California asserted that it "needs" $PM_{2.5}$ nonroad diesel standards that are more stringent than federal $PM_{2.5}$ standards, and because EPA is now required to use the "stringent, action-forcing provisions" of section 188–188(b) of the Clean Air Act as a result of the Decision, PLF maintains that it is appropriate to complete EPA's administrative proceedings on remand (from the Decision) before EPA is able to determine the extent to which there is a "need" for California to have its own $PM_{2.5}$ standard based on "compelling and extraordinary conditions" in California. In addition, PLF asserts that EPA's most recent revision of the NAAQS $PM_{2.5}$ primary standard, which lowers the existing level to 12.0 micrograms per cubic meter, and the concomitant revision to the Air Quality Index for $PM_{2.5}$, provides additional reason to question California's "need" for its own $PM_{2.5}$ nonroad diesel standard.[183] EPA responds to the substance of PLF's comments above in our discussion of the second criterion for authorization.

As discussed above, EPA does not agree that the recent decision of the Conrt of Appeals has any significant effect on the second criterion for granting authorization. Moreover, PLF has had a full opportunity to make its argument with regard to this new decision and its potential effect on this authorization determination, and EPA has responded in full to PLF's comments. We therefore believe there is no need for a further reopening of the comment period for this proceeding; nor is there any cause for any delay in issning onr decision with regard to the authorization. Therefore, we deny PLF's reqnest to reopen the authorization comment period and to delay issuing an authorization decision for the Fleet Requirements.

3. Claims Outside the Scope of the Clean Air Act

Airlines for America ("A4A") has provided comment opposing EPA authorization of California's Fleets Regulation. A4A claims that the Fleet Requirements, as they affect airport ground equipment, are preempted hy the Federal Aviation Act and the Airline Deregulation Act. These comments are outside the scope of EPA's scope of review of California authorization requests under section 209(e)(2). As EPA has stated on numerous occasions, EPA's review of California regulations under section 209 is not a broad review of the reasonableness of the regulations or its compatibility with all other laws. Sections 209(b) and 209(e) of the Clean Air Act limit EPA's authority to deny California requests for waivers and authorizations to the three criteria listed therein. As a result, EPA has consistently refrained from denying California's requests for waivers and authorizations based on any other criteria.[184] In instances where the U.S. Court of Appeals has reviewed EPA decisions declining to deny waiver requests based on criteria not found in section 209(b), the Court has upheld and agreed with EPA's determination.[185] A4A's comment raises issnes of federal preemption that are not included within the criteria listed under sections 209(e).[186] Therefore, in considering

[181] As explained in EPA's July 2009 GHG waiver decision, EPA is guided by the language in the Clean Air Act and not the hearing requirements set forth in the Administrative Procedure Act. EPA incorporates that reasoning into today's decision. *See* 74 FR 32744, 32780–32782 (July 8, 2009).

[182] EPA–HQ–OAR–2008–0691–0321.

[183] Although PLF expresses the NAAQS $PM_{2.5}$ primary standard in "micrometers," the correct unit of measure is micrograms.

[184] *See, e.g.*, 74 FR 32744, 32783 (July 8, 2009).

[185] *See Motor and Equipment Manufacturers Ass'n* v. *Nichols*, 142 F.3d 449, 462–63, 466–67 (D.C. Cir.1998), *Motor and Equipment Manufacturers Ass'n* v. *EPA*, 627 F.2d 1095, 1111, 1114–20 (D.C. Cir. 1979).

[186] A4A may raise these issues in a direct challenge to California's regulations in other forums, but these issues are not relevant to EPA's limited review under section 209.

whether to grant authorization for California's Fleet Requirements under section 209(e), EPA cannot deny California's request for authorization based on the issues raised by A4A.

EPA also received comment suggesting that EPA and California must certify CARB's Fleet Requirements as "not having a significant economic impact on a substantial number of small entities" under the Regulatory Flexibility Act (5 U.S.C. 601).[187] EPA notes that CARB's authorization request and EPA's subsequent action do not constitute a rule as defined in the Regulatory Flexibility Act, 5 U.S.C. 601(2), and therefore are not covered by the certification requirement in that statute. EPA's authorization proceedings and actions nnder section 209(e)(2)(A) are informal adjndications. In an authorization proceeding, EPA receives a request from one entity (CARB) that is presenting an existing regulation established as a matter of California law. The request is for an EPA anthorization for that party, so it may adopt and enforce the specific regulations. In deciding this request, EPA interprets and applies the three authorization criteria established by the Act, and under this provision is reqnired to grant the authorization unless EPA makes one of the tbree specified findings. EPA applies the pre-existing law, section 209(e)(2)(A), and EPA's regnlation promulgated therein, to a specific request covering a specific regulation, and applies the three statutory criteria to the facts of the specific request.

The decision to grant or deny the authorization request directly affects the legal rights of the party before EPA, California. If EPA grants the authorization, then CARB may enforce its state regulations. Other parties, for example, the fleet operators, may be indirectly affected because state regulation is no longer preempted. While there may be indirect consequences for various parties, the only decision taken by EPA in the authorization proceeding is the decision that permits the State of California to adopt and enforce its state regulations. As noted above, sections 209(b) and 209(e) of the Clean Air Act limit EPA's authority to deny California requests for waivers and authorizations to the three criteria listed therein. As a result, EPA has consistently refrained from denying California's requests for waivers and authorizations based on any other criteria.[188] Review of California regulations under the Regulatory Flexibility Act is not included within the criteria listed under sections 209(e). Indeed, Congress intended EPA to provide California with substantial deference in making its own decisions regarding the effects of its regulations. Therefore, in considering whether to grant authorization for California's Fleet Requirements under section 209(e), EPA is not required to undertake a review under the Regulatory Flexibility Act and could not deny California's request for authorization based on any such review.

4. Constitutional Claims

EPA received a number of comments suggesting that EPA should deny authorization of the Fleet Requirements because of their potential to impose negative economic impacts on fleets. These comments stated that the regulations would cause emissions control equipment that fleet operators purchased before CARB's regulations took effect to lose its asset value, even though tbe equipment still has a long useful life. The comments suggest that CARB's regulation amounts to a "taking" as defined under the Fifth Amendment to the U.S. Constitution and "appropriate sections of California Constitution and Law." EPA's response to these comments is gnided first by the language in section 209(e)(2)(A) that clearly sets forth the limited criteria or basis by which we may deny an authorization request from CARB. EPA's limited ability to deny an authorization request to the criteria found in section 209(e)(2)(A) of the Act is consistent with case law.[189] Therefore, in considering whether to grant authorization for California's Fleet Requirements under section 209(e), EPA cannot deny California's request for authorization based on constitntional arguments outside the scope of the Clean Air Act. Moreover, such arguments are best directed against California directly in a conrt of law, not to a separate government agency with only a limited authority to review California's regulations.

E. Authorization Determination for California's Fleet Requirements

After a review of the information submitted by CARB and other commenters, EPA finds that those opposing California's request have not met the burden of demonstrating that authorization for California's Fleet Requirements sbould be denied based on any of the statutory criteria of section 209(e)(2)(A). For this reason, EPA finds that an authorization for California's Fleet Requirements should be granted.

IV. Decision

The Administrator has delegated the authority to grant California section 209(e) authorizations to the Assistant Administrator for Air and Radiation. After evaluating California's Fleet Requirements, CARB's submissions, and the public comments received, EPA is granting an autborization to California for its Fleet Requirements.

My decision will indirectly affect not only persons in California, but also entities outside the state who must comply with California's requirements. For this reason, I determine and find that this is a final action of national applicability for purposes of section 307(b)(1) of the Act. Pnrsuant to section 307(b)(1) of the Act, judicial review of this final action may be sought only in the United States Court of Appeals for the District of Columbia Circnit. Petitions for review must be filed by November 19, 2013. Judicial review of this final action may not be obtained in subsequent enforcement proceedings, pursuant to section 307(b)(2) of the Act.

V. Statutory and Executive Order Reviews

As with past authorization and waiver decisions, this action is not a rnle as defined by Executive Order 12866. Therefore, it is exempt from review by the Office of Management and Budget as required for rules and regulations by Executive Order 12866.

In addition, this action is not a rule as defined in the Regulatory Flexibility Act, 5 U.S.C. 601(2). Therefore, EPA has not prepared a supporting regulatory flexibility analysis addressing the impact of this action on small business entities.

Further, the Congressional Review Act, 5 U.S.C. 801, *et seq.*, as added by the Small Business Regulatory Enforcement Fairness Act of 1996, does not apply because this action is not a rule for purposes of 5 U.S.C. 804(3).

Dated: September 13, 2013.

Janet G. McCabe,

Acting Assistant Administrator, Office of Air and Radiation.

[FR Doc. 2013–22930 Filed 9–19–13; 8:45 am]

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[187] Delta Construction, May 12, 2010 comment at 3 (Citing 42 U.S.C. 7410(k) and 40 CFR 52.02(a)).

[188] *See, e.g.* 74 FR 32744, 32783 (July 8, 2009).

[189] *MEMA I.*

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July 25, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: **Noise Impacts** - Comments regarding on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter.

This letter incorporates by reference, as comments on the DSEIR, all of the comments on the DSEIR contained in the July 22, 2015, letter report authored by acoustical engineer Frank Hubach (attached as Exhibit 1).

I. The DSEIR Is Not Sufficient as an Informational Document with Respect to Noise Impacts.

A fundamental defect in the DSEIR's analysis of noise impacts is its use of thresholds of significance that do not actually measure the impacts that matter. This is readily demonstrated by comparing the two impacts that relate to the consistency of the Project with governing noise standards or plans (i.e., Impacts NO-2 (construction) and NO-4 (operations)) with the two impacts that relate to how noise affects people (i.e., Impacts NO-1 (construction) and NO-5 (operations)). Even in its discussion of the impacts that affect people, the DSEIR uses thresholds of significance that conflate compliance with non-CEQA regulatory programs with less-than-significant impacts under CEQA. This is error.

The DSEIR uses several general thresholds of significance for noise impacts:

- Result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

(DSEIR, p. 5.3-16.)

Impact NO-1 is described as "Construction of the proposed project would not cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. (Less than Significant)." (DSEIR 5.3-20.) For construction impacts, the DSEIR uses several more specific thresholds of significance, including:

- Non-impact equipment. The impact is considered less than significant as long as construction noise from non-impact equipment is less than 80dba at 100 feet from the noise generating equipment.[1]

- Impact equipment. The impact is considered less than significant as long as the 1-hour Leq is less than 90 dBA for daytime and 80 dBA for nighttime construction noise exposure at residential uses,

[1] DSEIR, p. 5.3-16 - 5.3-17 ["Proposed construction activities would be required to comply with the San Francisco Noise Ordinance and the Mission Bay Good Neighbor Construction Noise Policy. The San Francisco Noise Ordinance prohibits construction activities between 8:00 p.m. and 7:00 a.m. and limits noise from any individual piece of construction equipment, except impact tools approved by the Department of Public Works, to 80 dBA at 100 feet. The Mission Bay Good Neighbor Construction Noise Policy limits pile driving or other extreme noise generating activity (80 dBA at a distance of 100 feet) to 8:00 a.m. to 5:00 p.m., Monday through Friday. As long as project construction activities comply with the noise ordinance, construction noise impacts from non-impact equipment would be considered less than significant. If construction activities using non-impact equipment would exceed these standards and the restrictions of the Mission Bay Good Neighbor Policy, then the noise effects would be potentially significant and mitigation measures would be required."]

and 100 dBA for commercial and industrial uses.[2]

The DSEIR then rigidly adheres to the regulatory scheme of the San Francisco Noise Ordinance in assessing the significance of noise from non-impact equipment, erroneously assuming the noise ordinance's regulatory scheme provides an appropriate threshold for determining whether impacts are significant under CEQA. Subdivision (d) of section 2909 of the San Francisco Noise Ordinance establishes thresholds for determining significance of noise impacts on nearby residents of 45 dBA nighttime/55 dBA daytime noise, stating:

> Fixed Residential Interior Noise Limits. In order to prevent sleep disturbance, protect public health and prevent the acoustical environment from progressive deterioration due to the increasing use and influence of mechanical equipment, no fixed noise source may cause the noise level measured inside any sleeping or living room in any dwelling unit located on residential property to exceed 45 dBA between the hours of 10:00 p.m. to 7:00 a.m. or 55 dBA between the hours of 7:00 a.m. to 10:00p.m. with windows open except where building ventilation is achieved through mechanical systems that allow windows to remain closed.

These standards (i.e., 45 dBA nighttime/55 dBA daytime noise) are based on the actual health and welfare of people. But the DSEIR does not use them for construction noise or operational traffic or crowd noise because this provision of the City's noise ordinance only applies to fixed noise sources. The DSEIR thus conflates compliance with the noise ordinance for less-than-significant impacts under CEQA.

The EIR's assumption in this regard violates CEQA, because compliance with regulatory standards cannot be used as a substitute for a fact-based analysis of whether an impact is significant. While San Francisco is free to adopt a noise ordinance that exempts specific noise sources from its regulatory effect, it is not free, under CEQA, to fail to disclose the significance of noise that exceeds these interior noise limits.[3]

[2] DSEIR, p. 5.3-17 ["The San Francisco Noise Ordinance does not identify any quantitative noise limit standard for impact equipment. To assess the potential impacts related to rapid impact compaction, this analysis employs the general construction noise assessment methodology and criteria suggested by the Federal Transit Administration (FTA). This guidance identifies a 1-hour Leq of 90 dBA for daytime and 80 dBA for nighttime construction noise exposure at residential uses. Commercial and industrial land use exposure to construction noise of 100 dBA is suggested as an assessment criterion."]

[3] *See*, e.g., *Californians for Alternatives to Toxics v. Department of Food & Agriculture* (2005) 136 Cal.App.4th 1, 16 (lead agencies must review the site-specific impacts of pesticide applications under their jurisdiction, because "DPR's [Department of Pesticide Regulation] registration does not

Because the DSEIR did not use the thresholds stated in section 2909(d), the noise impact assessment does not present relevant information that is necessary for determining whether the impact is significant. Instead, we have an impact assessment that is constrained by a series of arbitrary distinctions (i.e., the source fixed or not, the equipment impact or non-impact, the receptors are located in residences or hospitals) that have nothing to do with whether the affected community will suffer significant noise impacts.

The DSEIR refers to the World Health Organization (WHO) as "perhaps the best source of current knowledge regarding the health effects of noise impacts because European nations have continued to study noise and its health effects, while the United States Environmental Protection Agency all but eliminated its noise investigation and control program in the 1970s." (DSEIR, p. 5.3-4.) The DSEIR also cites WHO's Guidelines for Community Noise and its thresholds for adverse effects of noise on people.

> In contrast to many other environmental problems, noise pollution continues to grow and it is accompanied by an increasing number of complaints from people exposed to the noise. The growth in noise pollution is unsustainable because it involves direct, as well as cumulative, adverse health effects.

(WHO, Guidelines for Community Noise, p. vii.)

Specific effects to be considered when setting community noise guidelines include:

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and cannot account for specific uses of pesticides..., such as the specific chemicals used, their amounts and frequency of use, specific sensitive areas targeted for application, and the like"); *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1109 ["the fact that a particular environmental effect meets a particular threshold cannot be used as an automatic determinant that the effect is or is not significant ... a threshold of significance cannot be applied in a way that would foreclose the consideration of other substantial evidence tending to show the environmental effect to which the threshold relates might be significant"]; *Citizens for Non-Toxic Pest Control v. Department of Food & Agriculture (*1986) 187 Cal.App.3d 1575, 1587-1588 (state agency applying pesticides cannot rely on pesticide registration status to avoid further environmental review under CEQA); *Oro Fino Gold Mining Corporation v. County of El Dorado* (1990) 225 Cal.App.3d 872, 881-882 (rejects contention that project noise level would be insignificant simply by being consistent with general plan standards for the zone in question). *See also City of Antioch v. City Council of the City of Pittsburg* (1986) 187 Cal.App.3d 1325, 1331-1332 (EIR required for construction of road and sewer lines even though these were shown on city general plan); *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 712-718 (agency erred by "wrongly assum[ing] that, simply because the smokestack emissions would comply with applicable regulations from other agencies regulating air quality, the overall project would not cause significant effects to air quality.").

> interference with communication; noise-induced hearing loss; sleep disturbance effects; cardiovascular and psycho-physiological effects; performance reduction effects; annoyance responses; and effects on social behaviour.

(WHO, Guidelines for Community Noise, p. v.)

> The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments.

(WHO, Guidelines for Community Noise, p. iii.)

As discussed by Mr. Hubach:

> WHO's night-time standard for sleep disturbance inside bedrooms is 30 dBA, and outside bedrooms with "window open (outdoor values)" is 45 dBA. WHO's night-time and daytime standard for "speech intelligibility and moderate annoyance" for inside dwellings is 35 dBA. For outdoor living areas, WHO's daytime and evening standard for moderate annoyance is 50 dBA and for serious annoyance is 55 dBA.

(Exhibit 1, p. 3.) Yet, despite citing the WHO Guidelines, the DSEIR fails to use these standards as its thresholds of significance, and finds that "ambient plus project" noise levels much higher than the WHO's standards for harmful noise are less than significant.

Another human health and welfare based standard is provided by the State of California:

> State regulations include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are collectively known as the California Noise Insulation Standards and are found in Title 24 of the California Code of Regulations.
>
> The State of California updated its Building Code requirements with respect to sound transmission, effective January 2014. Section 1207 of the California Building Code (Title 24 of the California Code of Regulations) establishes material requirements in terms of sound transmission class (STC) 13 rating of 50 for all common interior walls and floor/ceiling assemblies between adjacent dwelling units or between dwelling units and adjacent public area. The previous code requirements (before 2014) set an interior performance standard of 45 dBA from exterior noise sources. This requirement will be re-instated in July of 2015.

(DSEIR, p. 5.3-10.) DSEIR does not tell us what buildings in area comply with this code. (See DSEIR § 5.3.3.4 [Sensitive Receptors], and Table 5.3-4.) However, as Mr. Hubach observes:

> Table 5.3-8 shows that all three receptors chosen for analysis will add construction noise to pre-existing ambient noise levels that already exceed the health and welfare based standards discussed above. As a result of construction operations (assuming all noise producing construction operations occur at the same time, noise levels at the Madrone Residential Tower will rise from 70.1 to 70.9 dBA (hourly Leq), at the Hearst Residential Tower from 71.2 to 80.8 dBA (hourly Leq), and at UCSF Hospital from 67 to 72.8 dBA (hourly Leq).

(Exhibit 1, p. 4.) Since the Project's noise, when added to background or ambient noise, exceeds the above health and welfare based standards, the impact is significant even if the impact does not violate the San Francisco Police Code.

For operational traffic noise, the DSEIR states:

> Traffic noise level significance is determined by comparing the increase in noise levels (traffic contribution only) to increments recognized by Caltrans as representing a perceptible increase in noise levels. Additionally, it is widely accepted methodology by both FTA18 and the Federal Interagency Committee on Noise (FICON)19 that thresholds should be more stringent for environments that are already noise impacted. Consequently, for noise environments where the ambient noise level is 65 dBA DNL or less, the significance threshold applied is an increase of 5 dBA or more, which Caltrans recognizes as a readily perceptible increase. In noise environments where the ambient noise level exceeds 65 dBA DNL, the significance threshold applied is an increase of 3 dBA or more, which Caltrans recognizes as a barely perceptible increase.

(DSEIR, p. 5.3-19.)

> Operational noise from non-transportation sources such as egress of patrons from events or sound amplification equipment in common areas are assessed based on noise increases of 8 dBA (for noise generated by commercial uses) over existing ambient (L90) levels and any applicable restrictions of the City's noise ordinance and Police Code. Although these operational noise increases would be of limited duration, they would be expected to occur throughout the life of the project and are therefore considered permanent changes in noise conditions.

(DSEIR, p. 5.3-19.)

As described by Mr. Hubach, for operational noise impacts (Impact NO-5), the DSEIR uses

a series of "ambient plus increment" thresholds. As discussed by Mr. Hubach, using "ambient plus increment" thresholds where existing noise levels are already high:

> disregards the fact the Project will make severe conditions worse. In addition, using these "ambient plus increment" thresholds for operational noise results in an unsustainable gradual increase in ambient noise. It is a formula for ever-increasing noise levels because each new project establishes a new, higher, baseline; then when the next project is approved, the incremental change will be added to the new baseline.

(Exhibit 1, p. 5.)

By ignoring the severity of existing noise levels and only looking to the "de minimis" nature of the Project's incremental effect, the DSEIR's noise impact determinations violate CEQA. (See *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120 ("*CBE*") ["[T]he relevant question"... is not how the effect of the project at issue compares to the preexisting cumulative effect, but whether "any additional amount" of effect should be considered significant in the context of the existing cumulative effect. [footnote omitted] In the end, the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant. [footnote omitted]"].)[4] *Communities* and *Kings County* teach that the significance of a cumulative impact depends on the environmental setting in which it occurs, especially the severity of existing environmental harm.

With respect to vibration impacts, as Mr. Hubach states:

> The DSEIR omits important information about the environmental setting. In particular, the DSEIR acknowledges that "Sensitive receptors to vibration include ... vibration-sensitive equipment." (DSEIR, p. 5.3-8.) But the DSEIR does not provide any evidence relating to the use of such equipment in the vicinity. Such information should include the type of equipment, the purpose of its use, its degree of sensitivity, and its distance from Project related sources of vibration.

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[4]*Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 720-21 ["They contend in assessing significance the EIR focuses upon the ratio between the project's impacts and the overall problem, contrary to the intent of CEQA.... We find the analysis used in the EIR and urged by GWF avoids analyzing the severity of the problem and allows the approval of projects which, when taken in isolation, appear insignificant, but when viewed together, appear startling. Under GWF's 'ratio' theory, the greater the overall problem, the less significance a project has in a cumulative impacts analysis. We conclude the standard for a cumulative impacts analysis is defined by the use of the term 'collectively significant' in Guidelines section 15355 and the analysis must assess the collective or combined effect of energy development"].)

In its impact assessment, the DSEIR inexplicably excludes also the users of vibration sensitive equipment from the category of sensitive receptors, and based on this policy decision, concludes that construction vibration effects are not significant, stating:

"As discussed in the 1998 FSEIR, construction vibration effects on sensitive equipment would be a concern for users of research buildings and could be an inconvenience. However, these users are not considered sensitive receptors, and therefore, construction vibration effects are not considered a significant environmental effect under CEQA." (DSEIR, p. 5.3-25.)

The DSEIR cannot omit an analysis of potentially significant effects by the simple expedient of arbitrarily defining the receptors of such effects as non-sensitive.

Thank you for your attention to this matter.

Very Truly Yours,

Tom Lippe

Thomas N. Lippe

List of Exhibits

1. Letter dated July 22, 2015, from Acoustical Engineer Frank Hubach.

\\Lgw-12-19-12\tl\Mission Bay\Administrative Proceedings\LOTNL Docs\C002e DSEIR Comment re Noise.wpd

EXHIBIT 1

22 July 2015

Mr. Tom Lippe, Esq.
Law Offices of Thomas N. Lippe APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Project: Warriors Event Center in Mission Bay
FHA # 648-02

Dear Mr. Lippe,

You requested that I review the analysis of this Project's noise impacts in the Draft Subsequent EIR dated 5 June 2015, Chapter 3.5. This letter report responds to your specific questions. My CV is attached.

1. Does the DSEIR use a reliable methodology to determine the significance of Impact NO-1 and Impact NO-5.

Impact NO-1 is "Construction of the proposed project would not cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. (Less than Significant)." (DSEIR, pp. 5.3-20 to 5.3-23.)

Impact NO-5 is "Operation of the proposed project would cause a substantial permanent increase in ambient noise levels in the project vicinity. (Significant and Unavoidable with Mitigation)." (DSEIR, pp. 5.3-32 to 5.3-39.)

In my opinion the DSEIR does not use a reliable methodology to determine whether Impact NO-1 or NO-5 is significant.

The DSEIR omits important information about the environmental setting.

For example, to judge the noise impact on residents of the Hearst Tower, it is important to know whether these residents typically open their window to get fresh air or, conversely, whether the building is subject to any requirements to keep windows closed. This is because closed windows provide significant sound transmission loss.

It also important to know what kind of windows nearby buildings have, because standard windows provide much less sound transmission loss than acoustically-rated windows.

Frank Hubach Associates, Inc
4905 Central Ave, Ste 100
Richmond, CA 94804

Acoustics and Vibration
Engineering Consultants

Phone 510-528-1505
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California State Building Code Section 1207 requires an interior performance standard of 45 dBA DNL. Given that windows in the Hearst Tower, and adjacent residences, are operable and ostensibly used for ventilation, achieving 45 dBA interior may be in jeopardy. It is unknown if the Hearst Tower has mechanical ventilation to allow the windows to be closed for noise control. Even if they do already have mechanical ventilation, their windows may not have sufficient sound transmission loss for the predicted increased noise levels.

The Title 24 compliance for Hearst Towers may have permitted windows to be open and not have required mechanical ventilation systems. If that is the case, they would need to keep windows open for fresh air and then suffer the increased noise.

I tried to find out if there is a ventilation system mandated by code for Hearst Tower. This is Section 1207.11 of the California State Building Code, which says in noisy settings, windows must be closed to achieve the state's 45 dB interior standard, in which case a mechanical ventilation system must be installed. I searched for an acoustical report typically filed with Planning and/or Department of Building Inspection (DBI) to see what original design requirement were in place. I visited DBI and spoke with Dwayne Farrell who said they had no record of Hearst Tower at 1560 3rd St, and only a crane permit for the parking garage on the opposite corner. He suggested I visit the inspectors and planners in the building to see if they could find a permit number or block and lot information. I did, to no avail. However, it was suggested that perhaps since it is a State building, the State Architect might have all records. So I contacted Luke Molinar, DSA, who did a records search but came up empty on this topic (See Attachment 1 [email exchange with Luke Molinar].)

Nevertheless, I visited the Project site on 8 July 2015, to make visual and aural observations. I walked along 3rd St from South St to 16th St, and South St to Terry Francois Blvd. The predominant noise is due to traffic – largely Muni, trucks and the occasional motorcycle. It was noticeably quieter away from 3rd St approaching the waterfront to the east. I spent some time in the pedestrian mall along Gene Friend Way.

I observed many of the windows in Hearst Tower and adjacent Mission Bay Housing were open. (See Attachment 2 [a photograph I took on 8 July 2015, showing part of the Mission Bay Housing building on the left and part of the Hearst Tower on the right], and Attachment 3 [a photograph I took on 8 July 2015, showing part of the Hearst Tower on the right].)

Therefore, regardless of whether the buildings are required to keep windows closed. The residents are opening them, presumably for fresh air.

For Impact NO-1 and Impact NO-5, the DSEIR uses a threshold of significance of the "ambient plus increment" type. For Impact No-1, the "ambient plus increment" threshold of significance is whether the "the increase in noise levels over existing conditions would be less than 10 dBA." (DSEIR, p. 5.3-23.)

This type of threshold discounts the significance or severity of pre-existing noise levels and treats them as if they are irrelevant to whether the incremental change caused by the Project is "significant." The DSEIR finds that "Peak cumulative construction activities would occur during a 3-month period in 2015–2016 and during this time, the increase in noise levels over existing conditions would be less than 10 dBA (without mitigation). All other periods of construction would similarly be under 10 dBA. Therefore, this impact would be less than significant." (DSEIR, p. 5.3-23.)

This conclusion is based on Table 5.3-8, which shows that all three receptors chosen for analysis have pre-existing ambient noise levels that are very loud already (i.e., Madrone Residential Tower is at 70.1 dBA (hourly Leq), Hearst Residential Tower is at 71.2 dBA (hourly Leq), and UCSF Hospital is at 67 dBA (hourly Leq).

As a point of reference for these noise levels, the World Health Organization's (WHO) standards for harmful noise are much lower than these pre-existing noise levels. WHO's night-time standard for sleep disturbance inside bedrooms is 30 dBA, and outside bedrooms with "window open (outdoor values)" is 45 dBA. WHO's night-time and daytime standard for "speech intelligibility and moderate annoyance" for inside dwellings is 35 dBA. For outdoor living areas, WHO's daytime and evening standard for moderate annoyance is 50 dBA and for serious annoyance is 55 dBA.

Another point of reference for the pre-exiting noise levels a the three "sensitive receptor locations" selected by the DSEIR is the San Francisco Noise Ordinance. As the DSEIR describes it, section 2909(d) provides "maximum noise levels at any sleeping or living room in any dwelling unit located on residential property must not exceed 45 dBA between 10:00 p.m. and 7:00 a.m., and 50 dBA between 7:00 a.m. and 10:00 p.m" where source of the noise is "fixed sources of noise, such as building mechanical equipment and industrial or commercial processing
machinery." (DSEIR, pp. 5.3-13, 14.)

The DSEIR does not use the WHO standards at all. With respect to the San Francisco Noise Ordinance, the DSEIR does not use the 45 dBA between 10:00 p.m. and 7:00 a.m., and 50 dBA between 7:00 a.m. and 10:00 p.m standard for any aspect of the Project's noise except the fixed machinery (e.g. generators) because the noise ordinance does not use this standard to regulate the Project's noise from construction equipment or operational noise from increased traffic, crowds, concerts, etc.[1]

This approach may be useful to the City for Impacts NO-2 and NO-4, which assess the Project's consistency with other applicable plans and laws, but it does not makes sense for assessing the construction or operational impacts of the Project on actual people.

Table 5.3-8 shows that all three receptors chosen for analysis will add construction noise to pre-existing ambient noise levels that already exceed the health and welfare based standards discussed above. As a result of construction operations (assuming all noise producing construction operations occur at the same time, noise levels at the Madrone Residential Tower will rise from 70.1 to 70.9 dBA (hourly Leq), at the Hearst Residential Tower from 71.2 to 80.8 dBA (hourly Leq), and at UCSF Hospital from 67 to 72.8 dBA (hourly Leq). Since the Project's

The DSEIR's use of compliance with the San Francisco Noise Ordinance as a threshold for judging the significance of the Project's construction noise impacts (see DSEIR p. 5.3-17) appears to reflect a policy decision, because it is not based on science.

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[1]The DSEIR states that: "The HUD regulations also include a goal (not a standard) that interior noise levels not exceed 45 dB DNL" (DSEIR, p. 5.3-9.) But HUD's goal of 45 DNL interior, is 10 dB greater than the 35 dB Leq level the DSEIR cites as a threshold for sleep disturbance (see DSEIR, 5.3-2), and 15 dB greater than the 30 dB Leq guideline given by WHO.
noise, when added to background or ambient noise, exceeds these health and welfare based standards, the impact is significant even if the impact does not violate the San Francisco Police Code standard.

The same is true of the DSEIR's use, for operational noise impacts, of a threshold of 8 dBA or 8 dBC above ambient noise, based on the San Francisco Noise Ordinance. (DSEIR, p. 5.3-13). The same is true of the DSEIR's use, for mobile sources of operational noise impacts, of "ambient plus increment" thresholds of significance:

> "Traffic noise level significance is determined by comparing the increase in noise levels (traffic contribution only) to increments recognized by Caltrans as representing a perceptible increase in noise levels. Additionally, it is widely accepted methodology by both FTA18 and the Federal Interagency Committee on Noise (FICON)19 that thresholds should be more stringent for environments that are already noise impacted. Consequently, for noise environments where the ambient noise level is 65 dBA DNL or less, the significance threshold applied is an increase of 5 dBA or more, which Caltrans recognizes as a readily perceptible increase. In noise environments where the ambient noise level exceeds 65 dBA DNL, the significance threshold applied is an increase of 3 dBA or more, which Caltrans recognizes as a barely perceptible increase."

(DSEIR, p. 5.3-17).

> "Consequently, for noise environments where the ambient noise level is 65 dBA DNL or less, the significance threshold applied is an increase of 5 dBA or more, which Caltrans recognizes as a readily perceptible increase. In noise environments where the ambient noise level exceeds 65 dBA DNL, the significance threshold applied is an increase of 3 dBA or more, which Caltrans recognizes as a barely perceptible increase."

(DSEIR, p 5.3-19)

Using these "ambient plus increment" thresholds where existing noise levels are already too high, as shown in Tables 5.3-9 and 5.3-10 (DSEIR, pp. 5.3-34, 36), disregards the fact that the Project will make already severe conditions worse. In addition, using these "ambient plus increment" thresholds for operational noise results in an unsustainable gradual increase in ambient noise. It is a formula for ever-increasing noise levels because each new project establishes a new, higher, baseline; then when the next project is approved, the incremental change will be added to the new baseline.

Therefore, the operational impact assessment needs to be redone using valid, science-based thresholds that relate to actual human health and welfare effects of noise.

In my opinion, is the Project will cause a significant increase in Impact NO-1 and Impact NO-5 above levels existing without the project.

2. Does the DSEIR use a reliable methodology to determine the significance of Impact NO-3?

Impact NO-3 is "Construction of the proposed project would not expose people and structures to or generate excessive groundborne vibration levels. (Less than Significant)." (DSEIR, pp. 5.3-24 to 5.3-26.)

In my opinion the DSEIR does not use a reliable methodology to determine whether Impact NO-3 is significant.

The DSEIR omits important information about the environmental setting. In particular, the DSEIR acknowledges that "Sensitive receptors to vibration include ... vibration-sensitive equipment." (DSEIR, p. 5.3-8.) But the DSEIR does not provide any evidence relating to the use of such equipment in the vicinity. Such information should include the type of equipment, the purpose of its use, its degree of sensitivity, and its distance from Project related sources of vibration.

In its impact assessment, the DSEIR inexplicably excludes also the users of vibration sensitive equipment from the category of sensitive receptors, and based on this policy decision, concludes that construction vibration effects are not significant, stating:

> "As discussed in the 1998 FSEIR, construction vibration effects on sensitive equipment would be a concern for users of research buildings and could be an inconvenience. However, these users are not considered sensitive receptors, and therefore, construction vibration effects are not considered a significant environmental effect under CEQA."

(DSEIR, p. 5.3-25.)

Since UCSF is a "research hospital" is it safe to assume that scanning electron-beam microscopes are used by researchers and pathologists. These devices are extremely sensitive to low level vibration. It is common for them to have environmental criteria specifically for vibration. If the specified vibration levels are exceeded the image will blur rendering the instrument useless. Therefore, in my opinion, the DSEIR should include users of vibration-sensitive equipment in the category of sensitive receptors, and then assess the Project's impact on the users.

For "Human annoyance" from groundborne vibration, the DSEIR uses a threshold of significance of : "For adverse human reaction, this analysis applies the "strongly perceptible" threshold of 0.1 inches per second PPV." (DSEIR, p. 5.3-25.) In my opinion, this threshold should be "perceptible, not "strongly perceptible."

In applying its "strongly perceptible" threshold, the DSEIR says:

> "The closest residence would be the UCSF Mission Bay Housing (Hearst Tower), approximately 200 feet from the project site while the nearest hospital would be approximately 560 feet away. A recent study of vibration induced by rapid impact compaction indicated that at a distance of 30 meters (100 feet), cumulative vibration energy results in maximum vibration level of 2.3 millimeters per second (0.09 inches per second). Because sensitive land uses would be more than 100 feet away, worst-case cumulative vibration levels generated by rapid impact compaction would be below the strongly perceptible threshold."

(DSEIR, p. 5.3- 25.)

In my opinion, this conclusion is incorrect because the DSEIR's calculation of vibration does take into account the increased vibration on upper floors of this building. Soil attenuation varies with the type of soil and moisture content, and distance attenuation from 100 to 200 feet may only be a factor of 0.5, or less. Accordingly, actual PPV at the Hearst Tower is likely to be 0.045 ips, or considerably greater depending on site-specific parameters. In addition, the DSEIR's calculation does not take into account building resonance effects for above-grade floors which amplify vibration at certain frequencies. Recalculating to take this factor into account indicates vibration on upper floors would certainly be "perceptible" and likely "strongly perceptible."

Alternate Calculation:

rapid impact compaction - 0.09 ips PPV @100 feet
distance attenuation factor - x 0.5 from 100 to 200 feet
rapid impact compaction - 0.045 ips PPV @200 feet
soil attenuation variation - x 2 (6 dB) ground floor
result at Hearst Tower - 0.09 ips PPV @100 feet
resonant amplification - x 3 (10 dB)
result at Hearst Tower - 0.27 ips PPV upper floors
criterion for humans - 0.1 ips PPV "strongly perceptible"

In my opinion, the Project likely to cause a significant increase in Impact NO-3 above levels existing without the project, particularly when compaction is occurring during construction.

Very truly yours,

Frank J. Hubach
President

attached: Attachment 1 [email exchange with Luke Molinar] (Attachment 1 to FHA Report.pdf)
Attachment 2 [photograph - Mission Bay Housing & Hearst Tower] (Attachment 2.pdf)
Attachment 3 [photograph - Hearst Tower] (Attachment 3.pdf)
Frank Hubach CV (FJHresume.pdf; expertCVfjh3.pdf)

FJH:fjh

J:\64802\AcousticReport3.wpd

ATTACHMENT 1

From: Molinar, Luke@DGS [mailto:Luke.Molinar@dgs.ca.gov]
Sent: Monday, July 20, 2015 9:56 AM
To: Frank Hubach
Subject: RE: Acoustical Report

Hello Frank,

I've done some digging, and the attached is all I have that deals with windows/hvac at the address you gave me.

I'm afraid we don't really have much documentation on noise control, as it does not fall within our remit.

We were not involved with any other projects that occurred at this address.

Hopefully the information I sent over helps.

Thank you,

Luke Molinar
Office Technician (General)

Division of the State Architect

Department of General Services

Phone (510) 286-0711
Fax (510) 622-3140
Email Luke.Molinar@dgs.ca.gov

DSA
DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

From: Frank Hubach [mailto:frank@fha-eng.com]
Sent: Tuesday, July 14, 2015 12:01 PM
To: Molinar, Luke@DGS
Subject: Acoustical Report

Luke,

You asked me to email my document request.

Project: UCSF Hearst Towers 1560 3rd St, San Francisco, CA

Primary Documents: Acoustical Report for Title 24 & State Building Code Section 1207.11

Additional Documents: Window schedule, HVAC duct drawings, HVAC ventilation schematics, etc.

Purpose: Determine the need to close windows to control noise. If windows are closed, mechanical ventilation must be provided. I want to confirm that design and implementation.

Thank you for assisting me today.

Regards,

Frank Hubach

510 528 1505

ATTACHMENT 2

ATTACHMENT 3

RESUME

FRANK J. HUBACH

Frank J. Hubach, President of FHA, has over twenty years experience in noise and vibration control for advanced technology, industrial and commercial projects. Design and testing of facilities where micro-vibration is of great concern for metrology and lithography has been his focus. Projects range from comprehensive campus master planning to remodeling in the private, public and institutional sectors. Structural dynamics and mechanical systems for cleanrooms and laboratories have been the specialty. His musical and audio engineering background also makes him well suited for acoustic design of critical listening rooms for recording, broadcast and performance.

Mr. Hubach has over thirty years experience in construction, electronics and audio engineering. He is considered a leading authority on noise and vibration control for microelectronics manufacturing. Mr. Hubach has published several papers and been a speaker at numerous conferences and seminars. He has given expert witness testimony in state and federal courts for acoustic forensics, noise control and construction.

EDUCATION

1971 Bachelor of Engineering Electrical Engineering	New York University Bronx, NY
1970 to 1972 Coursework Graduate Studies in Acoustics and Electronics	New York University Bronx, NY

PROFESSIONAL HISTORY

1984 to Present President	Frank Hubach Associates, Inc. Richmond, CA
1978 to 1984 Associate/V.P./Treas./President	Acoustical Consultants, Inc. San Francisco, CA
1975 to 1978 President/Owner/Audio Engineer	Pacific Application Systems Mill Valley, CA
1974 to 1975 V.P./Commercial Contractors	American Wall Systems, Inc. Middletown, NY
1971 to 1974 Recording Engineer	Record Plant Recording/Freelance New York, NY

SEMINARS/PAPERS

SEMINARS
(contributing speaker)

UNIVERSITY OF WISCONSIN

"Controlling Vibration in Microelectronic Manufacturing Facilities" - 1989 and 1990

UNIVERSITY OF GLASGOW

"Design of Vibration Free Environments for Precision Manufacturing" - 1986

PAPERS

Advanced Techniques for Controlling Building Vibration. 1993 CleanRooms West Convention Conference in Santa Clara, CA, September 1993.

Hubach, Frank J. and Edwards, Bob, Empirical Determination of Sound Isolation Requirements for Recording Studio Isolation Booths. 93rd Audio Engineering Society (AES) Convention in San Francisco, CA, October 1992.

Controlling Horizontal Microscale Vibration in Building Floor Entablatures. 1991 Symposium on Optical Science and Engineering (for SPIE) in San Jose, CA, October 1991.

Vibration Attenuation in Soil. National Conference on Noise Control Engineering (for INCE) in Tarrytown, NY, July 1991.

Neal, Stephen R.W. and Hubach, Frank J., Historic Artwork Preservation and Vibration Mitigation During Building Renovation. National Conference on Noise Control Engineering (for INCE) in Tarrytown, NY, July 1991.

Frank J. Hubach - Expert Witness Experience

2007 Bendahan v. Dovichi, Superior Court, Sacramento County. Residential noise nuisance case. Conducted acoustical tests of air-conditioning equipment at residence as related to noise code and advised counsel. (case settled)

2007 500 Bryant Street HOA v. 500 Bryant Street Partners, Superior Court, San Francisco County. Conducted acoustical tests in condominiums and analyzed data related to traffic noise control and California Building Code. Made recommendations to counsel and participated in Joint Expert Meeting. (case pending)

2007 Paseo Plaza Homeowners' Assoc. v. SFC Block 4 Residential Associates, et al, Superior Court, Santa Clara County. Reviewed acoustical tests, construction documents and depositions of other experts. Gave deposition related to urban noise control for condominiums and California Building Code. (case settled)

2006 Smolich v. Meritage Homes and Sierra Pacific Industries v. Meritage Homes, Superior Court, Placer County. Reviewed test reports and conducted acoustical test related to City of Lincoln Conditions of Use for industrial noise and residential subdivision adjacency. Conducted noise mitigation analyses and offered design solutions. Provided extensive consultation to counsel and participated in acousticians meeting. (case pending)

2006 Lyle v. Bogavich, Superior Court, Sacramento County. Residential noise nuisance case. Conducted acoustical tests of wood working tools at residence as related to noise code.

2003 Seagate Technology LLC and CH2M Hill Industrial Design Corporation and Tasso Katselas Associates, Pittsburgh, PA. Reviewed construction documents, test reports and design reports relative to excessive vibration, structural dynamics and mechanical equipment vibration control for sensitive electronics cleanroom. Supervised independent design analyses using Finite Element Analyses. Provided consultation to counsel regarding industry standards, design criteria and procedures, and potential for mitigation.

2001 Retained by counsel for pre-filing investigation. Conducted acoustical tests of interior noise at residence in San Jose, California. Civil case regarding construction deficiency and noise code.

2001 Retained by counsel for pre-filing investigation. Conducted acoustical tests of interior noise at residence in Oakland, California. Civil case regarding mechanical equipment noise control and industry standards.

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Frank J. Hubach
Expert Witness Experience

2000 OC America Construction, Inc. v. KCH Services, Inc., Superior Court, State of Washington. Reviewed acoustical tests, construction documents and depositions. Gave deposition in arbitration proceedings for construction litigation regarding specifications for noise control of large industrial exhaust systems.

1999 Kidd v. City of Fairfield, et al, United States District Court, Eastern District of California. Reviewed depositions and investigated crime site regarding speech intelligibility during incident. Provided consultation to counsel.

1997 Orlando v. Robbins, Superior Court, San Francisco County. Conducted acoustical tests in apartment and analyzed data related to noise ordinance. Consulted with counsel before and during deposition of acoustical expert.

1993 Lakeside v. State of California, Superior Court, Alameda County. Conducted acoustical tests regarding noise impact to residences from proposed CalTrans freeway construction. Gave deposition.

1991 Retained as expert in Municipal Court, San Francisco. Conducted acoustical tests and testified in Civil case regarding nightclub noise and noise ordinance.

1989 Retained as expert in Municipal Court, Berkeley, CA. Conducted acoustical tests. Civil case regarding acoustical privacy, neighbor's noise and noise ordinance.

1983, 1987 Retained as expert by Alameda County Public Defender. Conducted acoustical tests at crime scene. Criminal case regarding speech intelligibility at crime scene.

1986 Retained as expert in Superior Court, Marin County. Criminal case regarding acoustical privacy and intelligibility in courtroom between counsel and handcuffed client in murder case (shackles motion). Advised counsel regarding acoustical standards and test methodologies.

1984 Stephens v. Stephens, Superior Court, Marin County. Conducted acoustical tests at crime scene. Criminal case regarding speech intelligibility at crime scene.

1982 "Wrongful Death Case" v. Richmond Police ("Richmond Cowboys"), Federal Court, San Francisco. Retained as expert in high profile case. Conducted objective and subjective acoustical tests and recreated crime scene. Provided extensive court room testimony regarding speech intelligibility at crime scene.

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July 27, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: **Transportation Impacts** - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter.

This letter incorporates by reference, as comments on the DSEIR, all of the comments on the DSEIR contained in the July 23, 2015, letter report authored by traffic engineer Dan Smith (attached as Exhibit 1), and the July 21, 2015, letter report authored by traffic engineer Larry Wymer (attached as Exhibit 2).

I. THE DSEIR IS NOT SUFFICIENT AS AN INFORMATIONAL DOCUMENT WITH RESPECT TO TRANSPORTATION IMPACTS.

A. The DSEIR Fails to Assess the Project Traffic Impacts on the Entire Affected Environment.

The DSEIR studies Project-induced increases in congestion and delay, for both incremental and cumulative impacts, at twenty-two (22) intersections and six (6) freeway ramps, as shown in Table 1.

Table 1

Incremental Impact Assessment (With Implementation of the Special Events Transit Service Plan)	Incremental Impact Assessment (Without Implementation of the Special Events Transit Service Plan)	Cumulative Impact Assessment
Intersections at DSEIR, p. 5.2-18, Table 5.2-34 p. 5.2-121, Table 5.2-35 p. 5.2-123, Table 5.2-36 p. 5.2-172, Table 5.2-47 p. 5.2-174, Table 5.2-48	Intersections at DSEIR, p. 5.2-192, Table 5.2-53 p. 5.2-193, Table 5.2-54	Intersections at DSEIR, p. 5.2-214, Table 5.2-59 p. 5.2-217, Table 5.2-60.
Freeway ramps at DSEIR, p. 5.2-133, Table 5.2-37 p. 5.2-133, Table 5.2-38 p. 5.2-134, Table 5.2-39 p. 5.2-181, Table 5.2-49 p. 5.2-181, Table 5.2-50	Freeway ramps at DSEIR, p. 5.2-198, Table 5.2-55 p. 5.2-198, Table 5.2-66	Freeway ramps at DSEIR, p. 5.2-221, Table 5.2-61 p. 5.2-221, Table 5.2-62

Remarkably, the DSEIR fails to disclose the criteria the City used to select these intersections and freeway ramps. More importantly, the DSEIR fails to disclose the criteria the City used to *exclude* other intersections and freeway ramps. The omission of this fundamentally important information renders the DSEIR so legally inadequate as an informational document that it frustrates CEQA's goal of providing the public with a meaningful opportunity to comment on the DSEIR.

Also, as shown in the attached report from traffic engineers Larry Wymer and Dan Smith, the DSEIR omitted from its area of study numerous intersections and freeway ramps that will also suffer potentially substantial increases in traffic congestion and delay. The omission of these intersections and freeway ramps from the DSEIR's analysis of the Project's effect on traffic also renders the DSEIR so legally inadequate as an informational document that it frustrates CEQA's goal of providing the public with a meaningful opportunity to comment on the DSEIR.

How did this happen? The DSEIR simply states: "The traffic impact assessment for the proposed project was conducted for 23 study intersections and six freeway ramp locations in the vicinity of the project site" (DSEIR, p. 5.2-72),[1] with no further explanation. The same is true for

[1]The DSEIR actually studies 22 intersections, not 23, in the tables listed in footnote 1.

the six freeway ramps. (DSEIR, p. 5.2-74.)

The DSEIR does inform the reader that:

> The impacts of the proposed project on the surrounding transportation network were analyzed using the Transportation Impact Analysis Guidelines issued by the Planning Department in 2002 (SF Guidelines 2002), which provides direction for analyzing transportation conditions and in identifying the transportation impacts of a proposed project.

(DSEIR, p. 5.2-69.) These Guidelines provide:

> 2. Project Setting
> The setting information shall be presented immediately following the Project Description as a discrete chapter or report section. The goal is to provide a brief but complete description of existing transportation infrastructure and conditions in the vicinity of the project. Normally, the described vicinity is a radius between two blocks and 0.25 mile, however, a larger area may be determined in the scoping process. *The specific perimeters of the study area, for both setting and project impact analysis, are to be confirmed as part of the approval for the scope of work.*

(Transportation Impact Analysis Guidelines (October 2002), pp.6-7 (italics added).) Based on this text, the reader would expect to find the criteria and rationale for delimiting "the specific perimeters of the study area" in the Scope of Work which the City approved pursuant to these Guidelines as a prerequisite to preparation of the DSEIR. Unfortunately, this expectation is disappointed, because the City-approved Scope of Work is also silent on the topic. (DSEIR, Appendix TR, pp. TR-8 to TR 14.)

Consequently, the City must revise the DSEIR to include an analysis of the Project's congestion and delay impacts on the excluded intersections and freeway ramps and then recirculate the Revised DSEIR for at least 45 days for public review and comment.

B. The DSEIR Fails to Disclose the Severity of the Project's Impacts on Intersections and Freeway Ramps which the Project Will Cause to Deteriorate to Level of Service (LOS) F.

As explained by Dan Smith in his attached report, the DSEIR fails to disclose the severity of the Project's congestion and delay impacts on intersections and freeway ramps which the Project will cause to deteriorate to Level of Service (LOS) F.

The DSEIR discloses the Project will cause significant congestion and delay impacts at numerous intersections and freeway ramps in the "study area," where Project-induced increases in congestion and delay will cause deterioration in Level of Service (LOS) to LOS E or F. (See intersections and freeway ramps listed in footnote 1.) For the intersections and freeway ramps in the "study area" where Project-induced increases in congestion and delay will cause deterioration to LOS E, the DSEIR provides a measurement of the degree of severity of the significant impact (i.e., average delay for intersections or average density for freeway ramps).

However, for the intersections and freeway ramps in the study area where Project-induced increases in congestion and delay will cause deterioration to LOS F, the DSEIR fails to provide a full measurement of the degree of severity of the significant impact. Instead, for intersections pushed to LOS F, instead of presenting a measure of average delay, the DSEIR provides a "greater than" measurement of "80 seconds per vehicle." (See 5.2-74 and Tables cited above.) For freeway ramps pushed to LOS F, instead of providing the average density, the DSEIR provides no measurement of "existing plus project" density. Instead, the severity of the Project's impacts at intersections and freeway ramps pushed to LOS F has no upper limit, and remains undisclosed, other than to note that "demand exceeds capacity." (See 5.2-75, Table 5.2-19 and Tables cited above.)

Thus, the DSEIR fails to comply with CEQA because, beyond making the binary determination that the Project's impacts on these intersections and freeway ramps are significant, the DSEIR fails to disclose the severity of these significant impacts. (See *Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831 ["The conclusion that one of the unavoidable adverse impacts of the project will be the 'increased demand upon water available from the Santiago County Water District' is only stating the obvious. What is needed is some information about how adverse the adverse impact will be"].) Consequently, the City must revise the DSEIR to include this missing information, then recirculate the Revised DSEIR for at least 45 days for public review and comment.

C. The DSEIR Fails to Identify the Significance and Severity of the Project's Impacts on Intersections Where the Project Will Use Parking Control Officers.

In its impact assessment tables for "Intersection Level of Service - Existing plus Project Conditions - With a SF Giants Evening Game – Weekday PM and Saturday Evening Peak Hour" (DSEIR, p. 5.2-172, Table 5.2-47) and "Intersection Level of Service - Existing plus Project Conditions - With a SF Giants Evening Game – Weekday Evening and Late Evening Peak Hour" p. 5.2-174, Table 5.2-48), the DSEIR measures the significance of impacts by the use of Level of Service (LOS) and delay measurements.

But for two intersections, King and Third streets, and King and Fourth streets, the DSEIR provides no LOS or delay measurements, and therefore, no information on whether the Project's congestion and delay impacts on these intersections are significant, and if so, the severity of these significant impacts.

Instead, the DSEIR indicates that the Project calls for posting Parking Control Officers (PCOs) at these intersections at the times indicated. But the adoption of a mitigation measure cannot substitute for disclosing whether the Project's impacts on these intersections are significant or their severity.[2]

D. The DSEIR's Analysis of the Project's Construction-Related Traffic Congestion and Delay Impacts Is Legally Flawed.

The DSEIR's analysis of the Project's construction related traffic congestion and delay impacts is legally flawed because it is based on invalid criteria, it fails to lawfully assess the Project's cumulative construction period impacts, and it improperly defers the development of mitigation measures to reduce the Project's construction-related traffic impacts to less than significant.

The DSEIR states "Construction related impacts generally would not be considered significant due to their temporary and limited duration." (DSEIR, p. 5.2-46.) This statement is placed in the section describing the DSEIR's thresholds of significance. Therefore, it appears this conclusion reflects a policy decision rather than a fact-based assessment.

In the impacts analysis section, the DSEIR states: "Construction related impacts generally would not be considered significant due to their temporary and limited duration." (DSEIR p 5.2-111). Elsewhere the DSEIR quantifies the construction period's "temporary and limited duration" as 26 months. (DSEIR, p. 5.2-112.) However, the notion that the DSEIR can determine the Project's construction related traffic impacts to be "less than significant" based primarily on their temporary duration is legally and logically flawed because from a cumulative standpoint, the Project's construction impacts are part of an essentially permanent, not temporary, condition of ongoing construction in this part of San Francisco.

Indeed, the DSEIR's discussion of the Project's cumulative construction period impacts recognizes there are numerous other construction projects planned in Mission Bay and that the construction related traffic impacts of these projects will combine with this Project's construction related impacts. (DSEIR, p. 5.2-210 (Impact C-TR-1.)

However, the DSEIR's discussion of the Project's cumulative construction period impacts

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[2]CEQA does not permit an agency to simply adopt mitigation measures in lieu of fully assessing a project's potentially significant environmental impacts because mere acknowledgment that an impact would be significant is inadequate; the EIR must include a detailed analysis of "how adverse" the impact would be. (*Lotus v. Department of Transportation* (2014) 223 Cal.App.4th 645, 655-56' *Galante Vineyards v. Monterey Peninsula Water Management Dist.* (1997) 60 Cal.App.4th 1109, 1123*; Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831.)

is flawed because it is constrained by several artificial limits.

First, as discussed in section I.A above, the impact assessment is limited to impacts and intersections and freeway ramps within the artificially restricted geographic "study area."

Second, the impact assessment considers only construction projects within the Mission Bay neighborhood without regard to whether other "past, present, or reasonably foreseeable future projects" may be "closely related" because their impacts may combine with the Project's impacts.

Third, the DSEIR's analysis of cumulative traffic impacts for *construction* of the project only references a handful of foreseeable projects located very close to the Project, and the DSEIR's discussion of these projects is solely in terms of whether their construction periods overlap with construction of this Project, as if the operational impacts of other "past, present, and reasonably foreseeable future projects" are not "closely related." (See DSEIR, p. 5.2-10 and 11.)[3] This is incorrect because "closely related" simply means the other projects' impacts may combine with the Project's impacts.

Table 3 in the attached report by Larry Wymer shows that it is possible to include a broader range of projects - across both time and area - in the assessment of the Project's cumulative construction period traffic impacts, and that when this is done, there are many Projects that will be under construction or operational in the period before, during, and after construction of the Project whose effects will combine with those of the Warriors Arena construction. Therefore, the Project's construction impacts are part of an essentially permanent, not temporary, condition of ongoing construction in this part of San Francisco and the DSEIR errs by basing its determination of significance on the "limited duration" of the construction period. (DSEIR, p. 5.2-212.)

The second basis for the DSEIR's less-than-significant determination is the DSEIR's statement that "construction activities would be ... required to be conducted in accordance with City

[3]These projects are:
• 1.13 million gsf of UCSF LRDP projects under construction at the Mission Bay Campus, including, the UCSF East Campus project on Blocks 33/34,
• Construction of Bayfront Park,
• realignment of Terry A. Francois Boulevard,
• construction of a neighborhood park on the north side of Mariposa Street east of Owens Street,
• the Exchange project on Mission Bay Block 40,
• the Family House project on Mission Bay Block 7 East,
• the Residential and Hotel project on Mission Bay Block 1,
• the 360 Berry Street project on Mission Bay Block N4/P3, and
• Caltrain's Peninsula Corridor Electrification Project.

requirements." (DSEIR, p. 5.2-212.) This vague assurance is meaningless because the DSEIR does not specify what these " City requirements" are, does not specify a performance standard that these City requirements would either impose or achieve, and presents no evidence that these unspecified "City requirements" are likely to avoid significant cumulative construction related traffic effects. (See *Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 95 (*CBE*); *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; 1394 (*Gentry*).

The third and final basis for the DSEIR's less-than-significant determination is "Improvement Measure I-TR-1: Construction Management Plan and Public Updates." The DSEIR suggests this Plan would help avoid significant cumulative construction related traffic effects. (DSEIR, p. 5.2-212.) But it is improper for the DSEIR to rely on Improvement Measure I-TR-1 to help reduce impacts to less than significant because it is not identified as a mitigation measure necessary to substantially reduce significant Project impacts; therefore, it is not enforceable. (CEQA Guideline 15126.4(a)(4).)

Finally, the DSEIR fails to quantify the Projects' construction period impacts, presumably based on its qualitative conclusion that unspecified "City requirements" and "Improvement Measure I-TR-1" will avoid significant impacts. This puts the cart before the horse.[4]

E. The DSEIR's Analysis of the Project's Operational Traffic and Transit Congestion and Delay Impacts Is Legally Flawed.

1. The DSEIR understates traffic and transit volumes in the PM peak period of 4:00 to 6:00 PM by using "time of arrival" at the Arena as a proxy measurement for "time of travel."

In modeling traffic and transit impacts, the DSEIR assumes only 5% of basketball game attendees will be traveling in the "study area" in the PM peak period of 4:00 to 6:00 p.m. Table 5.2-21 states that 5% of arrivals are expected before 6:00 p.m. for 7:30 p.m. weekday basketball games; another 11% will arrive between 6:00 and 6:30 p.m. (DSEIR, p. 5.2-83.) This data is based on turnstile counts of people entering the arena.

As explained by Dan Smith in his attached report, this proxy measurement does not provide reliable data as to when game or event attendees are actually traveling through affected intersections or freeway ramps or using affected transit routes:

> These considerations are so obvious to any transportation professional knowledgeable about sports stadium transportation issues that the analysis presented

[4]See footnote 2 above.

> in the DSEIR cannot be said to constitute the good faith effort to disclose impact that the California Environmental Quality Act demands. Since the entire analysis of transportation impacts flows from the estimate of trip generation and time-of-travel analysis, the entire transportation impact component of the DSEIR must be redone to accurately reflect the time that event attendees are actually traveling on the transportation system instead of the time they enter the event venue.

(Exhibit 1, p. 3.)

In his analysis, Mr. Smith found:

> it seems highly probable that as much as one-third or more of the trips that the DSEIR considers to take place in the 6 to 7 PM period and the 7 to 8 PM period would actually be on the transportation system in the more critical 5 to 6 PM commute peak hour. That would put 7,466 event-related travelers on the transportation system in the 5 PM to 6 PM period instead of the 1,866 assumed in the DSEIR, a difference that would likely result in transportation impacts not disclosed in the DSEIR and/or intensification of impacts and mitigation needs of those that were disclosed.

(Exhibit 1, p. 3.)

Even just applying common sense to the DSEIR's data indicates that many or most of the 11% that the DSEIR says arrive at the turnstile between 6:00 and 6:30 p.m. would be traveling to the event in the PM peak period of 4:00 to 6:00 pm. This minimal adjustment alone changes the assumption on which the modeling is based from 5% to 16% traveling in the "study area" in the PM peak period of 4:00 to 6:00 pm. As shown by Mr. Smith, this minimal adjustment more than doubles the Project's contribution of traffic to affected intersections, and would change the DSEIR's determination from less-than-significant to significant at some intersections. (Exhibit 1, p. 4.)

This issue was flagged in public scoping comments on the DSEIR. (DSEIR, p. 2-15.) Yet, somehow, the DSEIR did not adjust its reliance on turnstile data to develop a reliable metric to use instead. Instead, the DSEIR offers a series of weak or irrelevant rationales for its methodology, including:

> because basketball games typically start at 7:30 p.m. a higher percentage of inbound event attendees would travel to the event center during the 6:00 to 8:00 p.m. period than during the 4:00 to 6:00 p.m. commute peak period.

(DSEIR p. 5.2-71); and

> the SF Guidelines do not include travel demand characteristics for the specialized uses (e.g., sports events, conventions, and other events) that would take place at the proposed event center. Similarly, standard trip generation resources, such as the Institute of Transportation Engineer's Trip Generation Manual, do not include sufficiently detailed trip generation data for such specialized uses. Therefore, the travel demand for the event center component of the proposed project was based on the estimated attendance, as well as information on current travel characteristics of Golden State Warriors basketball attendees at the Oracle arena in Oakland.

(DSEIR, p. 5.2-81); and

> The data are based on information provided by the Golden State Warriors for their current facility, which was then adjusted to provide for earlier arrival patterns based on comparable information collected at similar NBA facilities to account for the increased availability of retail and restaurant uses at the proposed project site compared to Oracle Arena in Oakland. A summary of this data is provided in the travel demand technical memorandum included in Appendix TR.

(DSEIR, p. 5.2-82.)[5]

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[5] In the "Travel Demand Methodology and Results" section of Chapter 5.2, the DSEIR states:

> The Basketball Game scenario reflects the travel demand of the office, retail and restaurant uses, plus an evening basketball game. The transportation impact analysis of the Basketball Game scenario was conducted for four analysis hours (weekday p.m., weekday evening, weekday late evening, and Saturday evening), for conditions without and with an overlapping SF Giants evening game at AT&T Park.
>
> Table 5.2-21 presents the expected temporal distribution of arrival and departure patterns for basketball game attendees of the proposed project. The data are based on information provided by the Golden State Warriors for their current facility, which was then adjusted to provide for earlier arrival patterns based on comparable information collected at similar NBA facilities to account for the increased availability of retail and restaurant uses at the proposed project site compared to Oracle Arena in Oakland. A summary of this data is provided in the travel demand technical memorandum included in Appendix TR. Based on this information, it was assumed that approximately 5 percent of arrivals to a basketball game would occur during the p.m. peak hour (5:00 to 6:00 p.m.), and up to 66 percent of arrivals would occur during the evening peak hour (7:00 to 8:00 p.m.). Similarly, up to 70 percent of the departures would occur during the late evening peak hour (9:00 to 10:00 p.m.).

A discussion and summary of the data from other venues than Oracle is provided in DSEIR, Appendix TR, at pp. TR-21 to TR-25 and TR-37 [Appendix A, p. A-9]. The table at page TR-37 provides time of arrival data from, in addition to Oracle, six purportedly "comparable" venues, namely: Icon Venue Group, Houston, Phoenix, Sacramento, Brooklyn (2013-2014), and Brooklyn (2014-2015). An interesting fact about this table is that the data for 4:00 to 6:00 p.m. arrivals at four of these six venues (i.e., Icon Venue Group, Houston, Phoenix, Sacramento) is "included in" the data for later time periods. So, in fact, the only purportedly comparable venue for which the DSEIR presents supporting data is Brooklyn (2013-2014 and 2014-2015). The venue with the largest proportion of arrivals in the 4:00 to 6:00 p.m. period is Brooklyn (2014-2015), with 4.1%.

In short, the City and the Warriors failed to develop reliable accurate, reliable data on the key variable in the entire transportation analysis, i.e., the number of people traveling to events in the peak PM time period when traffic and transit crowding are at their worst. A lead agency "must use its best efforts to find out and disclose all that it reasonably can." (CEQA Guideline, § 15144.)

The above quoted rationales do not excuse this failure. The scoping comments flagging this issue were submitted to the City between November 19, 2014, and December 19, 2014, during the middle of the basketball season. (DSEIR, p. 2-8 and 2-9, 2-15.) The Warriors played fifty-seven (57) games between December 19, 2014, through the close of the regular season on April 15, 2015.[6] There are thirty (30) teams in the NBA.[7] That means there were approximately eight-hundred and fifty five (i.e., 15 x 57 = 855) regular season games played in the 2014-2015 regular season after December 19, 2014. In the playoffs following the regular season, sixteen teams played a total of seventy-nine games after April 15, 2015.[8]

Therefore, both the Warriors and the City had ample opportunity to conduct market research by interviews and exit polling of a sample of the hundreds of thousands of fans attending these games to discover how far in advance of arriving at the turnstile they traveled through the traffic and transit impacted area surrounding the venue. The City's and Warriors' decision to pass up this opportunity after being informed of the issue does not satisfy their duty to use best efforts to find out

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> Event staff for basketball games would be expected to arrive between 4:30 and 5:00 p.m. and would be on post prior to the gate opening time; event staff would leave between 11:00 and 11:30 p.m.

(DSEIR, p. 5.2-82.)

[6]http://www.nba.com/warriors/schedule,

[7]http://www.nba.com/teams/?ls=iref:nba:gnav

[8]http://www.nba.com/playoffs/

and disclose all they reasonably can.

Indeed, the City was fully aware of the need to gather information more relevant to fans "time of travel" than turnstile counts and made some efforts to do so. But it failed to disclose that there are alternative metrics for "time of travel" or the results of its efforts in this regard. For example, an email exchange dated January 12, 2015, between the City's EIR consultant (ESA) and City Planning officials includes data on arrivals before 6:00 p.m. at the Arco Arena parking lot for a 7:00 p.m. Sacramento Kings game and arrivals before 6:00 p.m. in buildings for other NBA venues. Thus, the City was aware of other measurements (e.g., parking lot entry rather than turnstile counts) that could more accurately predict peak PM period travel to games.

Also, the arrival numbers cited in this email exchange show 14% arriving at the Arco Arena parking lot before 6 p.m. for one 7 p.m. game and 9% arriving before 6 p.m. in buildings for other NBA venues. These numbers indicate the DSEIR's assumption that 5% of fans will be traveling through the study area before 6 p.m. for 7:30 p.m. games is vastly understated. Yet the DSEIR fails to reference these numbers.

The DSEIR must be revised to provide accurate peak period traffic data and analysis

2. The DSEIR's Analysis of the Project's Cumulative Impacts Does Not Comply With CEQA.

a. The 5% threshold of significance for impacts at intersections and freeway ramps operating at LOS E or F violates CEQA.

For intersections operating at LOS E or F, the DSEIR uses a threshold of significance of "a contribution of 5 percent or more to the traffic volumes at the critical movements operating at LOS E or LOS F" (DSEIR, p. 5.2-73-74.) For freeway ramps operating at LOS E or F, the DSEIR uses a threshold of significance of "a contribution of 5 percent or more to the traffic volumes on the ramp." (DSEIR, p. 5.2-74.)[9]

No rationale for the 5% threshold is provided. Indeed, blind reliance on this number ignores the law governing the assessment of cumulative impacts, which requires a fact based assessment that takes into account the severity of preexisting impacts. A one-size-fits-all "ratio" violates CEQA. (See *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120 ("*Communities*"); *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d

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[9]"The project may result in significant adverse impacts at intersections that operate at LOS E or LOS F under existing conditions depending upon the magnitude of the project's contribution to the worsening of the average delay per vehicle." (DSEIR, p. 5.2-45.)

692, 720-21 (*Kings County*). *Communities* and *Kings County* teach that the significance of a cumulative impact depends on the environmental setting in which it occurs, especially the severity of existing environmental harm, and that focusing on the magnitude (i.e., "ratio") of the Project's incremental contribution to severe preexisting harm is inconsistent with the definition of cumulative impacts under CEQA.[10]

b. The year 2040 baseline for assessing the significance of the Project's cumulative impacts violates CEQA.

The DSEIR assesses the Project's incremental traffic and transit impacts and its cumulative traffic and transit impacts pegged to the year 2040, which is 25 years in the future.[11] While the Alliance supports such long range forecasting in general, as used in this DSEIR the year 2040 baseline for assessing the significance of the Project's cumulative impacts is misleading, for two reasons.

First, this approach overlooks the Project's cumulative traffic and transit impacts pegged to its first 1 to 10 years of operations. This time period is of immediate interest to the citizens of San Francisco because the traffic mess predicted by the DSEIR will be upon them then. And who among them know whether they will even be in the City by the year 2040. Thus, while including a year 2040 baseline is not in itself objectionable, the omission of a baseline 5 to 10 years in the future

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[10](*Communities,* 103 Cal.App.4th at p. 120 ["[T]he relevant question"... is not how the effect of the project at issue compares to the preexisting cumulative effect, but whether "any additional amount" of effect should be considered significant in the context of the existing cumulative effect. [footnote omitted] In the end, the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant. [footnote omitted]"]; *Kings County,* 221 Cal.App.3d at pp. 720-21 ["They contend in assessing significance the EIR focuses upon the ratio between the project's impacts and the overall problem, contrary to the intent of CEQA.... We find the analysis used in the EIR and urged by GWF avoids analyzing the severity of the problem and allows the approval of projects which, when taken in isolation, appear insignificant, but when viewed together, appear startling. Under GWF's 'ratio' theory, the greater the overall problem, the less significance a project has in a cumulative impacts analysis. We conclude the standard for a cumulative impacts analysis is defined by the use of the term 'collectively significant' in Guidelines section 15355 and the analysis must assess the collective or combined effect of energy development"].)

[11]"Future 2040 cumulative traffic volumes were estimated based on cumulative development and growth identified by the San Francisco County Transportation Authority SF-CHAMP travel demand model, using model output that represents Existing conditions and model output for 2040 cumulative conditions." (DSEIR, p. 5.2-110.)

renders the DSEIR informationally defective.

Second, by using a baseline projected to the year 2040, the DSEIR inflates the denominator in the 5% "ratio" it uses to determine the significance of Project cumulative impacts at LOS E and F intersections, thereby masking actual significant effects. (See Exhibit 2 (D. Smith), p. 25.)

c. The DSEIR's use of a "projection" based approach to the Project's cumulative impacts is misleading.

The DSEIR states that:

> Future 2040 cumulative traffic volumes were estimated based on cumulative development and growth identified by the San Francisco County Transportation Authority SF-CHAMP travel demand model, using model output that represents Existing conditions and model output for 2040 cumulative conditions. .... The 2040 cumulative traffic volumes take into account cumulative development projects in the project vicinity, such as the build-out of the Mission Bay Area, completion of the UCSF Research Campus and the UCSF Medical Center, the Mission Rock Project at Seawall Lot 337, Pier 70, etc., as well as the additional vehicle trips generated by the proposed project.

(DSEIR, p. 5.2-110.)[12]

The DSEIR presents no evidence supporting the DSEIR's assumption that the year 2040 projection is reliable for predicting future traffic and transit demand, other than the vague assertion that the "SF-CHAMP travel demand model, using model output that represents Existing conditions and model output for 2040 cumulative conditions ... has been validated to represent future

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[12]In the section titled "Approach to Cumulative Impact Analysis" (DSEIR 5.1-6, § 5.1.5), the DSEIR asserts that the CEQA Guidelines provide "two approaches to a cumulative impact analysis ... (a) the analysis can be based on a list of past, present, and probable future projects producing related or cumulative impacts; or (b) a summary of projections contained in a general plan or related planning document can be used to determine cumulative impacts. The projections model includes individual projects and applies a quantitative growth factor to account for other growth that may occur in the area." (DSEIR, p. 5.1-7.) The DSEIR asserts that "The analyses in this SEIR employ both the list-based approach and a projections-based approach, depending on which approach best suits the individual resource topic being analyzed ... the Transportation and Circulation analysis relies on a citywide growth projection model that also encompasses many individual projects anticipated in and surrounding the project site vicinity, which is the typical methodology the San Francisco Planning Department applies to analysis of transportation impacts." (DSEIR, p. 5.1-7.)

transportation conditions in San Francisco." (DSEIR, p. 5.2-110.) But, as explained by Mr Smith, the SF-CHAMP model's margin of error is greater than the 5% threshold used to determine the significance of Project cumulative impacts at LOS E and F intersections. (See Exhibit 2 (D. Smith), p. 25.) Therefore, SF-CHAMP is the wrong tool for the task.

Further, given the sheer number of developments in this area of the City (see table 3 of Mr. Wymer's report) and the breakneck pace of their approval and implementation, the projection approach is misleading, not informative. Therefore, the DSEIR's cumulative impact assessment must use a list based approach to forecast reasonably foreseeable travel demand, and do so in a meaningful time frame.

F. The DSEIR's Methodology for Analyzing Project Impacts on the Transit System Is Legally Flawed.

The DSEIR summarizes its methodology for analyzing Project Impacts on the transit system, as follows:

> The impact of additional transit ridership generated by the proposed project on local and regional transit providers was assessed by comparing the projected ridership to the available transit capacity at the maximum load point. Transit "capacity utilization" refers to transit riders as a percentage of the capacity of the transit line, or group of lines combined and analyzed as screenlines across which transit lines travel. The transit analyses were conducted for the peak direction of travel for each of the analysis time periods.

(DSEIR, p. 5.2-75.)

This methodology contains two flaws. First, it suffers from the same unwarranted and unsupported assumptions about basketball fans' time of travel to the arena for games described above. Second, the DSEIR's use of transit screenline and route capacities is also misleading and unsupported.

1. The DSEIR's use of transit screenline and route capacities is misleading and unsupported.

For its Project specific (or incremental) transit impact analysis, the DSEIR uses the following thresholds of significance:

> The proposed project was determined to have a significant transit impact if project-generated transit trips would cause downtown or regional screenlines, and, where applicable, directly affected routes, operating at less than its capacity

> utilization standard under existing conditions, to operate at more than capacity utilization standard. For Muni, the capacity utilization standard is 85 percent for conditions without an event at the project site, and 100 percent for conditions with an event at the project site. For regional operators, the capacity utilization standard is 100 percent for conditions without and with an event at the project site.

(DSEIR, p. 5.2-76, 77.)

For its cumulative transit impact analysis, the DSEIR uses the following thresholds of significance:

> Under 2040 cumulative conditions, the proposed project was determined to have a significant cumulative impact if its implementation would cause the capacity utilization at the Muni and regional screenlines and/or corridors within the screenlines to exceed the capacity utilization standard noted above for conditions without and with an event at the project site, or if its implementation would contribute considerably to a screenline or corridor projected to operate at greater than the capacity utilization standard under 2040 cumulative plus project conditions (i.e., a contribution of 5 percent or more to the transit ridership on the screenline or route). In addition, if it was determined that the proposed project would have a significant project-specific transit impact under existing plus project conditions, then the impact would also be considered a significant cumulative impact under 2040 cumulative conditions.

(DSEIR, p. 5.2-76, 77.)

For both Project specific (incremental) and cumulative impacts, the DSEIR uses "capacity utilization standards" as baselines against which to measure the Project's impacts. Capacity utilization standards are specific percentages of the theoretical maximum capacity of a transit screenline or transit line.

For Project specific (or incremental) thresholds of significance for Muni, the DSEIR uses two different capacity utilization standards against which to measure the Project's impacts. For conditions without an event at the Project site, the capacity utilization standard is 85 percent of maximum theoretical capacity of the transit screenline or line. For conditions with an event at the Project site, the capacity utilization standard is 100 percent of maximum theoretical capacity.

If the question to be answered by the transit impact analysis is whether the Project will inflict significant suffering on people riding Muni, why does the DSEIR use two different baselines for its impact assessment. If exceeding 85% inflicts suffering without an event, then exceeding 85% will inflict suffering with an event.

The DSEIR does not examine this use of inconsistent baselines. However, the June 21, 2013, Planning Department Memorandum "Transit Data for Transportation Impact Studies" (at Appendix-TR, p. TR-624) states:

> The SFMTA Board has adopted an "85 percent" capacity utilization standard for transit vehicle loads. In other words, transit lines should operate at or below 85 percent capacity utilization. The SFMTA Board has determined that this threshold more accurately reflects actual operations and the likelihood of "pass-ups" (i.e., vehicles not stopping to pick up more passengers). The Planning Department, in preparing and reviewing transportation impact studies, has similarly utilized the 85 percent capacity utilization as a threshold of significance for determining peak period transit demand impacts to the SFMTA lines.

(DSEIR, Appendix-TR, p. TR-624.) Thus, the 85 percent capacity utilization threshold apparently has nothing to do with the suffering of Muni's passengers; it simply reflects the reality of Muni's operations. And even if 85% of capacity is the break point at which Muni drivers tend to refuse to pick up more passengers due to overcrowding, then using 100% of capacity as a threshold of significance is entirely unsupportable.

For its cumulative impact analysis, the DSEIR uses the same baselines and thresholds of significance discussed above plus one more if the Project "would contribute considerably to a screenline or corridor projected to operate at greater than the capacity utilization standard under 2040 cumulative plus project conditions (i.e., a contribution of 5 percent or more to the transit ridership on the screenline or route)."

The 5% threshold for determining a Project's contribution to be "considerable" is stated at Appendix-TR, p. TR-625. No rationale for this number is provided. A Project contributing 1% more capacity utilization to a screenline that usually operates at 84%, resulting in a total capacity utilization of 85%, may not contribute considerably to a significant impacts, while a Project contributing 1% more capacity utilization to a screenline that usually operates at 94%, resulting in a total capacity utilization of 95%, may well contribute considerably to a significant impact. A one-size-fits-all "ratio" violates CEQA. (See *Communities, supra; Kings County, supra*.)

G. The DSEIR Unlawfully Defers the Development of Mitigation Measures.

The DSEIR sketches out a number of concepts for mitigating the Project's significant transportation effects where it defers the development of specific mitigation measure until a future date. The DSEIR's deferral all of the mitigation measures listed below in this section does not meet CEQA requirements to identify specific mitigation measures in the Draft EIR so the public may meaningfully review and comment on them. These measures violate CEQA's requirements for deferred mitigation because the DSEIR does not specify binding performance standards by which

the measures' success can be judged, there is no evidence it is impracticable to develop and include the specific measures in the DSEIR, there is no evidence the measures will be effective, there is no evidence the measures are feasible, there is no evidence the measures will be implemented because the Project Sponsor may deem them infeasible, and the measures are not enforceable. (See *Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 95 (*CBE*); *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; 1394 (*Gentry*).

The listed measures are qualified by language such as "if feasible" or "could include" (e.g., Measure M-TR-2b). Such qualifications render the measures illusory, unenforceable, and ineffective for purposes of the DSEIR's claim of substantial reductions in impact or reductions in impact to less-than-significant levels. (See *Federation of Hillside & Canyon Associations v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1260-1262; *Lincoln Place Tenants Association v. City of Los Angeles* (2005) 130 Cal.App.4th 1491, 1508 ["mitigating conditions are not mere expressions of hope..."].)

Even the listed measures that include performance standards (e.g., Measure M-TR-18) do not require they be achieved. For example, Measure M-TR-18 only requires that the Project Sponsor "work to achieve" the performance standards. CEQA requires that deferred mitigation measures include binding performance standards.

- Mitigation Measure M-TR-2b: Additional Strategies to Reduce Transportation Impacts. (DSEIR, p. 1-15.)

- Mission Bay FSEIR Mitigation Measure E.47: Transportation System Management Plan. (DSEIR, p. 1-17.)

- Mitigation Measure M-TR-5a: Additional Caltrain Service. (DSEIR, p. 1-18.)

- Mitigation Measure M-TR-5b: Additional North Bay Ferry and/or Bus Service. (DSEIR, p. 1-19.)

- Mitigation Measure M-TR-9a: Crane Safety Plan for Project Construction. (DSEIR, p. 1-20.)

- Mitigation Measure M-TR-9d: Event Center Exterior Lighting Plan. (DSEIR, p. 1-21.)

- Mitigation Measure M-TR-11b: Participation in the Ballpark/Mission Bay Transportation Coordinating Committee. (DSEIR, p. 1-22.)

- Mitigation Measure M-TR-11c: Additional Strategies to Reduce Transportation Impacts of Overlapping Events. (DSEIR, p. 1-23.)

- Mitigation Measure M-TR-13: Additional Muni Transit Service during Overlapping Events.

(DSEIR, p. 1-24.)

- Mitigation Measure M-TR-14: Additional BART Service to the East Bay during Overlapping Events. (DSEIR, p. 1-24.)

- Mitigation Measure M-TR-18: Auto Mode Share Performance Standard and Monitoring. (DSEIR, p. 1-25.)

H. The DSEIR's Discussion of Transportation Impacts Is Incomplete.

The DSEIR analyzes transportation impacts in two broad scenarios: with and without implementation of the Special Events Transit Service Plan.

In the scenario "With Implementation of the Special Events Transit Service Plan" the DSEIR analyzes two narrower scenarios: with and without a Giants game. In each Giants game scenario, the DSEIR analyzes three narrower scenarios: no event, convention event, and basketball game. The result is six scenarios applied to ten different transportation resources, as shown in Table 2.

Table 2

With Implementation of the Special Events Transit Service Plan					
Without Giants game			With Giants game		
No event	Convention event	Basketball game	No event	Convention event	Basketball game
TR-1 Construction - Traffic LS TR-2 Traffic - Intersections SUM TR-3 Traffic - Freeway Ramps SUM TR-4 Transit - Muni LS TR-5 Transit - Regional - Caltrain SUM TR-6 Pedestrian LSM TR-7 Bicycle LS TR-8 Loading LS TR-9a Construction Helipad LSM TR-9b Const. Lights Helipad LS TR-9c Operation Helipad LS TR-9b Operation Lights Helipad LSM TR-10 Emergency Vehicle Access LS			TR-1 Construction - Traffic LS TR-11 Traffic - Intersections SUM TR-12 Traffic - Freeway Ramps SUM TR-13 Transit - Muni LSM TR-14 Transit - Regional -All SUM TR-15 Pedestrian LSM TR-16 Bicycle LS TR-17 Emergency Vehicle Access LS		

In the scenario "Without Implementation of the Special Events Transit Service Plan"

the DSEIR analyzes only one narrower scenario: without a Giants game and with a basketball game. The result is one scenario applied to ten different transportation resources, but the omission of the other five scenarios, as shown in Table 3.

Table 3

Without Implementation of the Special Events Transit Service Plan	
Without Giants game	
Basketball Game	
TR-1 Construction - Traffic	LS
TR-18 Traffic - Intersections	SUM
TR-19 Traffic - Freeway Ramps	SUM
TR-20 Transit - Muni	SUM
TR-21 Transit - Regional	SUM
TR-22 Pedestrian	LSM
TR-23 Bicycle	LS
TR-24 Loading	LS
TR-25Emergency Vehicle Access	LS

Since the scenario "Without Implementation of the Special Events Transit Service Plan" is likely enough to justify including it in the DSEIR, the DSEIR should include the other five omitted scenarios.

In addition, the DSEIR's cumulative impact analysis does not even inform the reader if it is performed for the "with" or "without" scenario for "Implementation of the Special Events Transit Service Plan." The cumulative impact analysis should include both scenarios, and should inform the reader which is which.

Thank you for your attention to this matter.

Very Truly Yours,

Thomas N. Lippe

List of Exhibits

1. July 23, 2015, letter report authored by traffic engineer Dan Smith.

2. July 21, 2015, letter report authored by traffic engineer Larry Wymer.

3. January 12, 2015, email exchange dated between the City's EIR consultant (ESA) and City Planning officials.

4. December 2013, Final Report, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.

5. Final Report Appendices, Appendix B: White Paper, TRANSPORTATION NEEDS, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.

6. Final Report Appendices, Appendix C: CORE CIRCULATION STUDY, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.

7. Final Report Appendices, Appendix K: SF TRAVEL AT A GLANCE, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.

8. May 21, 2013, San Francisco Transportation Plan Update, SPUR Annie Alley Forum, San Francisco Transportation Plan 2040, prepared by San Francisco County Transportation Authority.

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EXHIBIT 1

SMITH ENGINEERING & MANAGEMENT

July 26, 2015

Mr. Tom Lippe
Law Offices of Thomas N. Lippe, APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Draft Subsequent Environmental Impact Report for Event Center and Mixed Use Development at Mission Bay Blocks 29-32. SCN:2014112045

P15003

Dear Mr. Lippe:

Per your request, I have reviewed the Draft Subsequent Environmental Impact Report (hereinafter "the DSEIR") on the above referenced Project in the City and County of San Francisco (hereinafter "the City"). The focus of my review is in regard to matters involving transportation and circulation. My qualifications to perform this review include registration as both a Civil and Traffic Engineer in California and 47 years professional consulting practice in these fields. I have prepared, reviewed, and commented on the traffic and circulation components of numerous environmental impact documents under the California Environmental Quality Act (hereinafter "CEQA"), working for Lead Agencies, Responsible Agencies and private citizens and organizations. I am familiar with the Project vicinity, having lived and worked in the Bay Area since 1967 and having been involved in numerous significant projects affecting the San Francisco Waterfront including a decade of planning studies for the Mission Bay development. My professional resume is attached. My comments follow.

The DSEIR's Transportation Impact Analysis Understates and Fails To Disclose and Mitigate Arena Event Impacts on PM Commute Peak Hour Travel Because It Fails to Consider the Time and Duration of Attendees Travel In Advance of Passing Through Venue Entry Turnstiles

The DSEIR considers turnstile data on time of arrival at the Golden State Warriors current venue site (Oracle Arena) and other basketball venues to

estimate how many attendees traveling to a game with a 7:30 PM start time would be traveling on the area transportation system in the 4 to 6 PM peak commute period versus in the 6 to 8 PM early evening peak shoulder period. However, it uses an overly simplistic relationship between turnstile arrival data and whether the attendee traveled in the 4 to 6 peak or in the 6 to 8 shoulder: If the attendee arrives at the turnstiles more than 1.5 hours before the 7:30 event start, they are assumed to have traveled in the 4 to 6 peak; if they hit the turnstiles less than 1.5 hours in advance of the event start, they are presumed to have traveled in the 6 to 8 shoulder. The problem with this is it fails to take into account the duration of each attendee's travel (which varies by where each person is coming from, the mode or modes they choose and the travel time on that mode or modes). It also fails to consider the substantial portion of attendees who, rather than passing through the turnstiles immediately, choose to remain outside for a while (such as stopping at a nearby restaurant / bar for a meal or drinks, or just waiting outside, as in the circumstance where 2 or more people are going to sit together but are traveling independently from different points and one person has all the tickets). Turnstile data is only a weak surrogate measure for end-time of trip for travel to stadium and arena event venues. It is weak and non-representative of the actual times attendees may be traveling on the transportation system for the following reasons. Many attendees at weeknight Warriors games will be coming from places where they will have to travel more than 45 minutes or an hour to get there. Many attendees, when they reach the area of the Project will choose to patronize nearby bars or restaurants or need to wait outside to meet up with others. In reality, someone who has traveled an hour to get to the Project site and passes through the turnstile directly on arrival at 6:30, say, will have actually completed a substantial portion of their trip within the PM peak hour. Another person who has only traveled for, say, 45 minutes but spends a half-hour in a nearby bar before passing through the turnstiles at 6:45 will also have completed most of their trip in the PM peak hour. These offsets of actual time-of-travel on the transportation system from time of passage through the turnstiles are not adequately considered in the DSEIR.

The DSEIR States that 5 percent of arriving 7:30 PM basketball event attendees arrive between 5:00 and 6:00 PM (per Table 5.2-21) which would be 903 person trips for 18,064 maximum attendance. However, Table 5.2-22 shows a total of 1,803 person trips within the 4-6 PM peak hour. Presumably, this discrepancy accounts for roughly 900 trips of the assumed 1100 day-of-game workers (ushers, ticket-takers, vendors, event-level security personnel and other day-of-game functionaries who generally need to be in place when the turnstiles open). Some 95 percent of the attendees are assumed to arrive in the 6 – 8 PM early evening peak shoulder per Table 5.2-21 with the maximum arrival hour between 7 and 8 pm involving 11,742 trips (65 percent of attendees per Appendix TR Table 3).

But, considering the facts that:

- over 70 percent of the attendees will be coming from outside San Francisco (including 31.1 percent from the East Bay, 8.9 percent from the North Bay, 26.7 percent from the South Bay and 4 percent from completely outside the Bay Region)[1] meaning many of their trips to the Project site will take 45 minutes to an hour or more,
- many attendees will, after traveling to the vicinity of the Project site, stop in neighboring restaurants and bars for drinks or a meal, thereby advancing the actual time of their trip ahead of their time of passage through the arena turnstiles by 30 minutes to an hour or more. This would apply to attendees coming from points in San Francisco as well as those making longer trips.
- many of the attendees, after completing their trip to the site, may need to wait to meet with others before passing through the turnstiles, thereby advancing the actual time of their trip ahead of their time of passage through the arena turnstiles. While some waits to meet are of short duration, the arrivals may often be disparate by 30 minutes or more. This would apply to attendees coming from points in San Francisco as well as those making longer trips.

When all of these factors are considered, it seems highly probable that as much as one-third or more of the trips that the DSEIR considers to take place in the 6 to 7 PM period and the 7 to 8 PM period would actually be on the transportation system in the more critical 5 to 6 PM commute peak hour. That would put 7,466 event-related travelers on the transportation system in the 5 PM to 6 PM period instead of the 1,866 assumed in the DSEIR, a difference that would likely result in transportation impacts not disclosed in the DSEIR and/or intensification of impacts and mitigation needs of those that were disclosed.

These considerations are so obvious to any transportation professional knowledgeable about sports stadium transportation issues that the analysis presented in the DSEIR cannot be said to constitute the good faith effort to disclose impact that the California Environmental Quality Act demands.[2] Since the entire analysis of transportation impacts flows from the estimate of trip generation and time-of-travel analysis, the entire transportation impact component of the DSEIR must be redone to accurately reflect the time that event attendees are actually

[1] Per DSEIR Appendix TR Table 8 at page TR 25.
[2] This commenter has consulted regarding transportation issues related to many professional sports stadiums and arenas. In addition, by being an attendee at a very large number of professional sports events and concert events, this writer has observed with a professional eye the transportation and pre-event behavior of attendees at nearly 1200 major league stadium and arena events at various venues. The writer has held season tickets to the Giants at their current venue for 8 years, to the 49ers for 33 years, to the Oakland Raiders for 20 years and a quarter-share of season tickets to the San Jose Sharks.

traveling on the transportation system instead of the time they enter the event venue.

In order to illustrate how consequential is the DSEIR's failure to consider the time difference between the time when event attendees pass through the arena turnstiles and the time when they are actually travelling on the transportation system, we review a simplified scenario. Undisputedly, people who pass through the arena turnstiles in the half-hour between 6:00 AND 6:30 PM were traveling on the transportation system before 6 PM – that is, within the 5 to 6 PM peak period. DSEIR Table 5.2-21 at page 5.2-83 estimates that 11 percent of turnstile arrivals do so in the 6:00 to 6:30 PM half-hour, amounting to 1987 person trips at capacity basketball attendance of 18,064. When these trips are added to the 1803 trips the DSEIR already estimates are traveling in the 5 to 6 pm peak hour[3] , there would really be a total of 3790 Project basketball-related trips traveling in the pm peak hour. In other words, the Project's basketball-related trips in the PM peak hour would be more than doubled (actual factor 2.102).

The effects of a doubling of PM peak hour travel attributable to adding the Project with a 7:30 PM basketball game as compared to what the DSEIR estimates would be most evident at the intersection of Seventh Street with Mission Bay Drive where, instead of operating at LOS D as projected in table 5.2-24, it would operate at deficient LOS E, a significant impact. The effect on outbound MUNI lines T Third and 22 Filmore requires some special attention because Table 5.2-40 is obviously in error, showing the ridership on each of these lines as being *less* with a basketball game than without one. This is completely inconsistent with the text in the first bullet point on page 5.2-141 which states that a basketball game would add 681 new outbound transit trips to these lines in the PM peak hour. If we correct the table to be consistent with the text of the DSEIR analysis, the DSEIR's analysis of these two lines in the "with basketball" scenario should show a total outbound ridership of 3862 trips (or 81.3 percent of capacity).[4] If we add to that the riders who pass through the turnstiles in just the 6 to 6:30 PM period who, because of the offset between overall ride time and the 6-to 6:30 turnstile entry count, must have been riding on the transportation system in the 5 to 6 PM commute peak hour, the analysis would show an added ridership due to basketball of 1431, a net ridership in that situation of 4612, and a capacity utilization of 97.1, extremely close to crush capacity.[5]

[3] See DSEIR Table 5.2-24 at page 5.2-90.
[4] Regardless of whether the City agrees with our further analysis of the PM peak ridership with a basketball game, it must correct this table to make it consistent with the analysis findings in the text.
[5] Under the City's normal impact threshold, which is riders exceeding 85 percent of screenline capacity, this would be a significant impact on transit. However, because the City has improperly created a Project-specific impact threshold of 100 percent of screenline capacity for this Project, the ridership would fall just below the gerrymandered impact threshold. The impropriety of creating a specially relaxed threshold of impact for this one Project is discussed in a subsequent section.

The DSEIR Only Analyzes Impacts of Weeknight Basketball Games That Start at 7:30 PM, Not at Other Start Times Closer to the PM Peak.

The only scenarios analyzed involving weeknight basketball games assume a start time of 7:30 pm. But this is not the only times that weeknight basketball games start although it does account for a majority. In the three preceding full seasons to the time of the NOP, 6 percent of the weeknight home games started at 6 PM (average 2.5 games per season) and over the three seasons there were individual games starting at 5 PM and 7 PM. However, the recently completed season proves that earlier games than 7:30 PM start times are not likely to be just a rarity in future years. In the three regular seasons considered in the DSEIR, the Warriors team was mediocre to 'emerging'. However, after this year's excellent regular season, the team played 11 home playoff games, seven of which were weekday games that started at 6 PM. With an outstanding young team, the prospects are that the team could play similar numbers of home 6 PM weeknight playoff games (6 PM being the time nationally broadcast weeknight games normally start) for several seasons hence. Moreover, the national attention this team has attracted could result in several more national broadcasts of regular season home games (also normally starting at 6 PM). So there is a substantial likelihood that weeknight 6 PM games could become a frequent occurrence rather than a rarity. There might easily be 16 out of 54 or so combined regular season and playoff home games that start at 6 PM, or just under 30 percent of the total weeknight home games. Obviously, the 6 PM start puts more travel pressure on the 4 – 6 PM peak. The DSEIR should analyze this basketball start time as a separate scenario rather than dismissing it as an anomaly

The City's Process for Evaluating a Project's Impacts on Public Transit Evades Disclosure of Significant Impacts

The City's process for evaluating transit impacts for projects in the "greater downtown area" (the C-3, SOMA and Mission Bay districts) is to consider peak hour ridership on the routes that cross designated screen lines across portions of the City or, for regional routes, on its perimeters versus the aggregate capacity of the peak hour services crossing those screenlines. There are several problems with this procedure that result in failure to disclose impacts.

- Considering aggregate capacity across screen lines versus aggregate patronage does not reasonably disclose impacts. For the routes inside San Francisco served by the San Francisco Municipal Railway (MUNI), a standard has been established that there is significant impact when ridership crossing the screen line exceeds 85 percent of capacity on that screen line. But this standard of significance involves an underlying assumption that individual travelers could use any of the routes crossing a particular screen line to accomplish their trip. But in actual fact, an

individual traveler's particular trip is most often only well served by one route. When some routes crossing a screen line are heavily patronized while others are less patronized, the excess capacity on the less popular routes does not cancel out the overcrowding on the most popular routes. It is noted that the City Planning Department can request that transit impacts be analyzed on an individual line basis. When this is done, if the individual line ridership exceeds 85 percent of capacity *and the project's contribution exceeds 5 percent of the total ridership at its maximum load point (MLP)*, then the project would be found to have significant transit impact.
- MUNI's capacity standards per vehicle involve percentages of standees above seating capacity ranging from 30% to 80% of seating capacity (depending on vehicle type); therefore, the above addition of 5 percent ridership to the impact threshold in analysis of individual lines represents a substantial crush loading.
- The capacity as considered in the analysis is the theoretical capacity of the services as scheduled. However, rarely, if ever, does MUNI deliver all of its scheduled service. San Francisco Municipal Transportation Authority statistics show that MUNI typically delivers an average of between 95 and 98 percent of scheduled services although on some days the percentage of missed runs can be much worse. MUNI's goal is to only deliver 98.5 percent of scheduled service. Principal causes of missed runs include driver unavailability, insufficient vehicle availability and in-service breakdowns. On the light rail lines, the percentage of weekdays when enough light rail vehicles were operationally available to deliver scheduled service averaged only 61.7 percent in fiscal year 2014 and was well under 50 percent in the two preceding years.
- Difficulty maintaining schedule reliability (on-time performance) exacerbates capacity problems. Muni's on-time performance is normally less than 20 percent. As a result, there is difficulty maintaining planned headways between vehicles on a given route. Bunching occurs. When that happens, the lead vehicle in a bunch becomes overcrowded while the one or more closely following vehicles in the bunch are underutilized. Muni experiences bunching on about 4 percent of its trips overall; in excess of 5 percent on its "Rapid Network".

If the threshold of impact were measured at 85 percent of the capacity of *actual effective service delivered* instead of *theoretical schedule-based service capacity*, more of the individual lines and screen lines would be found to be closely approaching or above the 85 percent of capacity criterion. And as a consequences of these circumstances in the City's procedures and policy criteria, it is rare for a project to be found to have significant impact on MUNI transit services despite the fact that the public perception is that MUNI is overburdened and dysfunctional.

We also note that for scenarios involving arena events at this Project, the DSEIR alters the City's normal criterion for evaluating transit impacts, changing the threshold of significant impact from 85 percent of capacity to 100 percent of capacity. Its basis for making this alteration, which tends to shield the Project from disclosure of significant transit impacts, is that event-goers accept a higher level of crowding than normal riders. However, "accept" is too generous a word. Nobody wants to ride in 'crush load' conditions. Event attendees grudgingly tolerate 'crush loads' as the least undesirable of their other options of a)walking long distances, b)paying much more for taxis or shared ride services, c) paying even much more to drive and park or d) (only in the post-event exit) waiting until the crowding has dissipated. Moreover, this shift in acceptability criterion is impactful of itself in that it imposes the values and tolerances of event-attendees upon normal riders who use the involved lines at that particular time of day. Furthermore, the DSEIR is unclear whether the change in impact criterion is operative only for lines directly serving the Project site, or system-wide, which would have a far greater impact on normal riders. The City's action to alter its normal thresholds of impact in the case of one particular project to lessens the chance of findings of significant impact and is not consistent with the good faith effort to disclose impact that CEQA demands. The City should faithfully disclose impacts as measured by its normal criteria, and, if it still wants to approve the Project, make findings of overriding considerations.

With regard to regional transit services, considering capacity versus ridership at San Francisco perimeter screenlines (North Bay, East Bay, South Bay) as the sole criterion of impact on the regional systems results in the analysis failing to address other significant impacts that are unrelated to corridor screenline ridership to capacity relationships. For example, in the case of BART, while Transbay capacity (the screen line analyzed) is a concern, an equal concern is the peak period platform capacity at the Embarcadero and Montgomery Street stations. These stations each individually serve 22 percent of all BART travelers and in the peaks are simultaneously serving peak-direction travelers to/from both eastbound and westbound corridors as well as serving contra-peak direction travelers in both directions. The platform congestion at both these stations is a serious operational and safety concern, has been documented in public[6], is visibly worse in the pm peak hour when the Giants have weekday night games scheduled and would presumably be similarly affected by weekday evening Warriors games and other large events at the Project. BART is actively developing designs for adding outboard platforms at both of these stations – a mitigation measure that the Project (and others) could make fair share contributions toward if the Project's impacts at these locations were properly

[6] See *BART Sustainable Communities Operations Analysis*, June 2013

analyzed. But for the present, the DSEIR's is deficient because it completely fails to analyze, disclose and mitigate the Project's impacts on this situation.

The City's Selections of Intersections (and Freeway Ramps) Studied in the DSEIR Excludes Intersections it Knew or Should Have Known Would Potentially Be Significantly Impacted by the Project

Intersections selected for study in the DSEIR for the subject Project exclude a number of intersection that were to be subject to analysis in the DEIR for the prior proposal for essentially the same project but located on the Piers 30/32 site. Among the intersections slated for study in the prior edition of the project but not studied in the current work are the 9 major intersections along Embarcadero from and including that with Brannan all the way to that with Broadway, plus those at Main with Harrison, Main with Bryant, Beale with Mission, Beale with Bryant, Delancy and the 80 on ramp, Fremont with each of Mission, Harrison and Folsom/80 off, Third with Harrison, Third with Mission, Second and Bryant, Second and Brannan, Second and King, Second and Bryant, First with Harrison and the 80 on ramp, Fourth and Howard, Fourth and Harrison/80 on ramp, Fourth and Bryant/80 off ramp, Bryant with Sterling/80 on ramp. Virtually all of these excluded intersections are heavily congested in the pm peak.

Although the Project location is now shifted to a site approximately 6800 feet south, and the DSEIR has added study intersections in that direction, the excluded intersections are still on the likely paths of traffic coming from the Northbay, Eastbay and northern parts of San Francisco. . The project is fundamentally the same size and will generate fundamentally the same amount of traffic. The amount of traffic through the excluded intersections approaching from and departing to the Northbay, Eastbay and northern parts of San Francisco is essentially unchanged from the totals that would have occurred with the Piers 30/32 site. So there is no reasonable logic for excluding these intersections from the current DSEIR analysis.

That the excluded intersections are at risk to be impacted by the Project is demonstrated in the DSEIR's own analysis of Alternatives to the Project. One of the alternatives it analyzes is putting the Project back on the previously proposed Piers 30-32 /Seawall Lot 330 site. Appendix TR at page TR-783 analyzes the project on the alternate (or formerly proposed site) at the intersections formerly proposed for evaluation. It shows the Existing + Project with Basketball Event would have significant project-specific impacts at 8 intersections, 5 of which are intersections excluded from the current DSEIR analysis of the Project at its current site, and would make significant contributions to traffic at 4 intersections already at LOS E or F, 3 of which are among the intersections excluded from the analysis of the Project at its currently proposed site. We reiterate, it is clear that most of the traffic contributory to the impacted intersections with the Project on the formerly proposed site would still pass through these intersections with the Project located at the currently proposed site. So the DSEIR is deficient for excluding these intersections from the analysis of the Project.[7]

We also note that DSEIR Figures 5.2-14 E and 5.2-14 F indicate that approximately 31 percent of Warriors game weekday and Saturday attendees would approach and depart two and from the northwest via 7th Street at times when there are no overlapping Giants games. Although the DSEIR does not specifically present usage of this corridor by Warrior's attendee traffic at times of overlapping Giants home games, it would doubtless be considerably greater. In both cases, this suggests that the capacity-challenged intersections of Seventh and Townsend, Seventh and Brannan, Eighth and Brannan and Eighth and Bryant should have been analyzed in the DSEIR. Please do so.

There is a similar situation with the study of freeway ramps. The current DSEIR analyzes 6 ramps. The study for the prior site analyzed 12 ramps. Four of the six ramps studied in the current work are new (not considered in the analysis of the former proposed site). In other words, ten of the ramps to be studied in the analysis of the prior site, all problematic in peaks, are eliminated from consideration. There is no reasonable justification for their elimination.

The Transit Analysis Understates Impacts Because It Relies On Stale Transit Baseline Data

This DSEIR's Notice of Preparation was filed on November 19, 2014. The DSEIR's transit impact analysis relies upon transit ridership data published in a City Planning Department memo dated June 21, 2013 entitled *Transit Data for Transportation Impact Studies*[8]. However, the data published in that memo is from counts taken in the fall of 2010 and in 2011. Between 2010/11 and late 2014 when the NOP was filed there have been a large number of significant development projects that have been completed and occupied in the C-3, SOMA and Mission Bay and numerous others approved and placed under construction. These render the transit database collected in 2010/11 stale for evaluation of a Project whose NOP was filed in late 2014. Hence, the transit analysis is inadequate for relying on stale data.

Similarly, for the regional transit corridor screenlines, the cited *Transit Data for Transportation Impact Studies* memo relies on data from a SFMTA TEP Project

[7] Our colleague, Mr. Larry Wymer of Larry Wymer and Associates Traffic Engineering has provided a separate letter of comment on this DSEIR (dated July 21,2015) that concurs in the need for study of additional intersections and provides supporting data.
[8] *Transit Data For Transportation Impact Studies* is reproduced in DSEIR Appendix TR at pages TR-624 thru TR-632.

document produced in October, 2012. Obviously, the transit ridership data in that document reflects observations some time before October, 2012. Again, significant development has occurred in the C-3, SOMA and Mission Bay between whenever the data published in October 2012 was collected and the date of the NOP for the subject Project. This would result in significantly heavier loadings on the regional transit carriers in the peak periods at the time of the NOP than represented in the *Transit Data for Transportation Impact Studies* memo. For example, the data relied on in the DSEIR indicates BART's Transbay peak hour ridership is 19,716. *BART Sustainable Communities Operations Analysis* report[9] indicates peak hour Transbay ridership at 21,600 passengers in 2012 and projects 21,815 peak hour peak direction riders by 2015. BART's ridership values would respectively put BART at 98 percent of capacity in 2012 and at 98.9 percent currently. This leaves considerably less capacity for peak hour travelers to the Project to be accommodated without impact.

The DSEIR transit analysis should be redone based on updated estimates of baseline transit ridership, taking into account projections of transit use from the environmental documents for all projects known to the City to have been completed since the time of the actual transit ridership counts or known to be reasonably certain, at the time of this Project's NOP, of being completed by the estimated time of completion of this Project

The Traffic Analysis Underestimates Impacts Because It Relies on Stale Baseline Data

The traffic impact component of the DSEIR relies on a number of traffic counts taken in 2013 and others in June, 2014. It adjusts those counts to account for traffic from the UCSF Medical Center Phase 1 and the Public Safety Building that are located close to the Project site and were under construction when the counts were taken but were occupied about the time of the NOP. However, it seems likely that there was other development in C-3, SOMA and Mission Bay completed in the period between when the 2013 counts were taken and the date of the NOP that would logically affect baseline traffic at some of the intersections analyzed in the DSEIR and still more that is known to the City to be reasonably certain of completion by the time of completion of the subject project. Please list all such developments and adjust the baseline traffic used in the DSEIR analysis accordingly.[10]

[9] *BART Sustainable Communities Operations Analysis*, Bay Area Rapid Transit District, June, 2013.
[10] The aforementioned separate comment letter on this Project by Mr. Larry Wymer includes a spreadsheet reflecting, to the best of Mr. Wymer's ability based on culling the posting of environmental documents of development projects on the City Planning Department's web site, a listing of such projects and the traffic they would contribute to locations that were or should have been studied in this DSEIR's traffic analysis. However, responsibility for developing a comprehensive list of such projects and adjusting the baseline for their effects rests with the City Planning Department that is charged with generating and maintaining these

The DSEIR Fails to Evaluate Impacts at Intersections Under PCO Control

The DSEIR does not report LOS or delay at intersections that are under PCO control in certain situations, claiming that LOS cannot be calculated for intersections under PCO control. However, this interpretation evades the issue of why PCO control is employed in the first place. The reason is because it is assumed or known through experience that these locations would become gridlocked (deep LOS F conditions) if left to automated traffic control. In theory, the PCO or group of PCOs is/are smarter than an automated traffic signal in such circumstances. In particular, the human controllers can observe downstream blockages and give advantage to movements with unblocked downstreams and alter phase sequences to give green to movements as their downstreams become unblocked. But fundamentally, any intersection under PCO control should be regarded as being at LOS F. But this poses another issue. There is no determination of how much worse (more impacted) conditions are in the Existing + Giants game + Warriors game situation than in the Existing + Giants game alone scenario. This determination is an essential purpose of this DSEIR and it is not being evaluated.

The DSEIR Fails To Evaluate Quantitatively the Severity of the Project's Traffic Impacts at Locations That Are Already In LOS F Condition

The DSEIR tables reporting intersection delay and intersection LOS for the various locations and scenarios analyzed fail to report the actual delay at intersections experiencing delay at or above the threshold of LOS F. They merely report the delay as being greater than 80 seconds of delay per vehicle. This manner of reporting prevents the public from knowing the severity of the Project's traffic impacts when it affects intersections already in impacted condition.

Most commercially available intersection LOS/delay calculation programs do calculate the actual delay of intersections that are above the LOS F threshold. It is the analyst's option to display the actual value in the program output or to suppress reporting it and display the >80 symbol. Some analysts claim that once an intersection is in LOS F, the delay value is irrelevant. But that is nonsense. If an existing condition is, say, just at the 80 second delay LOS threshold and a project causes the delay value to increase to 81 seconds, in that instance the degradation caused by the project may be almost imperceptible. But if the computation shows that the project increases delay to, say, 120 seconds per vehicle, than the degradation caused by the project is clearly quite severe and seriously impactful. Since an essential objective of an EIR is to disclose how

records, not to an independent party attempting to do so from the outside.

adverse or severe a project's impacts are, the DSEIR is deficient in failing to disclose information relative to severity that it easily could have disclosed.

The same considerations apply to the freeway ramp analysis where, once a ramp has reached the average vehicle density threshold of LOS F operations[11], the DSEIR presents a special character symbol instead of the actual density compiled, thereby thwarting the ability of the public or professional reviewers to understand how severe and adverse the impacts of the project really are. We also note that DSEIR Table 5.2-2 contains an apparent error in the entry for the I-80 eastbound ramp at Sterling for the weekday evening (6-8 PM) period. It reports that vehicle density is 38 vehicles per vehicle lane-mile but a LOS of C. If the density really is 38, this ramp would be in the LOS E-F range; if the LOS really is C, the density would have to be less than 28. Please correct the error.

Complex Interrelated Issues Are Not Addressed In the DSEIR

At present, persons traveling between BART or the MUNI LRT lines and the Project site can make a simple in-station transfer to/from the K-T line from any of the downtown Market Street stations. Once the Central Subway is completed, the T-Third line will no longer be directly inter-routed with the K-Ingleside line in the Market Street subway. Instead, access from BART and the Market Street LRT lines to the T line that serves the proposed Project site will only be via the Powell Street station and only via a 1,000 foot tunnel in the wrong direction that connects Powell to the Union Square station where T LRT trains can be boarded – an unattractive and slower transfer than at present. Although other MUNI LRT lines from the Market Street subway will continue to connect to 4th and King via the Embarcadero, passengers on those lines or those from BART who transfer to them at the Market Street stations will be faced with another transfer to the T-Third at that point or an walk of .8 miles to the Project site. These are less attractive options than what is available at present. With the rise of ride-share services like Uber and Lyft that can be summoned via a cell phone application – a new phenomenon, the percentage of persons who take ride share services or conventional taxi instead of transit all the way to the site may be far more than for AT&T Park events (which will continue to be served by LRT lines that stop directly in all the Market Street BART stations). This is detrimental as each time people use ride-share or conventional taxi services to

[11] Vehicle density, the number of vehicles per lane mile, is the logical measure of either congestion or high quality service on freeways and ramps in merge and diverge areas. In free-flowing conditions, vehicles operate with substantial space between them so the number of vehicles per lane mile is low. At highly congested conditions, stop-and-go or crawl speed operations, vehicles are closely spaced and the number of vehicles per lane mile is high. Per *Highway Capacity Manual 2000* the threshold for LOS E and F operations is 35 passenger car equivalents per lane-mile per hour. With true scientific caution, *Highway Capacity Manual 2000* counsels against reporting vehicle densities in the LOS E-F range because flow rates, a principle factor in calculating vehicle density, vary radically in LOS E-F situations. Nevertheless, the computed vehicle densities are what they are, and constitute the only reasonable way to measure weather the Project's effects on an already unacceptable ramp situation are significantly deleterious or not.

access the Project, they cancel the environmental savings of direct transit access usage and double the number of motor vehicle trips to the area as compared to if they drove and parked in the area (because the ride-share or taxi vehicle drives away after dropping passengers off). The DEIR does not appear to address these considerations. Please do so.

The DSEIR Cumulative Analysis Fails To Consider and Analyze the Project in the Context of the City's Proposal to Remove the Northern Portion of I-280 As Far South As the Mariposa Street Interchange

Since at least as long ago as 2012, the City has been actively considering a proposal to demolish the northern portion of I-280 as far south as the Mariposa Interchange, eliminating the on- and off -ramp connections to King Street and to Sixth Street[12]. If carried out, the I-280 truncation would shift much of the traffic that now uses those ramps to surface streets in the immediate vicinity (including two of the frontage streets) of the subject Project. Moreover, development of the site freed up would add to demands on the traffic and transit system. In view of the City's continuing active consideration and refined development of this proposed major change in transportation infrastructure[13] both well before and after the NOP for the subject Project, this DSEIR should have, at a minimum, in addition to the cumulative scenarios studied, analyzed the proposed Project in the context of an alternative transportation network scenario that reflects the truncation of I-280 as far south as the Mariposa Interchange. However, the DSEIR's only mentions the I-280 truncation project in two places. One is a single short background paragraph about ongoing projects in the vicinity of the site in the Appendix TMP introductory section. The other is a lengthier two-paragraph description at DSEIR pages 5.2-109 and 5.2-110. That section concludes by stating that the information on the 280 truncation is provided for information purposes only and that because that project is not fully designed, has not received the approval of other responsible agencies and is not funded, it is speculative and is not considered in the DSEIR cumulative 2040 analysis. However, since the City has already spent in excess of $ 1.7 million in design and feasibility studies, has already approached other responsible agencies for funding involvement and approvals and since it has such a vast potential consequence for the transportation network in the immediate area of the subject

[12] Evidence of this is the unveiling by the Mayor's Transportation Policy Director, Gillian Gillett, at a San Francisco Planning and Urban Renewal Association (SPUR) forum on January 10, 2013, releasing a City study deceptively named Fourth and King Street Railyards, Final Summary Memo dated December, 2012 and a related request dated January 7, 2013 by the Office of the Mayor to Steve Hemminger. Executive Director of the Metropolitan Transportation Commission.

[13] The City's continuing interest in the I-280 truncation is demonstrated by the initiation of the San Francisco Planning Department's *Railyard Alternatives and I-280 Boulevard Feasibility Study*, which began in June, 2014 and in the May 11, 2015 *San Francisco Chronicle* column by Matier & Ross lead by the statement "San Francisco Mayor Ed Lee is quietly shopping plans to tear down Interstate 280 at Mission Bay and build an underground rail tunnel through the area – complete with a station between the proposed Warriors arena and AT&T Park.".

Project by the forecast year of the cumulative analysis, and since that forecast year, 2040, is 25 years hence, it is evasive, irresponsible, improper for the City to have failed to at least considered an *alternative cumulative scenario* that assumes the latest design concept from the *Railyard Alternatives and I-280 Boulevard Feasibility Study* in *addition to* the cumulative scenario that was analyzed. The DSEIR should be revised to include such a cumulative alternative and recirculated in draft status for the 45 day review period.

There Is No Evidence The DSEIR Considered the Disruptive Impacts of the At-Grade Rail Crossing of 16th Street on Intersection LOS at the Intersections of 16th and 3rd and 16th and 7th Streets.

The Caltrain rail mainline crosses Sixteenth Street in an at-grade crossing between the study intersections of Sixteenth with Third and with Seventh Streets. In the 5 to 6 PM peak hour, gate closure protection to allow train passage blocks Sixteenth Street traffic 10 times and another 10 times in the 6 to 7 PM early evening peak shoulder period. Increased rail traffic and increased train lengths will increase the blockage time. There is no evidence this blockage has been taken into account in the LOS calculations for the nearby intersections.
If it has, please explain how. If it hasn't, please adjust the calculations or explain why not.

The Project's Truck Loading and Truck Staging Provisions Appear Inadequate.

With regard to loading facilities, the Project Description narrative at DSEIR page 3-20 states: "*The loading and service areas, including 13 truck loading docks, would be located on the Lower Parking Level 1"*. After describing dimensions of those loading dock spaces, the narrative continues: *"In addition to the 13 on-site below grade loading area, 17 on-street commercial loading spaces would be provided on South Street (8 spaces), Terry A Francois Boulevard south of South Street (8 spaces) and 16th Street (1 space) …".*

This statement in the Project Description has multifold inaccuracies:

- The accompanying scale drawing of Lower Parking Level 1 actually shows 14 off street truck loading spaces but about half of them cannot be accessed or egressed if trucks, especially the 70± foot tractor trailer rigs, are occupying nearby spaces.
- Other docks, if not completely blocked by vehicles in other loading docks, involve extremely difficult backing maneuvers.
- Some docks involve "blind" right hand backing turns from the "hammerhead" area that are ordinarily avoided in truck loading area design.
- The Project does not *provide* 17 on-street commercial loading spaces. It does not *provide* any. It simply asserts claim to enough on-street parking

area to park 17 large trucks, taking use of area that otherwise would be available for public parking.

- In addition to the above, the Project does not appear to have sufficient area for staging of trucks that have already been unloaded. Headliner rock concerts and family shows are often supported by large numbers of trucks. For instance, concerts for U-2's current tour are supported by 26 tractor-trailer rigs. The Rolling Stones are supported by about the same number. A national political convention would involve many more. It is obvious that this many trucks cannot be staged within the proposed site plan, especially since the loading docks also need to be used for the truck loading that is routine for any event (such as delivery of food. drink and souvenir supplies for the concessions, removal of garbage and support for the other uses in the proposed Project. It appears that the Project will either stash those trucks, when not actively loading or unloading, by preempting public on-street parking areas in the Project vicinity or by obtaining a formal off-site staging area. Which of these is planned and if a formal staging area is planned, where is it and what is its capacity?

Construction Impacts on Transportation and Circulation Are Not Adequately Addressed

In its section describing thresholds of significance, the DSEIR's transportation and circulation analysis declares that "Construction related impacts generally would not be considered significant due to their temporary and limited duration". This assessment by fiat rather than by a reasonable effort to measure or estimate the Project's construction impacts on the transportation and circulation system is inconsistent with the good faith effort to disclose impact demanded by CEQA. It also flies in the face of common sense. For example:

- A project that is located on a heavily trafficked street, a street with high-volume transit service or a street with heavy pedestrian flows would tend to have much more construction impacts on transportation than a project on a minor street that has none of those characteristics.
- A project whose construction causes closures of traffic lanes or closures of continuous sidewalks or temporarily eliminates or relocates transit stops has more construction impact on transportation than one that does not. A project that does those things on busy streets has more construction impact on transportation than one on lesser-used streets.
- A project that is large tends to involve more workers commuting daily, more daily import of supplies and construction materials, more export of demolition and construction refuse and, as a consequence of its size, tends to be of longer duration, tends to have greater construction impacts on transportation than a smaller one.

These considerations that distinguish the severity of construction impacts on transportation can be defined or measured both qualitatively and quantitatively. The DSEIR is deficient in failing to do so.

Despite its "by fiat" finding that the Project's construction impacts on transportation and circulation are less than significant (LS in the Summary Of Impacts And Mitigation Measures), the DSEIR identifies "Improvement Measure I-TR-1: Construction Management Plan and Public Updates". This so called 'Improvement Measure' is a surrogate 'Mitigation Measure' and, by its very existence, is de facto admission that the Project does have construction impacts on transportation and circulation that should have been disclosed as such.

Unfortunately, the measure is in part, vague and yet to be defined (deferred mitigation that is improper under CEQA, and in other parts, defies common sense. We discuss these subjects in a subsequent section.

The DSEIR Concludes, Without Adequate Foundation, That the Project Would Not Have Adverse Impact on Emergency Access

The emergency entrance to the newly opened UCSF Benioff Children's Hospital is located on Fourth Street near its intersection with Mariposa, about 1050 feet (as the crow flies) from the nearest corner of the Project site. At two locations in the Transportation and Circulation section the DSEIR states that if a project were to result in inadequate emergency access, the project would be found to have a significant impact on the environment. Yet incredibly, it concludes that the subject Project would not result in inadequate emergency access when capacity events are taking place at the Project on weekday evenings, weekend afternoons or weekend evenings, regardless of whether or not the Giants or other events at AT&T park are taking place at overlapping times. The DSEIR offers no objective data to support its conclusion that emergency access would not be adversely impacted in event travel peaks – such as relative emergency vehicle travel time data with and without event traffic[14]. Instead, the DSEIR relies on its own rationalizations of why emergency vehicles might not be slowed during event travel peaks to justify concluding the Project would not have significant impact.

The DSEIR notes drivers' obligations to get out of the way of emergency vehicles under the vehicle code. However, it fails to note that in special event access/egress situations, when vehicles are queued bumper to bumper and pedestrians are swarming the crosswalks, drivers abilities to clear the way for emergency vehicles are impaired and the emergency vehicles will inevitably be delayed more than in a

[14] Emergency responders ordinarily log the time calls are received by dispatch, the time the subject is reached and the time the subject is delivered to an emergency care facility. So there is an objective data base that could have been examined to assess the consequences when special events currently take place in the area versus times when special events are not taking place.

normal traffic situation. The DSEIR notes that the presence of PCOs will help clear paths or emergency vehicles through event traffic. PCOs can help, but when event traffic is jammed up with scant maneuvering space and pedestrians are swarming about, PCOs can only do so much and the emergency vehicle(s) will inevitably be delayed compared to normal traffic. The DSEIR also claims emergency vehicles can utilize the proposed exclusive transit lane on 16th Street to bypass normal vehicles in event jams. This will be fine until an emergency vehicle overtakes a transit vehicle, at which time a more confusing than normal maneuvering will have to take place. And not all the emergency vehicles will be approaching from points from which 16th Street is the best route. Finally, not all vehicles traveling in emergencies are official emergency vehicles equipped with emergency lights and sirens. Quite often, parents, caregivers or friends attempt to rush a person requiring emergency care to the emergency room in private vehicles. Private vehicles on an emergency mission are often not recognized as such by other drivers, pedestrians, or PCOs and consequently, it event traffic, suffer even more delay than official emergency vehicles.

Because of these considerations, the DSEIR's conclusions about emergency access impacts are not only unsupported by objective data but incorrect and implausible.

Mitigation Measures Are Vague, Insubstantive, Unresponsive to the Impact Purportedly Addressed or Do Not Qualify as Mitigation Under CEQA

A number of the mitigation measures (and de facto mitigation measures identified as "improvement measures") identified in the DSEIR are vague, insubstantive, unresponsive to the impact purportedly addressed or offer no basis for the DSEIR's conclusion. Measure having these characteristics, which disqualify them as adequate mitigation under CEQA, are not limited to those cited as egregious examples highlighted below.

<u>De Facto Mitigation Measure: Improvement Measure I-TR-1: Construction Management Plan and Public Updates</u>

The first section of this measure states as follows:

> ***Construction Coordination*** – To reduce potential conflicts between construction activities and pedestrians, bicyclists, transit and vehicles at the project site, the project sponsor shall require that the contractor prepare a Construction Management Plan for the project construction period. The preparation of a Construction Management Plan could be a requirement included in the construction bid package. Prior to finalizing the Plan, the project sponsor/construction contractor(s) shall meet with DPW, SFMTA, the Fire Department, Muni Operations and other City agencies to coordinate feasible measures to include in the Construction Management Plan to reduce traffic congestion, including temporary transit stop relocations and other measures to reduce potential traffic, bicycle, and transit disruption and pedestrian circulation effects during construction of the proposed project. This review should consider other ongoing construction in the project vicinity, such as construction of the nearby UCSF LRDP projects and construction on Blocks 26 and 27.

While expressing good intention, what will be done as the result of this measure is so vague and subject to future determination as to constitute deferred mitigation. To be an effective measure, it should commit to explicit features such as the following examples:

A continuous protected sidewalk will be maintained at all times on the Project's frontage on the east side of Third Street. Third Street will not be subject to lane closures at any time during the construction period. All access to the Project for workers, import of construction materials and equipment and export of demolition and construction debris shall be from the Sixteenth Street, South Street or Terry Francois Boulevard frontages. All connections to underground utilities shall be made from the Sixteenth Street, South Street or Terry Francois Boulevard frontages.

The second section of this measure states as follows:

> ***Carpool, Bicycle, Walk and Transit Access for Construction Workers*** – To minimize parking demand and vehicle trips associated with construction workers, the construction contractor could include as part of the Construction Management Plan methods to encourage carpooling, bicycle, walk and transit access to the project site by construction workers (such as providing transit subsidies to construction workers, providing secure bicycle parking spaces, participating in free-to-employee ride matching program from www.511.org, participating in emergency ride home program through the City of San Francisco (www.sferh.org), and providing transit information to construction workers.

This section contradicts common sense and common knowledge. It is common knowledge that few construction workers will use a bicycle, walk or use transit to travel to and from work - for compelling reasons. Many workers carry their personal tools and equipment with them each day; it is impractical to do this while walking, bicycling or riding transit. Construction work often involves strenuous physical labor. Consequently, even if not carrying tools and equipment, construction workers are normally disinclined to walk or bike to and from work. Because of the physical labor aspect, construction workers are frequently dirty and sweaty on the homebound commute. Because of this, construction workers are themselves uncomfortable and make other riders uncomfortable if they ride transit. Because these considerations are well known, it is ridiculous and cynical for the City to pad the DSEIR with useless statements such as that reproduced above.

<u>Mitigation Measure M-TR-2</u>

This sequence of mitigation measures purportedly reduces the effects of Impact TR-2 (that the proposed Project would result in significant traffic impacts at multiple intersections that would operate at LOS E or LOS F under Existing plus Project conditions without a SF Giants game at AT&T Park) even though the impacts are still classified Significant and Unavoidable with Mitigation (SUM). While many of the measures sound potentially useful, close consideration reveals they do not have quantifiable effects, they affect conditions that are not part of the original quantification of impact or they are ineffective in changing the behavior of the problem traveler population. We consider the mitigation measures for Impact TR-2 in sequence.

Mitigation Measure M-TR-2a: Additional PCOs during Events

This measure involves providing four more PCOs during events than the Project's proposed TMP and suggests 5 intersections where they may be deployed. The problem with this is that while PCOs can help prevent unnecessary degeneration of conditions (such as drivers 'blocking the box' or jaywalkers obstructing lanes on the green phase, they cannot cure fundamental LOS E or F conditions.

Mitigation Measure M-TR-2b: Additional Strategies to Reduce Transportation Impacts

This measure involves fourteen itemized strategies in four subgroups. The lead in states:

"The project sponsor shall work with the City to pursue and implement, if feasible, additional strategies to reduce transportation impacts. In addition, the City shall pursue and implement, if feasible, additional strategies that could be implemented by the City or other public agency (e.g., Caltrans)."

Critical words here are "if feasible". CEQA requires that "feasible mitigation" be developed. If there is any doubt at this point about the feasibility of the mitigation proposals, they cannot be presented in the DSEIR as mitigation.

Strategies to Reduce Traffic Congestion

 The City to work with Caltrans to install changeable message signs upstream of key entry points onto the street network, such as on I-280 northbound.

Variable message signing only helps LOS if there are uncongested routes to which traffic can be directed. The variable message signs placed on the freeway approaches to Candlestick Park when the 49ers still played there were noteworthy in their uselessness because there were no uncongested routes to which traffic could be directed.

 The City to provide coordinated outreach efforts to surrounding neighborhoods to explore the need/desire for new on-street parking management strategies, which could include implementation of time limits and Residential Parking Permit program areas.

Neighborhood parking conditions and parking permit programs have nothing to do with the LOS E and F conditions at major intersections that are the object of mitigation in this item. The proposal is irrelevant.

 The project sponsor to offer for pre-purchase substantially all available on-site parking spaces not otherwise committed to office tenants, retail customers or season ticket holders, and to cooperate with neighboring private garage operators to presell parking spaces, as well as notify patrons in advance that nearby parking resources are limited and travel by non-auto modes is encouraged.

Preselling parking so that drivers have a fixed destination they can travel to directly instead of circling blocks looking for parking is a good idea. But it solves a problem not accounted for in the DSEIR's original measurement of impact. The DSEIR's underlying traffic assignments all assume drivers are destined for explicit destinations, not milling about looking for one. So this would not reduce the LOS impacts forecast.

 The project sponsor to create a smart phone application, or integrate into an existing smart phone application, transportation information that promotes transit first, allows for pre-purchase of parking and designates suggested paths of travel that best avoid congested areas or residential streets such as Bridgeview north of Mission Bay Boulevard and Fourth Street.

The problem with this entry is similar to some of the prior entries. At event times, there really are no uncongested paths to the Project vicinity, pre-purchase of parking helps solve a problem unaccounted for in the intersection LOS computations, keeping people out of residential streets is inconsistent with the supposed objective of reducing congestion at major intersections and people driving and using the app to find parking or avoid most congested routes are likely inured to transit first promotional messages.

 The City and the project sponsor to work to identify off-site parking lot(s) in the vicinity of the event center, if available, where livery and TNC vehicles could stage prior to the end of an event.

This is a worthwhile action. But it avoids an on-street clutter of pick-up activity that was not accounted for in the original intersection LOS impact estimates. Hence, it does not mitigate the impact disclosed.

 The City to include on-street parking spaces within Mission Bay in the expansion and permanent implementation of SF*park*, including installation of sensors, dynamic pricing, and smart phone application providing real-time parking availability and cost.

This is a worthwhile action. But again, it helps solve a problem that is not reflected in the DSEIR intersection LOS analysis – that of vehicles cruising the area searching for parking. The 'searching' traffic would be additive to the traffic that was considered in compiling the LOS impacts.

 The City shall work to include the publicly accessible off-street facilities into the permanent implementation of SF*park*, and incorporate data into a smart phone application and permanent dynamic message signs.

The problem with this is the same issue as above – the 'searching' traffic it may reduce was never considered in the DSEIR's analysis. Hence, it does not reduce the LOS impacts as disclosed.

 If necessary to support achievement of non-auto mode shares for the project, the project sponsor shall cooperate with future City efforts for active interventions to effectively manage and price the parking supply in the project vicinity to reduce travel by automobile, thus improving traffic conditions.

The problem with this proposed mitigation measure is twofold. First, the project sponsor does not control most of the parking event attendees may use in the Project vicinity. Hence, it cannot meaningfully "manage and price" the parking supply. Second, for the 2015-16 basketball season, Warriors individual game tickets at season ticketholder prices range from $30 to $60 in the upper deck and from $85 to $550 in the lower deck. Season ticketholder per game prices for the recent 2015 playoffs ranged from $100 to $165 (upper deck) and from $210 to $1050 (lower deck) in the first round to, in the final round, from $230 to $345 (upper deck) and $525 to $2000 (lower deck). At these ticket prices, very few of the attendees who haven't already chosen to ride transit for other reasons are going to be sensitive enough to parking pricing to change mode. So this strategy is unlikely to be effective.

 The project sponsor to seek partnerships with car-sharing services.

Given the above ticket pricing inference as to the economics of event goers, it is doubtful that car-sharing partnerships would have quantifiable effect on travel habits or the ultimate intersection LOS impacts. Hence, there is no mitigation.

Strategy to Enhance Non-auto Modes

 The project sponsor to provide a promotional incentive (e.g., show Clipper card or bike valet ticket for concession savings, chance to win merchandise or experience, etc.) for public transit use and/or bicycle valet use at the event center.

Given the above ticket pricing inference as to the economics of event goers, it is doubtful that the suggested incentives would have any effect on travel habits or the ultimate intersection LOS impacts. Hence, there is no mitigation.

Strategies to Enhance Transportation Conditions in Mission Bay and Nearby Neighborhoods

 The project sponsor to participate as a member of the Mission Bay Ballpark Transportation Coordination Committee (MBBTCC) and to notify at least one month prior to the start of any non-GSW event with at least 12,500 expected attendees. If commercially reasonable circumstances prevent such advance notification, the GSW shall notify the MBBTCC within 72 hours of booking.

The notification provided herein is useful to set the ordinary event traffic management procedures in place for the scheduled date. However, there is no inference that this would change the intersection LOS impacts disclosed in the DSEIR. Hence, there is no mitigative effect.

 The City and the project sponsor to meet to discuss transportation and scheduling logistics following signing any marquee events (national tournaments or championships, political conventions, or tenants interested in additional season runs: NHL, NCAA, etc.).

Again, the notification provided herein is useful to set the ordinary event traffic management procedures in place for the scheduled date. However, there is no inference that this would change the intersection LOS impacts disclosed in the DSEIR. Hence, there is no mitigative effect.

Strategies to Increase Transit Access

 The City to coordinate with regional providers to encourage increased special event service, particularly longer BART and Caltrain trains, and increased ferry and bus service.

If the City really wanted to mitigate the significant impacts on intersection LOS, instead of just asking the regional service providers for more services, it should condition the Project to pay the regional providers for the incremental cost of such services over fare revenue generated. Otherwise, the measure as constituted is unenforceable and ineffective.

 The City to work in good faith with the Water Emergency Transportation Agency, the project sponsor, UCSF, and other interested parties to explore the possibility of construction of a ferry landing at the terminus of 16th Street, and provision of ferry service during events.

Discussing possibilities is not mitigation. If the City wants to have this measure as an effective mitigation, it must condition the Project to contribute a fair-share payment to the ferry landing, if developed, and to pay fair share incremental costs over fare revenues for ferry operations.

The next section of mitigation for Project Impact TR-2 counts on the Mission Bay FSEIR Mitigation Measure E.47: the Transportation System Management Plan.

However, the effects of those portions of that TSM Plan that have been implemented have been absorbed and are reflected in the existing baseline counts that underlie this DSEIR's disclosures of impact TR-2. To constitute effective mitigation for the subject Project, this DSEIR should identify the specific elements of the hypothetical Mission Bay FSEIR Mitigation Measure E.47 that have actually been implemented and what enhancements to it this Project needs to carry out. For instance, considering the elements of Mission Bay FSEIR Mitigation Measure E.47 the following observations can be made.

> *FSEIR Mitigation Measure E.47.a*: Shuttle Bus - Operate shuttle bus service between Mission Bay and regional transit stops in San Francisco (e.g., BART, Caltrain, Ferry Terminal, Transbay Transit Terminal), and specific gathering points in major San Francisco neighborhoods (e.g., Richmond and Mission Districts).

To be effective mitigation, the DSEIR must disclose what additions to shuttle routes and times of service would be needed to alter conditions reported in Impact TR-2 and commit the Project to implement them.

> *FSEIR Mitigation Measure E.47.b*: Transit Pass Sales - Sell transit passes in neighborhood retail stores and commercial buildings in the Project Area.

The effect of this measure is not quantifiable as mitigation. It is doubtful that anyone who might use transit to and from the Project site is deterred from doing so for want of a convenient location selling transit passes.

> *FSEIR Mitigation Measure E.47.c*: Employee Transit Subsidies - Provide a system of employee transportation subsidies for major employers.

While transit subsidies might alter the commute modes of some daytime employees at the Project, given the composition of uses proposed, it is unclear how many employers would be characterized as "major" and consequently, how many employees would be qualified for subsidies. Hence, the effect of this measure cannot be quantified.

> *FSEIR Mitigation Measure E.47.e*: Secure Bicycle Parking - Provide secure bicycle parking area in parking garages of residential buildings, office buildings, and research and development facilities. Provide secure bicycle parking areas by 1) constructing secure bicycle parking at a ratio of 1 bicycle parking space for each 20 automobile parking spaces, and 2) carry out an annual survey program during project development to establish trends in bicycle use and to estimate actual demand for secure bicycle parking and for sidewalk bicycle racks, increasing the number of secure bicycle parking spaces or racks either in new buildings or in existing automobile parking facilities to meet the estimated demand. Provide secure bicycle racks throughout Mission Bay for the use of visitors.

This measure might change the mode of choice of a few daytime employees or visitors to the site who would otherwise not use bicycle but it

is not likely to change the choices of event attendees, particularly in the evening or evening workers.

> *FSEIR Mitigation Measure E.47.f*: Appropriate Street Lighting - Ensure that streets and sidewalks in Mission Bay are sufficiently lit to provide pedestrians and bicyclists with a greater sense of safety, and thereby encourage Mission Bay employees, visitors and residents to walk and bicycle to and from Mission Bay.

Since adequate lighting is a prerequisite of any modern urban development, it is unlikely that this measure would change the mode splits the DSEIR already projects in disclosing impact TR-2. The measure has no. quantifiable mitigation effect.

> *FSEIR Mitigation Measure E.47.g*: Transit and Pedestrian and Bicycle Route Information - Provide maps of the local and citywide pedestrian and bicycle routes with transit maps and information on kiosks throughout the Project Area to promote multi-modal travel.

The amount of change in the mode choice pattern the DSEIR already projects that provision of this information would result in is not quantifiable. Hence, there is no clear mitigation of Impact TR-2.

> *FSEIR Mitigation Measure E.47.h*: Parking Management Strategies - Establish parking management guidelines for the private operators of parking facilities in the Project Area.

This measure is so vague that consequences of it are not quantifiable. Hence, there is no clear mitigation of Impact TR-2.

> *FSEIR Mitigation Measure E.47i*: Flexible Work Hours/Telecommuting - Where feasible, offer employees in the Project Area the opportunity to work on flexible schedules and/or telecommute so they could avoid peak hour traffic conditions.

This FSEIR mitigation measure does nothing to address the Project's special event transportation impacts in the PM peak and Early Evening hours.

> *FSEIR Mitigation Measure E.49*: Ferry Service - Make a good faith effort to assist the Port of San Francisco and others in ongoing studies of the feasibility of expanding regional ferry service. Make good faith efforts to assist in implementing feasible study recommendations.

As previously noted in the context of other mentions of ferry service, this item does not qualify as mitigation for the DSEIR subject project since the DSEIR has failed to determine that ferry service is feasible and since it does not condition the Project to take qualifying actions such as paying fair share contributions to development of a ferry landing serving the Project or paying a fair share of the incremental cost of ferry operations over revenue.

Impact and Mitigation Measure TR-5

The DSEIR finds that the Project would result in a substantial increase in transit demand that could not be accommodated by regional transit capacity and finds it significant and unavoidable with mitigation (SUM). However, many of the purported mitigations disclosed are fatally flawed as demonstrated below.

> **Mitigation Measure M-TR-5a: Additional Caltrain Service**
> As a mitigation measure to accommodate transit demand to and from the South Bay for weekday and weekend evening events, the project sponsor shall work with the Ballpark/Mission Bay Transportation Coordinating Committee to coordinate with Caltrain to provide additional Caltrain service to and from San Francisco on weekdays and weekends. The need for additional service shall be based on surveys of event center attendees conducted as part of the TMP.

Coordination does not qualify as mitigation. Doing something substantial such as offering to pay for incremental cost of additional services over revenues is necessary to consider this as mitigation. And determining the need for special service should have been done in this DSEIR, not deferred to subsequent surveys.

> **Mitigation Measure M-TR-5b: Additional North Bay Ferry and/or Bus Service**
> As a mitigation measure to accommodate transit demand to the North Bay following weekday and weekend evening events, the project sponsor shall work with the Ballpark/Mission Bay Transportation Coordinating Committee to coordinate with Golden GateTransit and WETA to provide additional ferry and/or bus service from San Francisco following weekday and weekend evening events. The need for additional service shall be based on surveys of event center attendees conducted as part of the TMP.

The same comment as immediately above applies. M-TR -5b does not qualify as mitigation under CEQA.

In summary, as these examples demonstrate, the measures proposed in an attempt to mitigate the Project's significant impacts lack substance, and their feasibility is still undetermined. Hence, the attempt at disclosing feasible mitigation is inadequate under CEQA.

Excessively Distant Time Frame and Massive Development Assumptions Masks Significance of Project's Nearer Term Cumulative Impacts

The cumulative analysis of the Project's transportation and circulation impacts is done in the context of a Year 2040 (25 years hence) plan-based development scenario. That scenario assumes development in Downtown, the SOMA and

Mission Bay that would add 162,000 new PM peak hour trips over existing[15]. Per DSEIR Table 5.2-22, the Project, at its highest PM peak hour trip generation intensity (with an evening capacity basketball game scheduled) would generate some 4599 person trips. This is only 2.84 percent of the new downtown-SOMA-Mission Bay trips projected in the 2040 cumulative analysis. As previously noted, San Francisco transportation impact thresholds require a project to add 5 percent to critical movements at an intersection already at unacceptable LOS, 5 percent to vehicle density on freeway ramps already at unacceptable levels, and 5 percent to MUNI ridership on screen lines and specific routes already exceeding acceptable percentages of capacity. Because the Project comprises only 2.84 percent of the PM peak hour core area trip growth contemplated in the cumulative analysis, it is highly unlikely that this Project, or any project of similar size, or even nearly double its size, could ever be found to cause transportation impacts that are cumulatively significant, given the nature of the impact thresholds and the distant and bloated development scenario that is the context of the cumulative transportation impact analysis of the Project. A more reasonable cumulative analysis would consider a future analysis year of, say, 10 years forward, and consider other development projects and transportation infrastructure projects that are reasonably foreseeable in that time frame. The cumulative analysis should be redone in that or similar context.

While on this subject, it is worthwhile considering the transportation forecast model relied upon in the cumulative analysis – SF Champ. This is a model that, by its nature, is intended to provide information guiding major planning development policy decisions and major transportation investment decisions. It is not intended, or suitable, for providing microscale information at the level of transportation impact assessment of individual development projects on intersections, freeway ramps, individual transit lines and so on. This is evident in the validation statistics of the model. On traffic *screenlines* its validation accuracy is within 10 percent on only 80 percent of the screenlines tested[16]. Its accuracy on individual roadways and intersections would be significantly less. Since the criterion of significant cumulative impact at unsatisfactory intersections and ramps is a 5 percent contribution to the traffic at that location, the accuracy of the model is less than the impact threshold that the environmental analysis is attempting to measure. So using this forecast model for an EIR type micro-analysis is like using a sledge hammer or pile driver to drive a common pin. The lesson in this is that the City should be using a project-based build-up analysis over a shorter term future to develop the cumulative scenario.

Conclusion

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[15] *San Francisco Transportation Plan 2040, Appendix C, Core Circulation Study*, SFMTA, 2013.
[16] See *San Francisco Transportation Forecasting Model Final Report, Executive Summary*, San Francisco County Transportation Authority by Cambridge Systematics, October 1, 2002.

Due to all of the foregoing, the DSEIR transportation and circulation section is inadequate. The document must be completely revised, a revision that will involve disclosure of significant new information. Hence, the document should be recirculated in draft status for a full 45 day review period.

Sincerely,

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Bachelor of Science, Engineering and Applied Science, Yale University, 1967
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PROFESSIONAL EXPERIENCE

Smith Engineering & Management, 1993 to present. President.
DKS Associates, 1979 to 1993. Founder, Vice President, Principal Transportation Engineer.
De Leuw, Cather & Company, 1968 to 1979. Senior Transportation Planner.
Personal specialties and project experience include:

Litigation Consulting. Provides consultation, investigations and expert witness testimony in highway design, transit design and traffic engineering matters including condemnations involving transportation access issues; traffic accidents involving highway design or traffic engineering factors; land use and development matters involving access and transportation impacts; parking and other traffic and transportation matters.

Urban Corridor Studies/Alternatives Analysis. Principal-in-charge for State Route (SR) 102 Feasibility Study, a 35-mile freeway alignment study north of Sacramento. Consultant on I-280 Interstate Transfer Concept Program, San Francisco, an AA/EIS for completion of I-280, demolition of Embarcadero freeway, substitute light rail and commuter rail projects. Principal-in-charge, SR 238 corridor freeway/expressway design/environmental study, Hayward (Calif.) Project manager, Sacramento Northeast Area multi-modal transportation corridor study. Transportation planner for I-80N West Terminal Study, and Harbor Drive Traffic Study, Portland, Oregon. Project manager for design of surface segment of Woodward Corridor LRT, Detroit, Michigan. Directed staff on I-80 National Strategic Corridor Study (Sacramento-San Francisco), US 101-Sonoma freeway operations study, SR 92 freeway operations study, I-880 freeway operations study, SR 152 alignment studies, Sacramento RTD light rail systems study, Tasman Corridor LRT AA/EIS, Fremont-Warm Springs BART extension plan/EIR, SRs 70/99 freeway alternatives study, and Richmond Parkway (SR 93) design study.

Area Transportation Plans. Principal-in charge for transportation element of City of Los Angeles General Plan Framework, shaping nations largest city two decades into 21'st century. Project manager for the transportation element of 300-acre Mission Bay development in downtown San Francisco. Mission Bay involves 7 million gsf office/commercial space, 8,500 dwelling units, and community facilities. Transportation features include relocation of commuter rail station; extension of MUNI-Metro LRT; a multi-modal terminal for LRT, commuter rail and local bus; removal of a quarter mile elevated freeway; replacement by new ramps and a boulevard; an internal roadway network overcoming constraints imposed by an internal tidal basin; freeway structures and rail facilities; and concept plans for 20,000 structured parking spaces. Principal-in-charge for circulation plan to accommodate 9 million gsf of office/commercial growth in downtown Bellevue (Wash.). Principal-in-charge for 64 acre, 2 million gsf multi-use complex for FMC adjacent to San Jose International Airport. Project manager for transportation element of Sacramento Capitol Area Plan for the state governmental complex, and for Downtown Sacramento Redevelopment Plan. Project manager for Napa (Calif.) General Plan Circulation Element and Downtown Riverfront Redevelopment Plan, on parking program for downtown Walnut Creek, on downtown transportation plan for San Mateo and redevelopment plan for downtown Mountain View (Calif.), for traffic circulation and safety plans for California cities of Davis, Pleasant Hill and Hayward, and for Salem, Oregon.

Transportation Centers. Project manager for Daly City Intermodal Study which developed a $7 million surface bus terminal, traffic access, parking and pedestrian circulation improvements at the Daly City BART station plus development of functional plans for a new BART station at Colma. Project manager for design of multi-modal terminal (commuter rail, light rail, bus) at Mission Bay, San Francisco. In Santa Clarita Long Range Transit Development Program, responsible for plan to relocate system's existing timed-transfer hub and development of three satellite transfer hubs. Performed airport ground transportation system evaluations for San Francisco International, Oakland International, Sea-Tac International, Oakland International, Los Angeles International, and San Diego Lindberg.

Campus Transportation. Campus transportation planning assignments for UC Davis, UC Berkeley, UC Santa Cruz and UC San Francisco Medical Center campuses; San Francisco State University; University of San Francisco; and the University of Alaska and others. Also developed master plans for institutional campuses including medical centers, headquarters complexes and research & development facilities.

Special Event Facilities. Evaluations and design studies for football/baseball stadiums, indoor sports arenas, horse and motor racing facilities, theme parks, fairgrounds and convention centers, ski complexes and destination resorts throughout western United States.

Parking. Parking programs and facilities for large area plans and individual sites including downtowns, special event facilities, university and institutional campuses and other large site developments; numerous parking feasibility and operations studies for parking structures and surface facilities; also, resident preferential parking .

Transportation System Management & Traffic Restraint. Project manager on FHWA program to develop techniques and guidelines for neighborhood street traffic limitation. Project manager for Berkeley, (Calif.), Neighborhood Traffic Study, pioneered application of traffic restraint techniques in the U.S. Developed residential traffic plans for Menlo Park, Santa Monica, Santa Cruz, Mill Valley, Oakland, Palo Alto, Piedmont, San Mateo County, Pasadena, Santa Ana and others. Participated in development of photo/radar speed enforcement device and experimented with speed humps. Co-author of Institute of Transportation Engineers reference publication on neighborhood traffic control.

Bicycle Facilities. Project manager to develop an FHWA manual for bicycle facility design and planning, on bikeway plans for Del Mar, (Calif.), the UC Davis and the City of Davis. Consultant to bikeway plans for Eugene, Oregon, Washington, D.C., Buffalo, New York, and Skokie, Illinois. Consultant to U.S. Bureau of Reclamation for development of hydraulically efficient, bicycle safe drainage inlets. Consultant on FHWA research on effective retrofits of undercrossing and overcrossing structures for bicyclists, pedestrians, and handicapped.

MEMBERSHIPS

Institute of Transportation Engineers   Transportation Research Board

PUBLICATIONS AND AWARDS

Residential Street Design and Traffic Control, with W. Homburger *et al*. Prentice Hall, 1989.

Co-recipient, Progressive Architecture Citation, *Mission Bay Master Plan*, with I.M. Pei WRT Associated, 1984.

Residential Traffic Management, State of the Art Report, U.S. Department of Transportation, 1979.

Improving The Residential Street Environment, with Donald Appleyard et al., U.S. Department of Transportation, 1979.

Strategic Concepts in Residential Neighborhood Traffic Control, International Symposium on Traffic Control Systems, Berkeley, California, 1979.

Planning and Design of Bicycle Facilities: Pitfalls and New Directions, Transportation Research Board, Research Record 570, 1976.

Co-recipient, Progressive Architecture Award, *Livable Urban Streets, San Francisco Bay Area and London*, with Donald Appleyard, 1979.

EXHIBIT 2

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July 21, 2015

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RE: Draft Subsequent EIR Informational Sufficiency Review for Golden State Warriors Arena
aka - Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (SCN:2014112045)

Mr. Lippe,

This letter summarizes the professional opinions of Larry Wymer, licensed California Traffic Engineer (#1955), on the informational sufficiency of the Draft Subsequent Environmental Impact Report (DSEIR) for the proposed Golden State Warriors Arena. Henceforth, "DSEIR" will refer to the arena project's DSEIR

Per your request, I reviewed specific aspects of the DSEIR focusing on transportation and circulation. My Curriculum Vitae is attached outlining my 26 years of consulting experience in traffic engineering/transportation planning.

My opinions are outlined below.

OPINION 1 - The DSEIR's Transportation and Circulation analysis does not adequately analyze the entirety of the study area impacted by the development

The defined study area for the DSEIR is taken to be a subsection of the study area identified for the "Mission Bay Final Subsequent Environmental Impact Report", from which the DSEIR was tiered. Since the Mission Bay FSEIR was completed in 1998, the assumptions included therein are presently 17 years old and require appropriate revisions, and possibly expansions beyond those assumed within that report, to provide a similar level of impact analysis as provided therein.

Numerous San Francisco regional planning documents conclude that auto trips within and adjacent to the DSEIR's study area will increase significantly up to the 2040 cumulative year horizon. Specifically, the "2040 San Francisco Transportation Plan" concludes that daily auto trips within the "SoMa/Mission Bay" (South of Market/Mission Bay) regions along roadways arena traffic would travel will grow by the following percentages between 2012 and 2040:[1]

- Overall SoMa/Mission Bay auto trips (2012-2040) = +82% (+125,000 vehicles)
- So/Ma between Downtown Core & I-80 (2012-2040) = +42%
- So/Ma (south of I-80) to Mission Bay = +174%

[1] San Francisco Transportation Plan 2040, Appendix K: SF Travel At a Glance

The DSEIR provides six figures showing "Project Vehicle Trip Patterns to Major Parking Facilities" serving the arena. **Table 1** summarizes the information within these figures establishing the trip percentages that travel to/from or through the SoMa and North Mission Bay areas.

Table 1
Project Vehicle Trip Patterns to Major Parking Facilities
North Mission Bay & South SoMa

Figure	Page	Figure Title	Trip Assignment Along Roadway: Seventh St s/o Townsend St	Fourth St s/o Townsed St	King St e/o Third St	from WB I-80 to Fifth St
5.2-14A	5.2-95	Project Vehicle Trip Patterns to Major Parking Facilities - Inbound Weekday PM Peak Hour - No Event and Convention Event	18% / 22%	7% / 7%	5% / 11%	8% / 7%
5.2-14B	5.2-96	Project Vehicle Trip Patterns to Major Parking Facilities- Outbound Weekday PM Peak Hour - No Event and Convention Event	19% / 19%	7% / 12%	5% / 5%	8% / 8%
5.2-14C	5.2-97	Project Vehicle Trip Patterns to Major Parking Facilities - Inbound Saturday Evening Peak Hour - No Event	20%	8%	5%	9%
5.2-14D	5.2-98	Project Vehicle Trip Patterns to Major Parking Facilities - Outbound Saturday Evening Peak Hour - No Event	20%	8%	5%	7%
5.2-14E	5.2-99	Project Vehicle Trip Patterns to Major Parking Facilities - Inbound Weekday and Saturday Peak Hours - Basketball Game Without a SF Giants Evening Game	31% / 32%	13% / 13%	9% / 11%	29% / 30%
5.2-14F	5.2-100	Project Vehicle Trip Patterns to Major Parking Facilities - Outbound Weekday Late Evening Peak Hour - Basketball Game Without a SF Giants Evening Game	31%	13%	11%	20%

Source: "Event Center and Mixed Use Development at Mission Bay Blocks 29-32" DSEIR (June 5, 2015)

The table above establishes that the arterials within the northern portion of the study area will experience significant increases in traffic volumes ranging from 9% to 32%. At issue for much of this traffic is where the traffic will originate.

Table 5.2-23 (page 5.2-85), and corresponding text on pages 5.2-84 to 5.2-86, describes expected trip distribution patterns to the project site from attendees arriving from the downtown area, with increased numbers on weekdays due to attendees traveling to the study area directly from their jobs downtown:

> *The origin/destination distribution range for a weekday basketball game reflects an adjustment for event attendees who would travel to the event center directly from work rather than from their place of residence. The adjustment was based on a survey of Golden State Warriors season ticket holders (see Appendix TR). As shown in Table 5.2-23, the number of trips starting in San Francisco on a weekday is projected to be about 7.5 percentage points greater than on a weekend, with the corresponding reductions in trips arriving from the East Bay (2 percentage points), North Bay (4 percentage points), and South Bay (1.5 percentage points) areas. The majority of visitor trips to a convention event, retail, office, and restaurant uses would be from within San Francisco (70 to 81 percent), followed by South Bay (9 to 10 percent), and then East Bay (3 to 9 percent) origins/destinations.*

Because these attendees will be arriving largely from the high employment areas in and near downtown, significant numbers of attendees would be required to pass through the SoMa area and northern portion of the DSEIR's defined study area to arrive at either the stadium or one of the ancillary land uses (i.e. restaurants) in the vicinity of the proposed arena. And because these attendees will be travelling to the arena directly from work, it can be reasonably assumed many (if not most) would initiate their trip within the later part of the PM peak period (i.e. 5:00/5:30 to 6:00

pm). Thus it can be expected many intersections north of those studied within the DSEIR (i.e. from north of Market Street to south of King Street) will experience large increases in PM peak hour traffic volumes as a result of this Project.

When these project volumes are combined with the 42% to 174% increases within this same area (from north of Market Street to south of King Street), the potential impacts are compounded necessitating the need to widen the study area northward towards downtown. Thus the increases in both cumulative background and project traffic volumes, particularly during weekday PM peak hour periods, requires widening the study area beyond that included within the Mission Bay Blocks 29-32 DSEIR, and beyond the study area within the 1998 "Mission Bay Final Subsequent Environmental Impact Report" from which the more recent DSEIR was tiered.

A revised SEIR should expand the study area northward to at least Market Street, an area henceforth referred to as the "expanded study area". For planning purposes, the expanded study area into north Mission Bay and SoMa is assumed to be northward from the existing study area within an area bounded generally by 8th Street to the west, Market Street to the north between 8th Street and The Embarcadero, northward along The Embarcadero to Broadway, and the San Francisco Bay to the east. A few additional intersections are included in the neighborhood east of the I80/US-101 interchange.

Further justification for expanding the study area northward is provided in Opinion 2 below.

The following opinion will almost exclusively focus on weekday PM peak hour conditions since that is the time period my proposed expanded analysis is assumed will largely experience the most significant impacts.

OPINION 2 - The DSEIR's Transportation and Circulation analysis does not analyze impacted study intersections and ramps in the SoMa and North Mission Bay areas, most notably those between Market Street and King Street

To assist in reviewing the adequacy of the DSEIRs study area limits, I reviewed the draft traffic study (in memorandum format) for the previous proposed arena site. That memorandum report was titled *"Travel and Parking Demand Estimates for the Proposed Event Center and Mixed Use Development at Piers 30-32 and Seawall Lot 330";* stamped "Draft-Subject to Revisions; dated August 9, 2013; submitted by Jose I. Farran of Adavant Consulting; and submitted to the San Francisco Planning Department (Brett Bollinger, Chris Kern and Viktoriya Wise), Orion Environmental (Joyce Hsiao), and Environmental Science Associates (Paul Mitchell). The traffic study for this earlier proposed arena will henceforth be referred to as the "2013 memorandum traffic study," or "2013 arena study" within tables.

Although the arena analyzed in the 2013 memorandum traffic study was also originally proposed to be located south of I-80 (same as the currently proposed arena), trip distribution patterns and intersections identified as critical intersections warranting study stretches significantly further northward into and through the entire SoMa area, with a few even included north of Market Street. Since both versions of the arena project are located south of I-80, traffic arriving at the respective arena sites would include traffic originating from the downtown areas as described in Opinion 1, traffic would travel southeastward along SoMa arterials and through SoMa intersections to both sites, and traffic would also pass through still more intersections within the first several blocks south of I-80. The original 2013 memorandum traffic study analyzed 12 intersections north of I-80 and 10 intersections between I-80 and King Street, whereas none of these 22 intersections were analyzed within the DSEIR. A review of trip distribution patterns for both versions of the project reveal that trip distribution and assignment patterns are not substantially different between the two, however the DSEIR fails to reflect this reality with a noticeable absence of much needed analysis of the critical intersections identified in the traffic study for the earlier site.

Table 2 provides a summary of 27 study intersections located within the SoMA area and blocks north and south of I-80 which were analyzed within the 2013 memorandum traffic study, and the PM peak hour levels of service which

were established therein for Existing (No Project), Existing Plus Project, and Existing Plus "No Event" Project conditions. The table also notes that 10 of these 27 intersections were analyzed within the1998 Mission Bay DSEIR, yet only 5 of those 10 intersections (and 5 of the 27) were analyzed within the DSEIR. And finally, the table shows that 13 of the 22 intersections neglected in the DSEIR would operate at deficient level of service (LOS) E or F operations for no project and/or plus project conditions.

Table 2
Expanded Study Area LOS Analysis

Intersection	Original Arena Study LOS Operations Weekday PM Peak Hour (4:00-6:00)						LOS Analysis Intersection # if Analyzed w/in Study		
	Existing (No Project)		Existing Plus Project		Existing Plus No Event		2013 Arena Study [1]	1998 Mission Bay FSEIR [2]	2015 DSEIR Arena Study [3]
	Delay	LOS	Delay	LOS	Delay	LOS			
The Embarcadero / Broadway	36.70	D	37.40	D	36.90	D	1		
The Embarcadero / Washington St	30.50	C	38.00	D	31.50	C	2		
The Embarcadero / Mission St	**79.50**	**E**	**>80 (1.13)**	**F**	**>80 (1.06)**	**F**	3		
The Embarcadero / Howard St	**>80 (1.13)**	**F**	**>80 (1.38)**	**F**	**>80 (1.18)**	**F**	4		
The Embarcadero / Folsom St	**61.90**	**E**	**>80 (1.39)**	**F**	**66.80**	**E**	5		
The Embarcadero / Harrison St	**71.00**	**E**	**>80 (1.01)**	**F**	**>80 (0.93)**	**F**	6		
The Embarcadero / Bryant St	**>80 (1.51)**	**F**	**>80 (1.08)**	**F**	**>80 (2.17)**	**F**	7		
The Embarcadero / Brannon St	39.10	D	42.40	D	37.60	D	9		
The Embarcadero / Townsend St	**58.10**	**E**	**70.40**	**E**	**62.60**	**E**	10		
2nd St / King St	**55.80**	**E**	**63.10**	**E**	**59.60**	**E**	11	X	
3rd St / King St	**72.70**	**E**	**>80 (0.99)**	**F**	**>80 (0.95)**	**F**	12	X	1
4th St / King St	51.90	D	**59.50**	**E**	**56.00**	**E**	13	X	2
5th St / King St / I-280 Ramps	**59.20**	**E**	**72.80**	**E**	**56.00**	**E**	14	X	3
Main St / Harrison St	**>80 (0.91)**	**F**	**>80 (1.07)**	**F**	**>80 (0.93)**	**F**	15		
Main St / Bryant St	21.20	C	24.20	C	32.50	C	16		
Beale St / Mission St	33.80	C	41.80	D	37.10	D	17		
Beale St / Bryant St	54.00	D	**>80 (1.15)**	**F**	**>80 (1.13)**	**F**	18		
Fremont St / Harrison St	32.40	C	38.80	D	34.40	C	19	X	
Fremont St / Folsom St	53.60	D	**>80 (0.75)**	**F**	54.00	D	20		
1st St / Harrison St / I-80 Ramps	**>80 (1.13)**	**F**	**>80 (1.28)**	**F**	**>80 (1.17)**	**F**	21	X	
4th St / Howard St	52.20	D	54.40	D	53.10	D	22		
4th St / Harrison St / I-80 Ramps	41.80	D	44.50	D	42.00	D	23		
4th St / Bryant St / I-80 Ramps	**>80 (0.76)**	**F**	**>80 (0.87)**	**F**	**>80 (0.77)**	**F**	24	X	
5th St / Harrison St / I-80 Ramps	48.40	D	**>80 (1.07)**	**F**	**60.90**	**E**	25	X	4
2nd St / Brannon St	20.20	C	28.20	C	21.30	C	27		
2nd St / Bryant St	**>80 (1.23)**	**F**	**>80 (1.27)**	**F**	**>80 (1.24)**	**F**	28	X	
5th St / Bryant St / I-80 Ramps	see note [4]		see note [4]		see note [4]		? [4]	X	5

NOTES:

Deficient LOS E or F within 2015 DSEIR LOS analysis.

[1] = Analyzed in Original 2013 Arena Study - "Event Center & Mixed-Use Development at Piers 30-32 & Seawall Lot 330" (GSW P30-32 LOS_Table 052815_FP.xlsx)(pg TR-783)

[2] = Analyzed in 1998 "Mission Bay Final Subsequent Envirorонmental Impact Report"

[3] = Analyzed in 2015 "Event Center and Mixed Use Development at Mission Bay Blocks 29-32" (SCN:2014112045).
Table only considers study intersections north of the proposed project site, thus study intersections #6 through #22 of the DSEIR are neglected herein.

[4] = Incomplete data from memoranudm traffic study indicates deficient LOS E &/or F but no specifics regarding intersection #, delays, and which scenarios are projected to experience LOS E/F.

The information provided in the Table above supports Opinion 1 that the DSEIR's Transportation and Circulation analysis does not adequately analyze the entirety of the study area impacted by the development, and that by extension the DSEIR's Transportation and Circulation analysis also does not adequately analyze impacted study intersections and ramps in the SoMa and North Mission Bay areas.

Based on the deficient levels of service identified in the table above which the proposed project would potentially add significant traffic volumes, a revised SEIR should add (at a minimum) the following 13 study intersections from the expanded study area identified above.

1) Mission Street / The Embarcadero
2) Howard Street / The Embarcadero
3) Folsom Street / The Embarcadero
4) Harrison Street / The Embarcadero
5) Bryant Street / The Embarcadero
6) Townsend Street / The Embarcadero
7) King Street / Second Street
8) Harrison Street / Main Street
9) Bryant Street / Beale Street
10) Folsom Street / Freemont Street
11) Harrison Street / First Street
12) Bryant Street / Fourth Street
13) Bryant Street / Second Street

Further justification for adding these 13 intersections is provided below.

Table 3 (divided into 3 sections 3a, 3b and 3c) summarizes a review of all of the CEQA Documents and notices for non-SFPUC projects consisting of Environmental Impact Reports, Negative Declaration, NOPs, etc. which were listed on the City/County of San Francisco's Planning Department Website as of July 17, 2015.[2] Each of the projects were reviewed to establish the location of the project relative to the arena, and more importantly if traffic generated by the project would impact any intersections the arena might also impact.

If a cumulative project is located both well outside of the expanded study area, and it can be reasonably concluded the project would add little to no traffic to potential study intersections within the expanded study area, the project was eliminated from further consideration and not included in Table 3.

If the cumulative project was located near the expanded study area with the potential to add traffic volumes to potential study intersections within the expanded study area, the project was reviewed further to make a determination whether or not it should be added to Table 3.

If a cumulative project was located within the general boundaries of the expanded study area, it was included in Table 3 regardless of whether an EIR had been prepared or the project was at the initial NOP stage with study intersections yet to be determined.

For those projects which have an EIR and corresponding traffic impact study, I reviewed the traffic impact study with particular attention to trip distribution and study intersection graphics, and LOS intersection and freeway ramp operations analysis tables. I noted any study intersections located within the expanded study area described in Opinion 1 which were found to operate at a deficient level of service for weekday PM peak hour conditions for any scenario whether it be existing, cumulative, no project, plus project, etc. These intersections, along with corresponding deficient delays and LOS E and/or F operations, are noted in Table 3.

If the proposed project was located within the expanded study area itself, it is included in Table 3 whether it has completed an EIR with corresponding LOS tables, or simply an NOP with no traffic analysis yet. They were included because the project will obviously add some level of (yet to be determined) traffic to (yet to be determined) study intersections in the expanded study area, some of which might be newly added study intersections for the arena

[2] http://www.sf-planning.org/index.aspx?page=3562

project. Cumulative NOP projects without an EIR or traffic impact study are included for future planning purposes with the assumption an EIR and traffic impact study might be ready when a review is initiated to establish a revised scope and study area for a revised DSEIR. In the meantime, Table 3 includes an "NA" (not applicable) notation in place of a list of intersections operating at deficient levels of service.

Note that Table 3 is considered a planning level tool. Because a more detailed analysis will need to be performed at a later time to establish trip distribution and assignment patterns through the expanded study area, there is at present some uncertainty regarding the complete list of intersections within the expanded study area which will warrant study. Although an initial list of additional study intersections is provided below which in my opinion satisfies that criteria, it is not comprehensive and requires additional planning level analysis to expand to a full list. Thus without foresight regarding what intersections may or may not be included within that final list, and in the interest of providing an initial list of potential study intersections, Table 3 simply lists any and all study intersections identified as operating deficiently within the expanded study area within any EIR or traffic study.

Table 3a
Approved & Cumulative Projects
with Designated Study Intersections at LOS E or F
from SoMa to Mission Bay

Case #	Project Name and Document	Study Intersections at LOS E or F (No Project Delay/LOS) > (Plus Project Delay/LOS) Existing Conditions	 Cumulative Conditions	Latest Update	Construction Status	Pgs in Report	Pgs in PDF	Study Link
2007.1275E and 2014.13	San Francisco 2004 and 2009 Housing Element	10) ------------------------ 11) ------------------------ 12) ------------------------ 13) 1st St/Market St (67.7 / E) 14) 1st St/Mission St (>80.0 / F) 15) 1st St/Harrison St (>80.0 / F) 16) ------------------------ 17) 2nd St/Bryant St (60.3 / E) 18) ------------------------ 19) ------------------------ 20) 4th St/Harrison St (63.2 / E) 22) ------------------------ 23) ------------------------ 24) 6th St/Brannan St (>80 / F) 55) ------------------------	10) The Embarcadero / Broadway (>80.0 / F) 11) The Embarcadero / Washington St (69.1 / E) 12) The Embarcadero / Harrison St (55.0 / E) 13) 1st St/Market St (>80.0 / F) 14) 1st St/Mission St (>80.0 / F) 15) 1st St/Harrison St (>80.0 / F) 16) 2nd St/Folsom St (>80.0 / F) 17) 2nd St/Bryant St (>80.0 / F) 18) 3rd St/King St (>80 / F) 19) 4th St/King St (57.3 / E) 20) 4th St/Harrison St (67.4 / E) 22) 6th St/Market St (60.2 / E) 23) 6th St/Mission St (>80.0 / F) 24) 6th St/Brannan St (>80.0 / F) 55) 3rd St / Cesar Chavez St (>80.0 / F)	7/14/2015	CONSTRUCTION ONGOING **(thru 2019)**	V.F-31 V.F-31	363 363	http://sfmea.sfplanning.org/2007.1275E_DEIR.pdf
2014.0198E	850 Bryant Street -- Hall of Justice - Rehabilitation and Detention Facility	Bryant Street/Sixth Street (>80 / F)	Bryant Street/Sixth Street (>80 / F)	5/13/2015	Construction Planned **2016-2020** (http://www.sfdpw.org/index.aspx?page=1818)	84 84	92 92	http://sfmea.sfplanning.org/2014.0198E_PMND.pdf
2014-001272ENV	Pier 70 Mixed-Use District Project	NOP Stage - No study intersections identified	NOP Stage - No study intersections identified	5/6/2015	Construction Planned **2018-2029** (http://sfmea.sfplanning.org/2014-001272ENV_NOP.pdf)	NA	NA	http://sfmea.sfplanning.org/2014-001272ENV_NOP.pdf
2013.1407E	Academy of Art University Project	-- -- -- -- Bryant Street/Fifth Street (64.3 / E) > (63.3 / E) -- --	Eighth St/Market St (70.8 / E) > (72.7 / E) Sixth St/Market St (>80 / F) > (>80 / F) Sixth St/Mission St (71.2 / E) > (72.8 / E) Second St/Folsom St (55.4 / E) > (60.4 / E) Fifth St/Bryant St (>80 / F) > (>80 / F) Sixth St/Brannan St (>80 / F) > (>80 / F) Sixth St/Folsom St (63.6 / E) > (69.2 / E)	4/10/2015	???	4.6-11 4.6-131	295 415	http://sfmea.sfplanning.org/2008.0586E_DEIR_VolI-3.pdf
2009.0291E and 2010.0275E	San Francisco Museum of Modern Art (SFMOMA) Expansion/Fire Station Relocation and Housing Project	1) Third/Market (56.2 / E) > (58.0 / E) 2) -- 3) -- 11) -- 14) Sixth/Shipley Streets (WB) (37.3 / E) > (37.5 / E)	1) Third/Market Streets (>80 / F) 2) Third/Mission Streets (>80 / F) 3) Third/Howard Streets (>80 / F) 11) Fifth/Harrison Streets/I-80 off-ramp (>80 / F) 14) Sixth/Shipley Streets (WB) (60.3 / F)	2/24/2015	CONSTRUCTION ONGOING **(2013-spring 2016)** (http://www.sfmoma.org/about/our_expansion/expansion_project_faq#ixzz3g9d1Oo75)	261 301	300 340	http://sfmea.sfplanning.org/2010.0275E_DEIR1.pdf
2007.0347E	Second Street Improvement Project	1) Market St/ Montgomery St (51.0 / D) > (77.8 / E) 2) New Montgomery St/Mission St (61.3 / E) > (>80 / F) 3) Howard St/New Montgomery St (39.5 / D) > (77.2 / E) 4) Howard St/Hawthorne St (19.6 / B) > (61.9 / E) 5) Hawthorne St/Folsom St (74.5 /E) > (>80 / F) 6) Harrison St/ Hawthorne St (43.4 / D) > (71.0 / E) 7) -- 8) -- 9) -- 10) Third St/King St (>80 / F) > (>80 / F) 14) -- 15) Second St/Folsom St (64.6 / E) > (30.7 / C) 16) -- 17) Second St/Bryant St (>80 / F) > (>80 / F) 18) South Park St/Second St (EB) (>80) / F) (4.6 / A) 20) -- 21) -- 22) -- 23) Harrison St/Essex St (>80 / F) > (>80 / F) 26) -- 27) Folsom St/ First St (>80 / F) > (>80 / F) 28) Harrison St/ First St (>80 / F) > (>80 / F) 29) Fifth/Bryant/I-80 EB on-ramps (> 80 / F) > (> 80 / F)	1) Market St/Montgomery St (>80 / F) > (>80 / F) 2) Mission St/New Montgomery St (>80 / F) > (>80 / F) 3) Howard St/New Montgomery St (17.5 / B) > (55.9 / E) 4) Howard St/Hawthorne St (12.0 / B) > (42.7 / D) 5) Folsom St/Hawthorne St (>80 / F) > (>80 / F) 6) Harrison St/Hawthorne St (30.5 C) / (>80 / F) 7) Bryant St/Third St (>80 / F) > (>80 / F) 8) Brannan St/Third St (>80 / F) > (>80 / F) 9) Townsend St/Third St (>80 / F) > (>80 / F) 10) King St/Third St (>80 / F) > (>80 / F) 14) Howard St/Second St (>80 / F) (>80 / F) 15) Folsom St/Second St (>80 / F) > (>80 / F) 16) Harrison St/Second St (>80 / F) > (>80 / F) 17) Bryant St/Second St (>80 / F) (>80 / F) 18) South Park St/Second St (61.0 / F) > (10.7 / B) 20) Townsend St/Second St (73.3 / E) > (>80 / F) 21) King St/Second St (>80 / F) > (>80 / F) 22) Folsom St/Essex St (>80 / F) > (>80 / F) 23) Harrison St/Essex St (>80 / F) > (>80 / F) 26) Howard St/First St (>80 / F) > (>80 / F) 27) Folsom St/First St (>80 / F) > (>80 / F) 28) Harrison St/First St (>80 / F) > (>80 / F) 29) Fifth St/Bryant St/I-80 EB On-Ramp (>80 / F) > (>80 / F)	2/11/2015	Construction Planned **Fall 2016-late 2017** (http://sfmea.sfplanning.org/2007.0347E_Draft%20SEIR.pdf)	54 90	70 106	http://sfmea.sfplanning.org/2007.0347E_Draft%20SEIR_Appx.pdf
2014.0012E	Better Market Street Project	NOP Stage - MARKET STREET intersections between Octavia Boulevard and The Embarcadero	NOP Stage - MARKET STREET intersections between Octavia Boulevard and The Embarcadero	1/14/2015	Construction Planned **2018** (http://www.bettermarketstreetsf.org/docs/BMS-Factsheet.pdf)	NA	NA	http://www.sf-planning.org/index.aspx?page=4003

Table 3b
Approved & Cumulative Projects
with Designated Study Intersections at LOS E or F
from SoMa to Mission Bay

Case #	Project Name and Document	Study Intersections at LOS E or F (No Project Delay/LOS) > (Plus Project Delay/LOS) Existing Conditions	 Cumulative Conditions	Latest Update	Construction Status	Pgs in Report	Pgs in PDF	Study Link
2011.0409E	5M Project, 925-967 Mission Street	Existing No Project > Existing Plus Project 1) Fourth/Market/Stockton (56.1 /E) > (64.6 / E) 2) ------------------------------ 3) Fourth/Howard (52.5 / D) > (74.8 / E) 4) Fourth/Folsom (> 80 / F) > (80 / F) 5) Fifth/Market (55.9 / E) > (56.8 / E) 8) Fifth/Natomac (EB) (38.2 / E) > (40.9 / E) 9) ------------------------------ 10) ------------------------------ 11) Fifth/Harrison (58.7 / E) > (60.7 / E) 12) Fifth/Bryant (>80 / F) > (>80 / F) 13) Sixth/Market (44.6 / D) > (45.3 / D) 15) Sixth/Minnac (WB) (>50 / F) > (>50 / F] 16) Sixth/Natomac (EB) (>50 / F) > (>50 / F) 17) ------------------------------ 18) Sixth/Folsom (43.3 / D) > (>80 / F) 19) ------------------------------ 20) Sixth/Bryant (>80 / F) > (>80 / F) 21) Sixth/Brannan (74.4 / E) > (>80 / F)	Existing No Project > Cumulative Plus Project 1) Fourth/Market/Stockton (56.1 / E) > (>80 / F) 2) Fourth/Mission (28.1 / C) > (> 80 / F) 3) Fourth/Howard (52.5 / D) > (> 80 / F) 4) Fourth/Folsom (> 80 / F) > (> 80 / F) 5) Fifth/Market (55.9 / B) > (> 80 / F) 8) Fifth/Natoma (38.2 / E) > (>50 / F) 9) Fifth/Howard (15.1 / B) > (>80 / F) 10) Fifth/Folsom (27.7 / B) > (>80 / F) 11) Fifth/Harrison (77.1 / E) > (>80 / F) 12) Fifth/Bryant (> 80 / F) > (>80 / F) 13) Sixth/Market (44.6 / D) > (62.4 / E) 15) Sixth/Minna (WB) (>50 / F) > (18.5 / B) 16) Sixth/Natoma (EB) (>50 / F) > (>80 / F) 17) Sixth/Howard (35.5 / D) > (>80 / F) 18) Sixth/Folsom (43.3 / D) > (>80 / F) 19) Sixth/Harrison (31.6 / C) > (>80 / F) 20) Sixth/Bryant (>80) / F) > (>80 / F) 21) Sixth/Brannan (74.4 / E) > (>80 / F)	10/15/2014	Construction Planned **Phase 1: 2017-2021** **Phase 2: 2020-2025** (http://5mproject.com/uploads/documents/150615_openhouse_factsheet.pdf) (http://sf-planning.org/ftp/files/Commission/hpcpackets/5M%20Project%20Public%20Draft%20EIR.pdf)(pg 59)	310 351	386 427	http://sfmea.sfplanning.org/2011.0409E_DEIR.pdf
2013.0154E	Moscone Center Expansion Project	1) Market St/N. Montgomery St (66.8 / E) > (66.8 / E) 2) -- 3) Market St/Fourth St (57.7 / E) > (58.0 / E) 4) Market St/Fifth St (59.3 / E) > (60.0 / E) 5) Mission St/N. Montgomery St (70.7 / E) > (70.9 E) 6) Mission St/Third St (71.9 / E) > (74.9 E) 7) -- 9) -- 11) Howard St/Third St (>80 / F) > (>80 / F) 12) Howard St/Fourth St (65.7 / E) > (69.5 / E) 13) -- 14) Folsom St/ Hawthorne St (78.4 / E) > (79.2 / E) 15) Folsom St/Third St (>80 / F) > (>80 / F) 16) Folsom St/Fourth St (>80 / F) > (>80 / F) 17) -- 18) -- 19) -- 20) -- 21) Harrison St/Fifth St (60.4 / E) > (60.7 / E) 22) -- 23) -- 24) Bryant St/Fifth St (>80 / F) > (>80 / F)	1) Market St/N. Montgomery St (>80 / F) 2) Market St/Third St (>80 / F) 3) Market St/Fourth St (>80 / F) 4) Market St/Fifth St (>80 / F) 5) Mission St/N. Montgomery St (>80 / F) 6) Mission St/Third St (>80 / F) 7) Mission St/Fourth St (>80 / F) 9) Howard St/N. Montgomery St (58.6 E) 11) Howard St/Third St (>80 / F) 12) Howard St/Fourth St (>80 / F) 13) Howard St/Fifth St (>80 / F) 14) Folsom St/ Hawthorne St (>80 / F) 15) Folsom St/Third St (>80 / F) 16) Folsom St/Fourth St (>80 / F) 17) Folsom St/Fifth St (>80 / F) 18) Harrison St/Hawthorne St (>80 / F) 19) Harrison St/Third St (>80 / F) 20) Harrison St/Fourth St (>80 / F) 21) Harrison St/Fifth St (>80 / F) 22) Bryant St/Third St (>80 / F) 23) Bryant St/Fourth St (>80 / F) 24) Bryant St/Fifth St (>80 / F)	9/16/2014	Construction Planned **2014-2018** (http://mosconeexpansion.com/faq)	IV.A-54 IV.A-54	155 155	http://sfmea.sfplanning.org/2013.0154E_DEIR.pdf
2013.0208E	Seawall Lot 337 and Pier 48 Mixed-Use Project	NOP Stage - No intersections identified	NOP Stage - No intersections identified	12/11/2013	Construction Planned **2015-2021** (http://sfport.com/Modules/ShowDocument.aspx?documentID=5666)	NA	NA	http://sfmea.sfplanning.org/2013.0208E_NOP.pdf
2005.0424E	465 Tehama/468 Clementina Street	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	11/19/2013	???	NA	NA	http://sfmea.sfplanning.org/2005.0424E_FMND.pdf
2011.0702E	101 Polk Street	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	3/27/2013	CONSTRUCTION ONGOING **(thru early 2016)** (http://www.sfbog.com/101-polk-street-architecture-construction-analysis-summary/)	NA	NA	http://sfmea.sfplanning.org/2011.0702E_PMND1.pdf
2007.0385E	345 Brannan Street	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	3/20/2013	CONSTRUCTION ONGOING **(thru late 2015)** (http://www.sfbuildingtradescouncil.org/news/top-stories/177-developers-working-together-on-brannan-street-projects)	NA	NA	http://sfmea.sfplanning.org/2007.0385E_PMND.pdf

Table 3c
Approved & Cumulative Projects
with Designated Study Intersections at LOS E or F
from SoMa to Mission Bay

Case #	Project Name and Document	Study Intersections at LOS E or F (No Project Delay/LOS) > (Plus Project Delay/LOS)		Latest Update	Construction Status	Pgs in Report	Pgs in PDF	Study Link
		Existing Conditions	Cumulative Conditions					
2008.1084E	706 Mission Street – The Mexican Museum and Residential Tower Project	Existing No Project > Existing Plus Project Third / Market (56.2 / E) > (63.2 / E) ------------------------------ ------------------------------ ------------------------------ Fourth / Market (>80 / F) > (>80 / F) ------------------------------ ------------------------------	Existing No Project > Cumulative Plus Project Third / Market (56.2 / E) > (>80 / F) Third / Stevenson (12.1 / B) > (>80 / F) Third / Mission (20.1 / C) > (>80 / F) Third / Howard (36.1 / D) > (>80 / F) Fourth / Market (>80 / F) > (>80 / F) Fourth / Mission (41.8 / D) > (>80 / F) Fourth / Howard (42.5 / D) > (>80 / F)	3/7/2013	CONSTRUCTION ONGOING **(thru September 2018)** (http://www.sfgate.com/bayarea/article/Record-breaking-condo-project-coming-to-SoMa-6126543.php)	IV.E.37 IV.E.60	149 172	http://sfmea.sfplanning.org/2008.1084E_DEIR_Part_3.pdf
2000.618E	801 Brannan and One Henry Adams Streets Project	1) ------------------------------ 2) ------------------------------ 3) ------------------------------ 4) ------------------------------ 5) Division/Brannan/Potrero/Tenth (57.8 / E) > (61.5 / E) 6) Eighth/Brannan (55.4 / E) > (77.5 / E) 7) ------------------------------ 9) ------------------------------ 10) Division/Rhode Island (NB) (24.6 / C) > (39.2 / E) 15) ------------------------------ 16) Sixteenth/Rhode Island (NB) (48.7 / E) > (>50 / F)	1) Seventh/Harrison (>80 / F) 2) Ninth/Bryant (60.6 / E) 3) Eighth/Bryant (>80 / F) 4) Seventh/Bryant (>80 / F) 5) Division/Brannan/Potrero/Tenth (>80 / F) 6) Eighth/Brannan (>80 / F) 7) Seventh/Brannan (75.7 / E) 9) Seventh/Townsend (>80 / F) 10) Division/Rhode Island (NB) (>50 / F) 15) Sixteenth/Kansas/Henry Adams (>80 / F) 16) Sixteenth/Kansas/Rhode Island (NB) (>80 / F)	1/9/2013	CONSTRUCTION ONGOING One Henry Adams **(thru 2016)** http://news.theregistrysf.com/equity-residential-breaks-ground-on-one-henry-adams-in-san-francisco/801 Brannon) 801 Brannon **(thru Spring 2017)** (http://www.bizjournals.com/sanfrancisco/blog/real-estate/2015/05/equity-residential-soma-apartments-801-brannan.html)	177 205	271 299	http://sfmea.sfplanning.org/2000.618E_DEIR1.pdf
2011.1381E	Art & Design Educational Special Use District (1111 8th Street)	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	9/26/2012	?????	NA	NA	http://sfmea.sfplanning.org/2011.1381E
2011.1086E	752 Carolina Street	Mitigated Neg Dec (No Intersection LOS Analysis)	Mitigated Neg Dec (No Intersection LOS Analysis)	9/5/2012	?????	NA	NA	http://sfmea.sfplanning.org/2011.1086E_PMND-CPE.pdf
2008.0586E	Academy of Art University Project	NOP Stage - No study intersections identified	NOP Stage - No study intersections identified	9/29/2010	?????	NA	NA	http://www.sf-planning.org/modules/ShowDocument.aspx?documentid=8289
2006.1106E	222 Second Street	1) ------------------------------ 2) ------------------------------ 3) ------------------------------ 4) ------------------------------ 5) ------------------------------ 6) ------------------------------ 7) ------------------------------ 8) Folsom Street / Second Street (36.8 / D) > (60.5 / E) 9) Harrison Street/ Fourth Street (62.0 / E) > (68.1 / E) 10) Harrison Street / Second Street (55.7 / E) > (64.2 / E) 11) Harrison Street / First Street (>80 / F) > (>80 / F) 12) Second Street / Tehama Street (28.7 / D) > (>50 / F)	1) Mission Street / Third Street (>80 / F) 2) Howard Street / Third Street (>80 / F) 3) Howard St / New Montgomery St (>80 / F) 4) Howard Street / Second Street (>80 / F) 5) Howard Street / First Street (>80 / F) 6) Howard Street / Fremont Street (>80 / F) 7) Folsom St. / Hawthorne St. (76.6 / E) 8) Folsom Street / Second Street (>80 / F) 9) Harrison Street/ Fourth Street (>80 / F) 10) Harrison Street / Second Street (>80 / F) 11) Harrison Street / First Street (>80 / F) 12) Second Street / Tehama Street (>50 / F)	7/8/2010	CONSTRUCTION ONGOING **(thru 2016)** (http://www.bloomberg.com/news/articles/2014-04-22/linkedin-said-to-fully-lease-tishman-s-san-francisco-tower)	81 81	109 109	http://www.sf-planning.org/modules/ShowDocument.aspx?documentid=8070
2006.1506E	749 Wisconsin Street	NOP Stage - No study intersections identified	NOP Stage - No study intersections identified	6/30/2010	?????	NA	NA	http://www.sf-planning.org/ftp/files/MEA/2006.1506E_749_Wisconsin_NOP.pdf
2004.0588E	255 Seventh Street Project	Reduction in Traffic Volumes	Reduction in Traffic Volumes	2/24/2007	?????	NA	NA	http://www.sf-planning.org/modules/ShowDocument.aspx?documentid=408

Table 4 (divided into tables 4a and 4b due to length) combines and refines information provided within Tables 2 and 3 to provide a better planning level focus on the selection of study intersections within the expanded study area. It includes all of the intersections identified and included within Table 2 and/or Table 3. The table is organized with intersections separated into five different categories with those within the top most section being those which in my opinion absolutely satisfy the criteria of requiring analysis within a revised DSEIR, and those at the bottom of the list not requiring analysis unless a future screening analysis included them. A full and complete list of additional study intersections should be determined through a planning level analysis which considers trip distribution and assignment through the SoMa and northern Mission Bay areas north and south of I-80.

For clarity, intersections are organized within Table 4 with a specific order. For example, intersection "A"/"B" is such that street "A" consists of the northwest-southeast street (i.e. The Embarcadero, 1st St, 2nd St, ... , 7th St, 8th St, etc.) and street "B" consists of the southwest-northeast street (i.e. Market St, Mission St, ... , Harrison St, Bryant St, Brannan St, Bryan St, King St, Berry St, etc.). Additionally, lists of intersections are ordered beginning in the northeast (i.e. The Embarcadero/Broadway) and ending in the southwest (i.e. 8th St/Berry St).

The first five intersections (included within Table 4a) were already included within the DSEIR and are assumed would be included within the revised DSEIR. They are included simply to provide a full list of the intersections included in the 2013 memorandum traffic study.

The second set of intersections (also included within Table 4a) are comprised of the same thirteen intersections identified above as those which a revised SEIR should add (at a minimum) into the traffic analysis, all of which were also included within the 2013 memorandum traffic study.

The third set of intersections (also included within Table 4a) are comprised of the nine remaining intersections analyzed within the 2013 memorandum traffic study which may or may not be established as being included within a revised SEIR depending on the outcome of a refined trip distribution/assignment process.

The fourth set of intersections (also included within Table 4a) are comprised of the eleven remaining intersections analyzed within the 1998 Mission Bay FSEIR excluded from the 2015 DSEIR which may or may not be established as being included within a revised SEIR depending on the outcome of a refined trip distribution/assignment process.

The fifth and final set of intersections (comprising the entirety of Table 4b) are all of the remaining intersections included within Table 3, some of which may be established as being included within a revised SEIR depending on the outcome of a refined trip distribution/assignment screening process.

Table 4a
Potentially Impacted Intersections in Expanded Study Area

Intersection	Approved/Cumulative Projects LOS E/F (E=Existing)(C=Cumulative) — Project ID Code (see notes): A	B	C	D	E	F	G	H	I	J	#	2013 Arena Study [1]: #	ENP	E+P	E+P (NE)	LOS E/F	2015 DSEIR Arena Study [2]	1998 Mission Bay FSEIR [3]	Note
3rd St / King St	-C				EC						2	12	**E**	**F**	**F**	**E/F**	1	X	KEEP
4th St / King St	-C										1	13	D	**E**	**E**	**E/F**	2	X	KEEP
5th St / King St / I-280 Ramps											0	14	**E**	**E**	**E**	**E/F**	3	X	KEEP
5th St / Harrison St / I-80 Ramps				-C		EC	EC				3	25	D	**F**	**E**	**E/F**	4	X	KEEP
5th St / Bryant St / I-80 Ramps			EC		EC	EC	EC				4	see note [4]				**E/F**	5	X	KEEP
The Embarcadero / Mission St											0	3	**E**	**F**	**F**	**E/F**			ADD 1
The Embarcadero / Howard St											0	4	**F**	**F**	**F**	**E/F**			ADD 2
The Embarcadero / Folsom St											0	5	**E**	**F**	**E**	**E/F**			ADD 3
The Embarcadero / Harrison St	-C										1	6	**E**	**F**	**F**	**E/F**			ADD 4
The Embarcadero / Bryant St											0	7	**F**	**F**	**F**	**E/F**			ADD 5
The Embarcadero / Townsend St											0	10	**E**	**E**	**E**	**E/F**			ADD 6
Main St / Harrison St											0	15	**F**	**F**	**F**	**E/F**			ADD 7
Beale St / Bryant St											0	18	D	**F**	**F**	**E/F**			ADD 8
Fremont St / Folsom St											0	20	D	**F**	D	**E/F**			ADD 9
1st St / Harrison St / I-80 Ramps	EC				EC					EC	3	21	**F**	**F**	**F**	**E/F**		X	ADD 10
2nd St / Bryant St	EC				EC						2	28	**F**	**F**	**F**	**E/F**		X	ADD 11
2nd St / King St					-C						1	11	**E**	**E**	**E**	**E/F**		X	ADD 12
4th St / Bryant St / I-80 Ramps							-C				1	24	**F**	**F**	**F**	**E/F**		X	ADD 13
The Embarcadero / Broadway	-C										1	1	D	D	D				
The Embarcadero / Washington St	-C										1	2	C	D	C				
The Embarcadero / Brannon St											0	9	D	D	D				
Main St / Bryant St											0	16	C	C	C				
Beale St / Mission St											0	17	C	D	D				
Fremont St / Harrison St											0	19	C	D	C			X	
2nd St / Brannon St											0	27	C	C	C				
4th St / Howard St						EC	EC	-C			3	22	D	D	D				
4th St / Harrison St / I-80 Ramps	EC						-C				2	23	D	D	D				
Essex St / Harrison St / I-80 Ramps					EC						1							X	
2nd St / Harrison St					-C					EC	2							X	
3rd St / Townsend St					-C						1							X	
3rd St / Berry St											0							X	
4th St / Townsend St											0							X	
4th St / Berry St											0							X	
6th St / Brannan St / I-280 ramps	EC		-C			EC					3							X	
7th St / Harrison St									-C		1							X	
7th St / Bryant St									-C		1							X	
7th St / Brannon St									-C		1							X	
7th St / Townsend St									-C		1							X	

NOTES:

Approved/Cumulative Projects

A = (2007.1275E & 2014.1327E) = San Francisco 2004 and 2009 Housing Element
B = (2014.0198E850 Bryant Street -- Hall of Justice - Rehabilitation and Detention Facility
C = (2013.1407E) = Academy of Art University Project
D = (2009.0291E & 2010.0275E) = San Francisco Museum of Modern Art (SFMOMA) Expansion/Fire Station Relocation and Housing Project
E = (2007.0347E) = Second Street Improvement Project
F = 2011.0409E) = (5M Project, 925-967 Mission Street
G = 2013.0154E) = (Moscone Center Expansion Project
H = (2008.1084E) = 706 Mission Street – The Mexican Museum and Residential Tower Project
I = (2000.618E) = 801 Brannan and One Henry Adams Streets Project
J = (2011.1381E) = Art & Design Educational Special Use District (1111 8th Street)
K = (2006.1106E) = 222 Second Street

Original Arena Study LOS Operations - Weekday PM Peak Hour (4:00-6:00)

= Study Intersection # in Study / ENP = Existing No Project / E+P = Existing Plus Project / E+P(NE) = Existing Plus No Event

[1] = Analyzed in Original 2013 Arena Study - "Event Center & Mixed-Use Development at Piers 30-32 & Seawall Lot 330" (GSW P30-32 LOS_Table 052815_FP.xlsx)(pg TR-783)

[2] = Analyzed in 2015 "Event Center and Mixed Use Development at Mission Bay Blocks 29-32" (SCN:2014112045).
Table only considers study intersections north of the proposed project site, thus study intersections #6 through #22 of the DSEIR are neglected herein.

[3] = Analyzed in 1998 "Mission Bay Final Subsequent Environmental Impact Report"

[4] = Incomplete data from memoranudm traffic study indicates deficient LOS E &/or F but no specifics regarding intersection #, delays, and which scenarios are projected to experience LOS E/F.

Table 4b
Potentially Impacted Intersections in Expanded Study Area

Intersection	Approved/Cumulative Projects LOS E/F (E=Existing)(C=Cumulative) — Project ID Code (see notes): A	B	C	D	E	F	G	H	I	J	#	2013 Arena Study [1]: #	ENP	E+P	E+P (NE)	LOS E/F	2015 DSEIR Arena Study [2]	1998 Mission Bay FSEIR [3]	Note
Fremont St / Howard St										-C	1								
1st St / Market St	EC										1								
1st St / Mission St	EC										1								
1st St / Howard St					-C					-C	2								
1st St / Folsom St					EC						1								
Essex St / Folsom St					-C						1								
2nd St / Howard St					-C					-C	2								
2nd St / Tehama St										EC	1								
2nd St / Folsom St	-C		-C		EC					EC	4								
2nd St / South Park St					EC						1								
2nd St / Townsend St					-C						1								
New Montgomery St / Market St					EC		EC				2								
New Montgomery St / Mission St					EC		EC				2								
New Montgomery St / Howard St					EC		-C			-C	3								
Hawthorne St / Howard St					EC						1								
Hawthorne St / Folsom St					EC		EC			-C	3								
Hawthorne St / Harrison St					EC		-C				2								
3rd St / Market St				EC			-C	EC			3								
3rd St / Stevenson St								-C			1								
3rd St / Mission St				-C			EC	-C		-C	4								
3rd St / Howard St				-C			EC	-C		-C	4								
3rd St / Folsom St							EC				1								
3rd St / Harrison St							-C				1								
3rd St / Bryant St					-C		-C				2								
3rd St / Brannan St					-C						1								
3rd St / Cesar Chavez St	-C										1								
4th St / Market St / Stockton						EC	EC	EC			3								
4th St / Mission St						-C	-C	-C			3								
4th St / Folsom St						EC	EC				2								
4th St / Harrison St										EC	1								
5th St / Market St						EC	EC				2								
5th St / Natoma St						EC					1								
5th St / Howard St						-C	-C				2								
5th St / Folsom St						-C	-C				2								
6th St / Market St	-C		-C			EC					3								
6th St / Mission St	-C		-C								2								
6th St / Minna St						EC					1								
6th St / Natoma St						EC					1								
6th St / Howard St						-C					1								
6th St / Folsom St			-C			EC					2								
6th St / Shipley St				EC							1								
6th St / Harrison St						-C					1								
6th St / Bryant St		EC				EC					2								
8th St / Market St			-C								1								
8th St / Harrison St / I-80 Ramps											0								
8th St / Bryant St									-C		1								
8th St / Brannan St									EC		1								
9th St / Bryant St									-C		1								
10th St / Brannan St / Division / Potrero									EC		1								
16th St / Kansas St / Henry Adams St									-C		1								
Rhode Island St / Division St									EC		1								
Sixteenth / Kansas St / Rhode Island St									EC		1								

OPINION 3 –The DSEIR's Transportation and Circulation analysis understates and fails to disclose and mitigate arena event impacts on PM commute peak travel because it fails to consider the time and duration of attendees travel in advance of passing through venue entry turnstiles

I have reviewed Dan T. Smith Jr.'s opinion within his report dated July 15, 2015 regarding The DSEIR's failure to adequately consider PM peak hour impacts due to its failure to consider the time and duration of attendees travel in advance of their arrival at the turnstile. I agree particularly with his statement that:

"many attendees will, after traveling to the vicinity of the Project site, due to their this stop in neighboring restaurants and bars for drinks or a meal, thereby advancing the actual time of their trip ahead of their time of passage through the arena turnstiles by 30 minutes to an hour or more."

I can personally attest to this dynamic. I have personal experience with 'time of arrival' issues pertaining to the NBA arena where the Sacramento Kings play, presently called 'Sleep Train Arena', but historically called (and still commonly called) 'Arco Arena'. I lived in Sacramento for sixteen years (1996-2012), and during seven of those years (1996-2003) I literally lived within 100 ft of the I-80/Truxel Road interchange. The I-80/Truxel Road interchange is presently 1 of 3 main interchanges providing primary access to the arena, and during the time I lived near the interchange I witnessed the building of the interchange (about 1998, which at the time became the 2nd main interchange providing primary access to the arena). I also witnessed and experienced the development of nearly ALL of the ancillary commercial developments (including restaurants, bars, shopping, etc.) surrounding the arena following the completion of the Truxel interchange. Throughout those seven years I commuted to/from work along the highways and arterials surrounding the arena, and frequented the commercial developments surrounding the arena during and immediately after the PM peak hour period. Thus on each and every game day, whether I personally went to a game myself or not, I experienced first-hand the increased trip generation to ancillary land uses during the later part of the PM peak hour (i.e. 5:00-6:00), experienced increased traffic volumes on I-80 and connecting arterials near the arena, and experienced worsening levels of service and increased delays. In addition to living for a time in the immediate vicinity of the arena, I also attended over 200 NBA games at the arena (as well as dozens of other special events at the arena) throughout the sixteen years I lived in Sacramento. Although I moved to and lived in the Rocklin area between 2003 and 2012, I continued to visit the arena for games, concerts, etc. and would often arrive early to meet with friends and/or frequent one of the many restaurants in the area. Through this experience, I can personally attest to the fact that the ancillary commercial uses surrounding the arena most definitely experiences a significant uptick beginning about 5:00/5:30 pm on game days (and other special events), and that this uptick most definitely increases traffic volumes along I-80, on I-80 freeway ramps to the three interchanges providing primary access to the arena, and along the arterials (and surface streets) surrounding the arena. As part of my research to provide opinions of the sufficiency of review for the proposed Golden State Warriors Arena in Mission Bay, I contacted one of the traffic engineers in the City of Sacramento's Department of Transportation to discuss this 'early arrival' dynamic. He was in agreement that the area most definitely experiences an uptick in traffic and resulting worsening in levels of service during the end of the PM peak period.

Please feel free to give me a call if you have any questions.

Sincerely,

Larry Wymer & Associates Traffic Engineering

Larry Wymer, CA T.E. 1955

Larry Wymer & Associates Traffic Engineering

P.O. Box 4635
El Dorado Hills, CA 95762
Phone: (916) 768-6158
E-Mail: Larry@LarryWymerTE.com
Website: LarryWymerTE.com

Larry Wymer & Associates Traffic Engineering provides traffic/transportation engineering and transportation planning consulting services for development projects, public agencies, and others requiring solutions to their transportation challenges.

Owner Larry Wymer is a licensed traffic engineer with over twenty years of diverse experience covering a full range of traffic and transportation issues, including completion of over 100 traffic impact studies ranging from small single-use developments to large multi-use developments having regional impact. His experience includes working with private clients, as well as public sector clients including Caltrans, numerous Cities and Counties throughout California, and California tribal governments. This experience with both the private and public sectors, and the establishment of successful, positive, working relationships with both private entities and public agency officials, helps to assure that fair and equitable traffic mitigation measures will be identified and/or negotiated when project induced traffic impacts are identified within our client's traffic impact studies. Mr. Wymer is known for his skillful report writing and strict attention to detail which assures that all traffic studies conform to CEQA, Caltrans, and local agency standards, and include well researched, thorough, and detailed analysis which meet the expectation of reviewing agencies.

In addition to his involvement in typical transportation engineering projects, Mr. Wymer brings three years of distinctive experience working with attorneys and expert witnesses to analyze impacts, design conceptual mitigated alternative site designs, and formulate opinions for use in depositions and expert witness testimony for over 100 properties undergoing eminent domain proceedings; as well as investigating, analyzing, reconstructing, and formulating opinions for over 100 accidents.

SERVICES PROVIDED

- Traffic/Transportation Engineering Consulting
- Transportation Planning Consulting
- Traffic Impact Studies (including CEQA level for EIR's)
- Circulation Elements
- Traffic Operations and Flow Analysis
- Project Access & Internal Circulation Analysis
- Traffic Signal Warrant Analysis
- Speed Studies
- Traffic Data Collection (including Peak Hour Intersection Turning Movement Counts)

LARRY C. WYMER
Curriculum Vitae

PROFESSIONAL REGISTRATION

- California T.E. (Traffic Engineer) #TR-1955, February, 1998
- Florida P.E. (Professional Engineer) #47692, February 1994
- Professional Traffic Operations Engineer (P.T.O.E.) #2187, June, 2007

PROFESSIONAL ORGANIZATIONS

- Institute of Transportation Engineers – Northern California Section
  - President (2007-08)
  - Section Administrator (2008-present)
  - Board Member (2004-Present) through positions as Treasurer (2004-05), Secretary (2005-06), Vice President (2006-07), President (2007-08), Past President (2008-09), Section Administrator (2008-present)
  - Various Chairs: Career/Student Guidance Chairperson (1997-2000), Technical Chairperson (1999-2000), Membership Chairperson (2004-present), Archivist (2007-08).
- Institute of Transportation Engineers – Western District (aka District 6 / Western United States)
  - Current Vice Chair for Student Initiatives (2008-present)
  - Current N. CA Section Representative of ITE District 6 Student Endowment Fund Grassroots Committee
  - Candidate for ITE International Director representing Western District (2009-12 term)
  - Candidate for ITE Western District Secretary-Treasurer (2008-09 term)

EDUCATION / HONORS

- University of Texas at Arlington. B.S. in Civil Engineering, 1989
  - President - American Society of Civil Engineers Student Chapter
  - Distinguished Senior Award - Civil Engineering Department
  - Chi Epsilon National Civil Engineering Honor Society
  - Omicron Delta Kappa National Leadership Honor Society
- Recipient of ITE District 6 (Western US District) Presidential Proclamation (2008)

PROFESSIONAL EXPERIENCE

Owner, *Larry Wymer & Associates Traffic Engineering*, El Dorado Hills, CA	Jan 2009 – Present
Manager, Traffic Engineering, *Gene E. Thorne and Associates*, Cameron Park, CA	Oct 2006 – Jan 2009
Senior Transportation Engineer, *Omni Means*, Roseville, CA	Feb 2004 – Sept 2006
Senior Transportation Engineer, *Analytical Environmental Services*, Sacramento, CA	July 2002 – Feb 2004
Manager, Traffic Engineering, *David Evans & Associates*, Roseville, CA	Aug 1999 – July 2002
Senior Transportation Engineer, *CCS Planning & Engineering*, Sacramento, CA	May 1996 – Aug 1999
Transportation Engineer, *Zook, Moore & Associate*, West Palm Beach, FL	Dec 1992 – Nov 1995
Transportation Analyst, *Kimley-Horn & Associates*, Orange, CA	Jan 1992 – Dec 1992
Associate Transportation Engineer, *DKS Associates*, Oakland & Santa Ana, CA	June 1989 – Nov 1991

College Internships

Transportation Technician, *Texas Transportation Institute*, Arlington, TX	Aug 1988 – May 1989
Environmental Technician, *Environmental Protection Agency*, Dallas, TX	Summer 1987

RELEVANT SKILLS / REPRESENTATIVE PROJECTS

OFFICE/BUSINESS MANAGEMENT SKILLS

- Owner of Larry Wymer & Associates Traffic Engineering (2009-present).
- Developed and managed Transportation Engineering Department at Gene E. Thorne & Associates in Cameron Park (2006-2009).
- Managed newly established Transportation Engineering Department of David Evans & Associates' Roseville office (2000-2002).
- Served as interim office manager of CCS Planning and Engineering's Sacramento office during the summer of 1997.
- Former licensed irrigator in Texas - Owner and operator of Forever Green Lawn Irrigation (June 1986 - June 1989) and Co-Operations Manager/Salesman at Sprinkler Engineering Corporation (Feb. 1982-June 1986).

TRANSPORTATION PLANNING

- Project manager/engineer on over 100 traffic impact studies ranging from small single-use developments requiring simple hand trip assignments and operations analysis to large regionally impacting multi-use developments requiring detailed computer analysis. (*NOTE: See attached list of selected traffic impact studies)*
- Project manager/engineer studying the feasibility of potential bypass alternatives for SR-49 traffic between I-80 and North Auburn, as well as traffic continuing to/from Nevada County. Analyzed existing travel patterns through use of video surveys and an associated DMV license plate check, oversaw the development and calibration of a MINUTP traffic model to simulate these patterns, tested ten alternative routes and various improvement strategies to alleviate congestion along the S.R. 49 corridor, and compared and contrasted the relative benefits and impacts associated with each of these alternatives, particularly in terms of how it eases congestion and improves operation of SR-49. Was an integral part of the SR-49 Bypass Study Technical Advisory Committee (TAC).
- Project manager/engineer of transportation/circulation studies for various design options associated with development of the Shingle Springs Rancheria in El Dorado County, a 160 acre site located adjacent to US-50 belonging to the Shingle Springs Band of the Miwok Indians. The latest proposed project includes a 238,500 sq. ft. casino and 250 room hotel with access via a new US-50 interchange. The various studies conformed to both CEQA/NEPA criteria and included: (1) Shingle Springs Hotel-Casino Environmental Assessment (EA), (2) Shingle Springs Medical Clinic-Residential EA, (3) Shingle Springs Interchange Project Study Report (PSR), and (4) Shingle Springs Interchange Project EIR/EA. Worked with El Dorado County traffic engineering personnel to establish analysis methodologies consistent with the El Dorado County General Plan, including helping the County to establish a matrix which outlines specific significant impact thresholds and criteria. The analysis investigated impacts to roadways and highways throughout all of El Dorado County through use of the El Dorado County MINUTP traffic model. The analysis also involved extensive research regarding recreational activity options within El Dorado County which resulted in an establishment of the likely distribution of recreation oriented trips to and from the hotel component of the project. Also an active member of the Project Development Team (PDT).
- Project engineer for Project Study Reports (PSR) for I-80/Elkhorn-Greenback interchange in Sacramento and SR-99/Hammer Lane and SR-99/Wilson Way interchanges in Stockton. Assisted with development of traffic forecasts, performed traffic operation analyses for various alternatives and helped establish final recommended geometrics.
- Project manager/engineer assisting the developer of the Pheasant Run development in the City of Dixon by providing justification to the City of Dixon to change the parcel's zoning from light industrial to residential. Prepared a traffic study using the City's MINUTP model. Presented findings to the city council showing the lessened impacts which would accompany the proposed change in zoning. The city council subsequently approved the project.
- Project engineer performing numerous screenline analyses of fatal impacts associated with the development of Indian gaming casinos at various locations to help casino developers and tribes with the selection or elimination of potential casino locations in and around the San Francisco Bay metropolitan area.
- Project engineer in responsible charge of preparing the first circulation element for the newly incorporated City of Diamond Bar, California. The project included development of a corresponding forecast transportation demand model using EMME/2. Also organized and oversaw a license plate survey which quantified the through traffic along all of the city's arterials. Also prepared circulation element updates for the cities of South Pasadena and Chino Hills.
- Project engineer performing analysis of added trips within various San Diego County sub-regions which would be

generated by new housing and commercial development associated with growth induced by development of the Jamul Indian gaming casino. Trips were established based on the number of jobs which would be established and the number of new homes which would be built to accommodate newly created jobs, with consideration for commutes occurring between and within each sub-region.

- Project engineer involved in the development and post-processing of the Riverside-San Bernardino Regional Transportation Model (RIVSAN) for the Riverside County Transportation Commission (RCTC) using TRANPLAN.
- Assistant project manager/project engineer for initial stages of preparation of the South San Diego County Impact Fee Study.

TRAFFIC ENGINEERING

- Extensive experience analyzing intersection and roadway operations using a variety of methodologies, software applications, and traffic impact study guidelines. Operations analysis includes detailed methodologies requiring use of TRAFFIX and HCM software; more simple critical movement analysis methodologies (i.e. Circular 212, CMA); and straight volume-to-capacity analysis. Experience includes detailed research and surveys for purposes of collecting and establishing existing, proposed and future year field conditions including traffic volumes, geometrics, and signal timings; supplemented as necessary by experienced engineering judgment to establish reasonable assumptions when data is not available.
- Owned and operated business performing traffic data collection services, including peak hour intersection turning movement counts. Organized and supervised data collection crews, summarized traffic data for clients.
- Project manager/engineer for Ridge Road speed study to analyze 85th percentile speeds and safety consideration for establishment of a speed zone in the vicinity of the Jackson Rancheria, including testimony to Amador County Board of Commissioners.
- Project manager/engineer for traffic control analysis of Lincoln Boulevard/Wyandotte Avenue intersection in the City of Oroville. Analyzed the feasibility of various traffic control measures to improve traffic operations at the intersection including signalization, all-way stop, and a round-about, along with opinions of costs for each alternative.
- Project manager/engineer for traffic operations and capacity analysis of design alternatives for a new roundabout intersection providing access to the new Grand Canyon Transit Center.
- Project engineer involved in the traffic engineering element of the Long Beach-Los Angeles Metro Blue Line Light Rail Transit Project. Field manager overseeing the bench and field testing and installation of modified local and central traffic signal control and surveillance software for all 27 traffic signals within the City of Los Angeles. Continued to provide system fine tuning, modifications, and on-call troubleshooting during actual operation of the system. Modified design specifications and prepared final as-built functional specifications and users manuals for the software. Also assisted in the development of the automated traffic signal testing programs created specifically for the project.
- Project engineer in responsible charge of overseeing data collection and analysis of traffic related data for the Contra Costa Transportation Authority's (CCTA) Traffic Service Objective (TSO) Monitoring Study. The study was the first detailed study performed to gauge the degree to which the County's traffic goals were met as compared to specific TSO's developed eight years earlier by CCTA, the five sub-County districts, Contra Costa County, Caltrans, BART and other local transit agencies, and the 20 incorporated cities within the County. Traffic Engineering analysis included level of service analysis for 120 intersection and numerous roadways, travel time studies and vehicle occupancy studies along freeways and dozens of major arterials, transit ridership, park and ride lot utilization, reduction of accidents, and reduction of through truck traffic.
- Project engineer assisting in the redesign of Tropicana Avenue in Las Vegas, Nevada to an 8-lane facility by analyzing intersection design alternatives, and assisting with preparation of final intersection, signal, and roadway designs.
- Principal project engineer for a corridor traffic improvement study for Spring Mountain Road in Las Vegas, Nevada.
- Experience and classroom training in use of TSIS/CORSIM (including TRAF-NETSIM, FRESIM), with ability to construct simulation models using ITRAF or write input code from scratch, and calibrate model with actual field conditions; applications include use in analyzing vehicle progression, signal coordination, and alternatives testing.

CALTRANS INITIAL STUDIES

- Project manager/engineer on seven Initial Studies analyzing impacts associated with roadway and intersection improvements along SR-16 associated with the expansion of the Cache Creek Casino in Yolo County. The first of

seven Initial Studies analyzed impacts associated with revised project access to the casino including a new signalized entrance, two new additional access driveways, and the widening and realigning of SR-16 adjacent to the casino. The other six Initial Studies analyzed impacts associated with improvements at six off-site intersections along SR-16 to accommodate increased traffic volumes associated with the expansion. Also active member of Project Development Team (PDT), and participated in public meeting in the affected community accepting comments on the first of the seven Initial Studies.

BICYCLE ROUTE STUDIES

- Completed the Safety and Transportation Analysis section of the City of Sacramento Bikeway Master Plan Update EIR which addressed safety and traffic related impacts which would be associated with adoption of the proposed plan amendments studied. Issues which were addressed included cyclist safety including shared use of roadways, potential conflicts with traffic, adequacy of roadways to accommodate proposed bikeways, and impacts associated with barriers such as freeways, freeway interchanges, rivers, railroad crossings, and major intersections. The analysis also addressed the consistency of the Bikeway Master Plan Amendment with local and regional transportation plans and programs.

CONSTRUCTION TRAFFIC HANDLING

- Project engineer responsible for evaluating traffic impacts and preparing preliminary traffic handling strategies for SRCSD pipeline construction projects along major arterials in Sacramento County including the 8 mile long Folsom 2 Interceptor and the 34 mile long Northwest Interceptor.
- Project engineer responsible for performing field inspections and assisting in the preparation of PS&E for traffic handling, construction area signing, and pavement delineation along the project corridor for the US-50 Storm Damage Repair Project in Caltrans District 3.

SPECIAL EVENT TRAFFIC MANAGEMENT

- Project engineer responsible for aspects of traffic and parking for the first annual Wings over Stockton Air Show with an attendance of over 100,000 people. Responsibilities included designing and overseeing creation and placement of signing designating routes into and through the City of Stockton to off-site shuttle lots and on-site parking; design of on-site parking including public parking, handicap, and various special pass lots; overseeing actual parking and traffic during the show including coordinating the activities of approximately 250 volunteers and troubleshooting.

EMINENT DOMAIN / SITE DEVELOPMENT & ANALYSIS

- Project engineer involved with analyzing the impacts to over 100 properties undergoing eminent domain proceedings for use in expert witness testimony. Analysis of impacts and design of mitigating cures requires investigation and analysis of numerous issues encompassing many disciplines of civil engineering in addition to traffic engineering, transportation planning, and roadway design. Civil and traffic engineering issues which are typically addressed include site access and circulation, parking, building setbacks and landscape buffers, site drainage, adjacent roadway design, conceptual site redesigns, and preparation of construction cost estimates. Transportation planning issues include concurrency reviews and conceptual traffic impact analysis for both vacant sites and fully developed sites with alternative land use concepts. Work with attorneys as well as marketing experts, appraisers, contractors, and engineers acting as expert witnesses to help formulate final opinions and courtroom defense tactics.

ACCIDENT STUDIES & ACCIDENT RECONSTRUCTION

- Project engineer involved with the investigation and reconstruction of over 100 accidents for use in expert witness testimony. Analyze accident dynamics through hand calculations, graphical analysis, and the utilization of accident reconstruction computer programs such as EDVAP. Investigate potential deficiencies in roadway designs and traffic control. Research accident histories and conduct cost-benefit analysis for potential improvements at high accident risk locations. Work with attorneys and engineer acting as expert witness to help formulate final opinions and courtroom defense tactics.

SELECTED TRAFFIC IMPACT STUDIES

Penobscot Ranch Subdivision TIS (El Dorado County) – 331.54 acre site with 33 single family residences.
Diamond Plaza TIS (El Dorado County) – 1.80 acre site with 10,389 sq. ft. retail, 5,603 sq. ft. office, 3,644 sq. ft. restaurant, and 7 single family residential lots.
Wild Chaparral Offices TIS (El Dorado County) – 2.00 acre site with 18,000 sq. ft. office.
Lakeside Avenue Sub-division TIS (City of Redding) – 25.9 acre site with 40 single family residences.
Willows Wal-Mart Expansion TIS (City of Willows) – Replacement of existing Wal-Mart store with 187,348 sq. ft. Wal-Mart Supercenter, plus 3,206 sq. ft. fast food restaurant with drive through, and gas station.
Sierra College Center TIS (City of Rocklin) – 9.83 acre site with 77,588 sq. ft. of retail/office development.
West Ridge MP TIS (City of Redding) - 400 acre site with 296 single family residences.
Chico Wal-Mart South TIS (City of Chico) – Expansion of existing 97,124 sq. ft. Wal-Mart store to a 223,013 sq. ft. Wal-Mart Superstore, plus a 5,000 sq. ft. fast food restaurant with drive through, and gas station.
Woodcreek Terraces TIS (City of Roseville) – 10 acre site with 30,420 sq. ft. of mixed retail, and 53 single family dwelling units.
Tierra Oaks TIS (City of Redding) – Expansion of subdivision to include an additional 57 single family residences.
Oroville Retail NW of SR-70 & Nelson TIS (City of Oroville) – 15.56 acres with 271,117 sq. ft. of retail/business.
Martin Ranch TIS (City of Oroville) – 70 acres with 238 single family residences.
Fiddler Green TIS (Placer County) - 18.5 acre site 116 single family residences.
Butte Woods 2 TIS (City of Oroville) - 55 acre site with 169 single family residences.
Bella Ceda TIS (City of Oroville) - 24.1 acre site with 22,000 sq. ft. medical-dental office, 7,000 sq. ft. restaurant, and 87 single family residences.
Javani Estates TIS (Sacramento County) - 7.67 acre site with 74,527 sq. ft. of grocery/retail.
Oroville Los Olivos & Ceraolo TIS (City of Oroville) - 35 acre site 132 single family residences.
Mercy San Juan Medical Center TIS (Sacramento County) – Expansion of existing hospital to include new 142,683 sq. ft. hospital tower, and a new 40,000 sq. ft. medical office building, as well as two new parking structures.
Auburn Fitness TIS (Placer County) – 3.5 acre site with 35,000 sq. ft fitness center.
West Tuolumne Rd Subdivision (City of Turlock) – 48 single family residences.
California Waste Recovery & Transfer Station (City of Galt) – 5 acre waste/recycling transfer facility.
Walnut Avenue Theater / Retail Project (City of Galt) – 15.5 acre site with 117,000 sq. ft. retail and 43,000 sq. ft. (11 screen / 1,800 seat) movie theatre.
Rocklin Pavilion (City of Rocklin) – 41.9 acre site with 415.1 sq. ft. of retail shopping center and 15,000 sq. ft. office.
Cache Creek Casino-Hotel (Yolo County) – 262,137 sq. ft. casino and 200 room hotel.
Enterprise Rancheria Casino-Hotel (Yuba County) – 40 acre site including a 207,760 sq. ft. casino and 170 room hotel.
Auburn Rancheria School (Placer County) – 2.84 acre site including 19,354 sq. ft. facility with school, administrative and tribal offices, health center, and assembly hall.
Guenoc Winery (Lake and Napa County) – Expansion of irrigated winery vineyard, pasture, and forage cropland from 1,819 acres to 6,847 acres.
Lincoln Gateway Development (City of Lincoln) – Analysis of three alternatives for 18 acre site: (1) Proposed Project: 52,500 sq. ft. retail, 5,000 sq. ft. restaurant, 12,500 sq. ft. fast food, 75,000 sq. ft. professional office, 25,000 sq. ft. medical office, and 150 affordable senior residences; (2) Reduced Commercial/Reduced Residential Alternative: 39,375 sq. ft. retail, 12,500 sq. ft. fast food, 56,250 sq. ft. professional office, 18,750 sq. ft. medical office, and 112 affordable senior residences; (3) Reduced Commercial/Increased Residential Alternative: 52,500 sq. ft. retail, 12,500 sq. ft. fast food, 5,000 sq. ft. restaurant, 44 single family residences, and 138 affordable senior residences.
Latrobe Self Storage (El Dorado County) – Rezone of 7.0 acre site from Research/Development to self-storage facility containing 104,880 sq. ft. of enclosed storage space (containing up to 693 storage units), 121 RV parking spaces, and a 4,052 sq. ft. manager office/residence.
Horizon Church (San Joaquin County) – 10, 880 sq. ft. church.
Timbisha Shoshone Casino-Hotel (City of Hesperia) – 58.1 acres including 182,500 sq. ft. casino and 300 room hotel.
Ione Casino-Hotel (City of Plymouth) – 120,000 sq. ft. casino and 250 room hotel.
Sacramento Mormon Temple (Sacramento County) – 47 acre site containing 17,500 sq. ft. the Church of Jesus Christ of Latter-Day Saints temple, a clothing and curriculum supply distribution center, and two caretakers' residences.

Evans Creek Storage (El Dorado County) – 122,000 sq. ft. of enclosed storage space consisting of up to 752 storage units.
Travis Crossing Apartments (Solano County) – 9.52 acres with 181 apartments.
All Outdoor Whitewater Rafting (El Dorado County) – Modification of existing 7.5 acre site to provide for commercial whitewater rafting put-ins and take-outs at the site.
Chapa De Indian Health Program Medical Center (City of Grass Valley) – 26,980 sq. ft. medical clinic.
Shingle Springs Casino-Hotel (El Dorado County) – 238,500 sq. ft. casino complex and 250 room hotel.
Shingle Springs Clinic and Residential Development (El Dorado County) – 14,335 sq. ft. health clinic and six single family residences.
Paskenta (Rolling Hills) Reservation Casino (Tehama County) – 50 acres including 60,000 sq. ft. casino.
Santa Rosa Rancheria Fire Station (King County) – Relocation of Kings County Fire Station #7 to Santa Rosa Rancheria adjacent to The Palace Casino.
Greenville Rancheria Casino (Tehama County) – Analysis of 2 alternatives: (1) 120,000 sq. ft. casino; (2) 122,250 sq. ft. commercial development.
Mechoopda/Chico Rancheria Casino (Butte County) – 7.58 acres with 41,600 sq. ft. casino.
Sienna Vista PCD Development (City of Phoenix, Arizona) – 260.6 acre mixed use development including 805 single family residences, elementary school, convenience market/gas station, and 13.5 acre park.
North Coast Business Park (Clatsop County, Oregon) – Master plan of 270 acre community with analysis of 2 alternatives: (1) 59.4 acres light industrial, 80 bed youth correctional facility and county animal shelter; (2) 59.4 acres light industrial, 326,700 sq. ft. shopping center, 170 county jail, 80 bed youth correctional facility county animal shelter, and 2,100 student junior college.
San Jose Continuation High School (City of San Jose)
Coachella-Augustine Rancheria Casino (Riverside County) – Two studies: (1) 162,500 sq. ft. Casino, 200,000 sq. ft. Retail, 400 room hotel, and an 18 hole golf course; (2) scaled down development with a 31,200 sq. ft. casino.
Sybil Women's Prison (Los Angeles County) – renovation of 900 bed Sybil Brand Institute and Correction Facility.
5-Star Storage (El Dorado County) – 3.34 acres with 295 storage units.
Cameron Park Storage (El Dorado County) – 5.9 acres with 90,790 sq. ft. of enclosed storage and 105 RV parking spaces.
Rios Labor Farm Camp (San Joaquin County) – existing 80 acre farm with 75 proposed housing units to accommodate approximately 400 employees/labor camp residents.
Delta Church (San Joaquin County) – 37,580 sq. ft. church including a 499 seat worship area, education, and administration facilities, as well as outdoor recreational facilities.
Central Valley Baptist Church (San Joaquin County) – 10,000 sq. ft. church and 2,400 sq. ft. multi-purpose building.
Granade Automotive (El Dorado County) – 4,000 sq. ft. automotive repair garage.
March Industrial Park (City of Roseville) – 5.25 acres of light industrial development.
Arbor View Development (City of Roseville) – 6.8 acres with 29, 909 sq. ft. retail, 7,477 sq. ft. office, and 4,500 sq. ft. restaurant.
Lincoln Terrace Apartments (City of Lincoln) – 5.1 acres with 80 apartments.
6th Street Extension (City of Lincoln) – Impacts associated with abandonment of proposed westward extension of 6th Street to accommodate 190 dwelling unit apartment complex.
Warmington Homes (City of Auburn) – 16.98 acre rezone from commercial to residential to accommodate 83 single family residences.
Forest Hill Retirement Community (Placer County) – 1700 unit active retiree community.
Peabody Green Residential Development (City of Fairfield) – 17.9 acres with 146 single family residences.
Pleasant Valley Executive Homes (City of Vacaville) – 629 acre single family residential development with planning level analysis of 500 units vs. 700 units vs. 900 units vs. 1,200 units.
Pheasant Run (City of Dixon) – 37 acre rezone from light industrial to 132 single family residences and 4.71 acres of highway commercial development.
Second Street Senior Apartments (City of Dixon) – 3.8 acres containing 81 affordable senior apartments.
Vineyard Springs Comprehensive Plan Update (Sacramento County) – 2,560 acre community with analysis of 2 alternatives: (1) 5,409 single family residences, 1,160 multi-family residences, 100,000 sq. ft. medical/dental office, 100,000 sq. ft. general office, 2 elementary schools, 18-hole golf course, 10 neighborhood parks; (2) 5,399 single family

residences, 1,170 multi-family residences, 14 acres shopping center, 5 acres limited commercial, 146,000 sq. ft. medical/dental office, 146,000 sq. ft. general office, 2 elementary schools, 18-hole golf course, 10 neighborhood parks.
Arcadian Village Community Plan Amendment Update (Sacramento County) – 268 acres including 883 single family residences, 300 multi-family residences, 22 acres commercial, 11 acres office, 1 elementary school, 3 neighborhood parks, 1 community park.
Riverwalk General Plan/Community Plan Amendment (Sacramento County) – 677 acres including 305 single family residences, 18-hole golf course, 35 acre equestrian center, swim/tennis club.
Deer Creek Hills Community Plan (Sacramento County) – 1,892 acre seniors community including 2,224 single family residences, 775 multi-family residences, 150 dwelling unit congregate care facility, 50 bed nursing home, 80,000 sq. ft. shopping center, 30,000 sq. ft. medical/dental office, 18-hole golf course.
Embassy Suites Waterfront Hotel (Downtown City of Sacramento) – 248 room hotel with meeting rooms, restaurant, bar, retail.
Capitol East End Office Development (Downtown City of Sacramento) – 1.45 million sq. ft. state office park immediately east of State Capitol.
Capitol Area Plan Update (Downtown City of Sacramento) – Master plan for downtown Sacramento including development of 2.8 million sq. ft. of new office, 4,211 new parking spaces, 90,000 sq. ft. of new commercial, and 725 new residential dwelling units.
Neighborhood Preservation Transportation Plan (NPTP) Alternative Analysis (Downtown City of Sacramento) – Recirculation of traffic following implementation of complex network of traffic calming measures.
Coral Business Park (City of Sacramento) – 18 acres including 360,000 sq. ft. office park, gas station/restaurant, 2 restaurants, 240 room hotel.
Farmer's Market IV (City of Sacramento) – 90,000 sq. ft. office.
Calvary Christian School (City of Sacramento) – 300 student elementary school/day care center.
Citgo 7-11 Convenience Store (City of Sacramento)
Taco Bell at Folsom/53rd (City of Sacramento)
South Sacramento Streams (City of Sacramento) – Area wide levee improvement project.
Arch Road Industrial Site (San Joaquin County) – 103 acres including 2,700,000 sq. ft. light industrial/warehouse.
Woodson Road Trucking Facility (San Joaquin County) – 15 acre agricultural trucking facility.
Morada Ranch (City of Stockton) – 265 acre rezone including 107 single family residences, 413,000 sq. ft. commercial.
University of the Pacific Campus Plan (City of Stockton) – Reconfiguration of campus roadways and circulation.
Sacramento Valley (Bill Graham Presents) Amphitheater (Yuba County) – 20,000 seat concert amphitheater.
City of Dixon Multi-Modal Station (City of Dixon) – Commuter Rail Station.
San Joaquin River Conservancy EIR (Fresno and Madera Counties) – Development of recreational facilities along 45 miles of San Joaquin River.
Pleasant Grove/Foothills Commercial Center - Woodcreek Plaza (City of Roseville) – 14 acres including 12,300 sq. ft. shopping center, 16,800 sq. ft. quality restaurant, 2,000 sq. ft. fast food restaurant, 8,400 sq. ft. medical office, 8,400 sq. ft. general office, 7,800 sq. ft. day care center.
Lifescan 2 Corporate Expansion (City of Milpitas) – 85,000 sq. ft. add on of administrative office to corporate park.
Peery-Arrilliga Business Park (City of Milpitas) – 144 acres including 1,945,000 sq. ft. of research and development center, 150,000 sq. ft. general office, 110,000 sq. ft. commercial.
Treefarm Condominium/Office Development (City of Los Altos) – Includes 90 multi-family residences, 72,000 sq. ft. office, 28,000 sq. ft. retail.
Phil Lewis Property (West Palm Beach, Florida) – 100,000 sq. ft. light industrial development.
Parkway Center (Downtown City of Las Vegas, Nevada) – 250 acres including 3 hotel/casinos (5,404,000 sq. ft.), 1,642,000 sq. ft. office, 1,690,000 sq. ft. County Administration Center, 773,000 sq. ft. commercial, 78,000 sq. ft. fast food, 65,000 sq. ft. quality restaurant, 65,000 sq. ft. high turnover restaurant.
The Orchards Development (City of Las Vegas, Nevada) – 432 acres including 1,750 single family residences, 1,250 multi-family residences, 11.3 acres commercial, 600 student elementary school, 15,400 sq. ft. church, 13 acre city park.
Meadow Valley Development – North & South (Clark County, Nevada) – 75 acres including 294 single family residences, 376 multi-family residences, 3,700 sq. ft. bank, and 58,000 sq. ft. commercial.
Greenway Gardens Development (City of Henderson, Nevada) – 89 single family residences.
Foothills North Development (City of Henderson, Nevada) – 43 acres including 205 single family residences.

Wilson Tower Development (City of San Gabriel) – 25,000 sq. ft. 3-story commercial/office building.
Huntington Plaza Development (City of South Pasadena) – 23,000 sq. ft. 2-story commercial/office building.
Guasti Community (City of Ontario/Ontario International Airport) – 74 acres including 2,038,000 sq. ft. of office, 422,000 sq. ft. of office/industrial, 3 hotels with 1,100 rooms and commercial uses.
Beach Blvd./La Mirada Blvd. Shopping Center (City of Buena Park) – 11 acres including 53,000 sq. ft. supermarket and 78,000 sq. ft. commercial.
Villages of Palm Springs (City of Palm Springs) – 348 single family residences.
Duoc Su Buddhist Temple (City of Garden Grove)
San Juan Meadows Development (City of San Juan Capistrano) – Residential development with 18-hole golf course and driving range.
Bixby Old Ranch Development (City of Seal Beach) – 231 acres including 168 single family residences, 125 multi-family residences, 15,000 sq. ft. restaurant, 180 room hotel.
Santa Monica College Satellite Campus - Madison School Site (City of Santa Monica) – Use of old elementary school to accommodate 8 college classrooms and a day care center for 24 children.
South Gate New Elementary and High Schools (City of South Gate) – 100 classroom (2,700 student) high school and 21 classroom (600 student) elementary school.

EXHIBIT 3

From: Paul Mitchell
To: lubaw@lcwconsulting.com; Bollinger, Brett (CPC); Wise, Viktoriya (CPC); Jose Farran
Cc: Joyce; Brian Boxer
Subject: RE: GSW - Arrival distribution
Date: Monday, January 12, 2015 3:01:04 PM

Luba:

I just sent everyone in this email the Sacramento Kings RTC document via ESA DeliverIt. Also, Brian Boxer sent the information below regarding arrival/departure patterns for the Kings ESC EIR to Jose last Wednesday.

Paul Mitchell
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The following is extracted from pages 4.10-43 and 4.10-44 of the Sacramento ESC EIR:

Arrival / Departure Patterns

Following is an evaluation of expected arrival/departure patterns for each event type (see Appendix D for technical data).

- **Weekday Evening Kings Game** – Table 4.10-8 displays the observed percentages of vehicles entering the Sleep Train Arena parking lot (via all four entrances) for a 7 pm weekday Kings game on April 5, 2012. As shown, 67.4 percent of all attendees arrived between 6 and 7 PM. This table also shows data provided by ICON Venue Group for a number of other NBA arenas. Although the data show that 53.8 percent entered the arena during the one-hour prior to the game start, it is likely that many of the 37 percent that arrived at or after tipoff initially arrived to the site during the one-hour prior (and were searching for parking or visiting an adjacent retail/restaurant. Therefore, to be reasonably conservative, 67.4 percent of evening Kings game attendees are assumed to enter the study area during the pre-event peak hour.

- **Morning Civic Event** – Based on data from previous studies and professional judgment, two-thirds (66.7 percent) of civic event attendees are expected to arrive during the AM peak hour. This is reasonably conservative when compared to other of conference centers that assume 50 percent or less of arrivals occur during the AM peak hour.

- **Afternoon Event** – Based on data from previous studies and professional judgment, three-quarters (75 percent) of special/family event attendees are assumed to depart during the PM peak hour. This input is substantiated by 2010 traffic counts collected at a Los Lobos concert at the Mondavi Performing Arts Center on the UC Davis campus. That study found that 74 percent of all concert attendees departed the event within the one-hour after the event ended.

TABLE 4.10-8
PRE-EVENT ATTENDEE ARRIVAL PATTERNS

Time	Percent Entering Sleep Train Arena Parking Lot for 7 pm Game [1]	Percent Entering Building for Other NBA Venues [2]
5-6 pm	14%	9.2%
6-6:30 pm	22.7%	21.5%
6:30-7 pm	44.7%	32.3%
7-8 pm	18.6%	37.0%

1. Fehr & Peers conducted counts from 5 to 8 pm at all entrances to a Kings home game (versus Clippers) at Sleep Train Arena on Friday, April 5, 2012. Game had attendance of 12,600.
2. Based on data provided by Icon Venue Group.

SOURCE: Fehr & Peers, 2013.

According to the Sacramento Kings, about 850 of the 1,200 ESC Kings game event employees would arrive two hours prior to the start of the event (i.e., prior to the pre-event peak hour) and remain on-site for some time after the event concludes.[1] For analysis purposes, 100 inbound employee trips are conservatively assumed during the pre-event peak hour.

During weekday evening Kings games, other event management, all-day, and cleaning staff would arrive/depart during various parts of the day. Data from the April 5, 2012 Kings game were reviewed and showed 190 outbound trips departing Sleep Train Arena from 6 to 7 PM. This may have included departing day employees, deliveries, and even some drop-offs. To account for these types of activities, 200 outbound employee trips are estimated for the pre-event peak hour.

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From: lubaw@lcwconsulting.com [mailto:lubaw@lcwconsulting.com]
Sent: Monday, January 12, 2015 10:04 AM
To: Brett Bollinger; Viktoriya Wise; Joyce; Paul Mitchell
Cc: Jose Farran
Subject: GSW - Arrival distribution

Hi all

The numbers that GSW Warriors provided are the actual Oracle arena arrivals numbers, but Clarke was happy that they were higher than the other NBA aggregated venues that Kate had provided late on Friday (Although it is likely that the aggregated venues do not include lots of downtown arenas - plus SF is different anyway).
There is some question about what exactly was used in the Kings arena, and Clarke is following up with Brian with that. Also, Clarke will ask Brian on how the AECOM comment on the EIR was responded to.

Changing the distribution now would add more than a week to the schedule, depending.

I mentioned that one way or another we need to address this issue this Wednesday, and that we need direction from EP. We feel that it is appropriate that the percentage arriving during the 4 to 6 PM peak period at the SF site is greater than at the existing arena. What percentage, not sure.

Paul, can you get the Kings EIR RTC document to us? And maybe have someone find the AECOM comment?

Thanks,
Luba

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[1] See Chapter 2, Project Description, Table 2-5.

EXHIBIT 4

moveSmartSF
SAN FRANCISCO TRANSPORTATION PLAN 2040

FINAL REPORT
DECEMBER 2013

FROM THE EXECUTIVE DIRECTOR

The countywide transportation plan is where all of the city's transportation modes, operators, and networks come together. Ten years ago we developed the first long-range transportation plan and investment blueprint for San Francisco. This investment strategy served as the basis for Prop K, the half-cent transportation sales tax reauthorized by over 75% of voters in late 2003. To date, we have allocated over $1 billion in Prop K expenditures, leveraging as we did so significant regional, state, and federal matching dollars. The Transportation Authority's Prop K and other allocations have funded critical improvements in every neighborhood such as traffic calming, safe pedestrian and bicycle networks, new transit vehicles, signal priority, and street resurfacing. With the help of public and private partners, all of the Plan's signature capital investments also have been implemented or are substantially underway, including the Presidio Parkway, Transbay Transit Center, Central Subway, and Van Ness Avenue Bus Rapid Transit. During this time, the city responded together with the region to a statewide call to action on climate change, approving a generation of land use plans with transit-oriented designs and sustainable policies. Together, we weathered an economic cycle whose impacts were mitigated by our ability to use local funds such as Prop K to keep projects moving forward and competitive for new funding opportunities when they eventually arose (such as federal stimulus funds). We also partnered with the City to maintain our transportation assets, though significant needs remain. Now, as economic activity returns, we must continue to invest to address pressing maintenance and safety needs. We should deploy and manage our scarce resources efficiently. And we will develop innovative solutions and deliver the next generation of infrastructure that is necessary to meet our goals for a healthy, vibrant, and equitable transportation system for all users.

Tilly Chang
EXECUTIVE DIRECTOR, SFCTA

SAN FRANCISCO TRANSPORTATION PLAN 2040

CONTENTS

Adopted by the Transportation Authority Board on December 17, 2013

Preparation of this report was made possible in part by the San Francisco County Transportation Authority through a grant of Proposition K local transportation sales tax funds and a grant from the U.S. Department of Transportation and the Federal Highway Administration. Content of this report does not necessarily reflect the official views or policy of the U.S. Department of Transportation.

Photo above courtesy of Perkins + Will | Report design by Bridget Smith

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FINAL REPORT • SAN FRANCISCO TRANSPORTATION PLAN
SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY • DECEMBER 2013

CHAPTER ONE

INTRODUCING THE SAN FRANCISCO TRANSPORTATION PLAN

THE SAN FRANCISCO TRANSPORTATION PLAN, OR SFTP, is the blueprint for San Francisco's transportation system development and investment over the next 30 years. The SFTP brings all transportation modes, operators, and networks together, with a view to improving travel choices for all users. Through detailed analysis, interagency collaboration, and listening to the public, we've evaluated ways to improve our system with existing and potential new revenues. The SFTP recommends a diverse investment plan that makes meaningful progress towards our important goals: livability, world-class infrastructure, economic competitiveness, and a healthy environment. The SFTP also recommends policy changes that depart from business as usual and will help us make the most of our investments.

INSIDE THE SFTP

The SFTP contains:

- The Investment Plan, to guide spending of existing and anticipated new transportation funds through 2040.
- The SF Investment Vision, to guide spending of additional new locally-controlled revenues.
- Policy recommendations and strategic initiatives to complement the Investment Plan and Vision.
- Next steps for implementing the SFTP recommendations and monitoring results.

Through 2040, we can expect about $75 billion in funding to support San Francisco's transportation system. Most of this is already committed to specific projects or purposes. This leaves $5 billion in existing and anticipated new revenues that we can decide how to spend. As shown in Figure 1, this $75 billion funds the Investment Plan. Because there is far more need than available revenues for transportation, the SF Investment Vision assumes an additional $7.5 billion in locally-controlled revenues. Figure 2 presents the highlights of the Investment Plan and Vision.

PHOTO: CENTRAL SUBWAY'S TUNNEL BORING MACHINE "MOM CHUNG" IS NOW MAKING ITS WAY BENEATH THE STREETS OF SAN FRANCISCO

The SFTP recommends a diverse investment plan that makes meaningful progress towards our important goals: safe and livable neighborhoods, well-maintained infrastructure, economic competitiveness, and environmental health.

FIGURE 1. SF INVESTMENT PLAN AND SF INVESTMENT VISION REVENUE
(BY USE)

FIGURE 2. HIGHLIGHTS OF THE SFTP INVESTMENT SCENARIOS

	INVESTMENT PLAN		SF INVESTMENT VISION	
Operations and Maintenance of Transit and Streets	$66.3B 88%	70% of highest priority transit maintenance needs met Maintains today's pavement condition	$69.7B 84%	100 % of highest priority transit maintenance needs met Pavement condition improves to "good" levels
Multimodal Street Safety, Enhancement, and Community Mobility	$1.2B 1%	About 40% of the City's Pedestrian Safety Strategy and 22% of the City's Bicycle Strategy funded Parking and peak period congestion pricing downtown help reduce auto trips by up to 10%	$2.5B 3%	100% of the Pedestrian Safety and Bicycle Strategies funded Further expansions of cost-effective employer, school, and community trip reduction programs help reduce auto trips by up to 14%
Efficiency and Expansion Projects	$7.6B 10%	15 miles of protected transit lanes Caltrain electrification and extension to a rebuilt Transbay Terminal	$10.4B 13%	Up to 33 miles of protected transit lanes, including increased BART capacity and reliability Freeway management and transit efficiency strategies, including increased BART capacity and reliability
TOTAL	**$75.1B**		**$82.6B**	

KEY FINDINGS AND POLICY RECOMMENDATIONS

- Prioritize revenues to fully fund timely vehicle replacement and rehabilitation
- Expand transit service while supporting steps to stabilize costs
- Achieve city goals for average pavement condition
- Build the pedestrian and bicycle strategies to establish safer neighborhood networks citywide
- Create more complete streets (at lower cost) through coordination with repaving
- Increase investment in employer, school, and community trip reduction programs
- Increase transparency and promote public involvement by sharing agency prioritization and development processes
- Continue to develop pricing approaches to congestion management
- Continue rapid transit network development, including bus rapid transit
- Continue to coordinate transit investment with land use development plans
- Set a vision for managing the city's freeway network
- Identify the next generation transit network priorities for BART, Caltrain, and Muni
- Consider all options for delivering projects

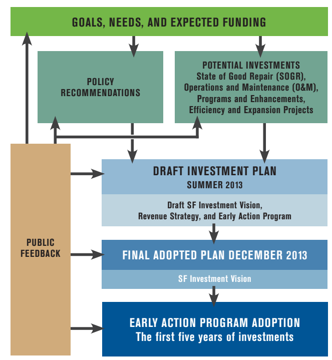

FIGURE 3. SFTP PROCESS FLOW CHART

SFTP GOALS

The SFTP positions San Francisco to meet our city's transportation system goals. We identified the four SFTP goal areas, shown in Figure 4, through Board, partner agency, and community input, and through consideration of city policies like the Transit First Policy in the City Charter and the City's Climate Action Plan. Appendix A (SFTP Plan Development Process) and Appendix B (Needs Analysis White Paper) describe how these goals and associated performance measures shaped our assessment of transportation system needs, the Investment Plans, and policy recommendations.

HOW WE DEVELOPED THE SFTP

As Congestion Management Agency (CMA) for San Francisco, the Transportation Authority is responsible for developing a long-range, countywide transportation plan. We developed the SFTP through extensive technical analysis, consultation with partner agencies, and community outreach over several years. Appendices A-J describe the technical analysis behind the plan.

Throughout the SFTP development process, we heard several consistent policy questions from our Board, partner agencies, and the public, and we responded with research and analysis. Figure 5 (next page) lists the policy research topics and associated products. The research findings led to the creation of the final policy recommendations contained in this document.

THE SIGNIFICANCE OF THE SFTP

The priorities established in the SFTP influence the regional transportation plan prepared by the Metropolitan Transportation Commission (MTC), known as Plan Bay Area, and position San Francisco for regional, state, and federal transportation funding. Transportation projects seeking this funding must be consistent with the SFTP and Plan Bay Area.

Additionally, the SFTP informs and guides other local and regional plans and policy priorities:

- It reflects and reinforces San Francisco's Transit First Policy, adopted in 1973.
- It informs local plans and investments including the General Plan Transportation Element, the SFMTA and City and County of San Francisco Capital Plans, and regional transit operator (e.g. BART and Caltrain) expansion plans.
- It informs San Francisco's efforts to manage congestion and coordinate transportation investment with land use, as described in the Congestion Management Program (CMP).
- It guides project selection for the Proposition K (Prop K) 5-year plans. Prop K is San Francisco's half-cent transportation sales tax, approved by over 75% of voters in 2003. Prop K leverages federal, state, and other funds to direct hundreds of millions of dollars toward SFTP implementation.

FIGURE 4. SFTP GOAL AREAS

SAN FRANCISCO TRANSPORTATION PLAN 2040

FIGURE 5. ANALYSIS AND POLICY STUDIES DEVELOPED DURING THE SFTP PROCESS

POLICY QUESTION/STRATEGIC INITIATIVE	RESEARCH PRODUCT
How can we...	
Meet our ambitious livability and environmental goals?	Needs Analysis White Paper (Appendix B)
Improve the social and geographic equity of our transportation system?	Transportation Equity Analysis (Appendix F)
Create complete streets that improve safety for all users?	Small Project Delivery White Paper (Appendix H)
Deliver transportation projects faster?	Small Project Delivery White Paper (Appendix H) Large Project Delivery White Paper (Appendix I)
Reduce conflicts between the local and regional transportation systems, and improve connections?	Core Circulation Study (Appendix C)
Collaborate more effectively with the private sector to manage travel demand?	Travel demand management strategic plan (expected spring 2014)
Reduce conflicts and provide for the needs generated by the fast-growing SoMa neighborhood?	Core Circulation Study (Appendix C)
Raise new revenue for transportation?	Revenue Options Analysis (available on request) Revenue White Paper (expected early 2014)
Meet the unique transportation needs of young students, visitors, and deliveries?	Needs Analysis White Paper (Appendix B)

Significant progress has been made on goals set in the 2004 Countywide Transportation Plan, projects that were made possible in part through San Francisco's Prop K transportation sales tax dollars, approved by over 75% of voters in 2003.

ACCOMPLISHMENTS SINCE THE LAST PLAN

The SFTP builds on the accomplishments of the 2004 Countywide Transportation Plan,[1] including:

- Major investments in new transit capacity and system maintenance projects are constructed or underway:
  - » T-Third Light Rail linking the Bayview and South of Market.
  - » Tunneling work for the new Central Subway linking the T-Third to SoMa, Union Square and Chinatown.
  - » Replacement of the old Central Freeway with Octavia Boulevard.
  - » Replacement of Doyle Drive with Presidio Parkway.
  - » A new Transbay Transit Center under construction.
- A citywide network of rapid buses is under development:
  - » Completion of environmental work for Van Ness Avenue Bus Rapid Transit (BRT).
  - » Environmental impact analyses are underway for Geary Boulevard BRT and the Transit Effectiveness Project.
- Neighborhoods are more livable, through bicycle, pedestrian, traffic calming, and streetscape improvements:
  - » Prop K provided the first and only stable source of funding for traffic calming.
  - » Examples such as Leland Avenue, Valencia Street, and Broadway Street re-designs demonstrate new ways of improving safety, livability, and creating open space.
  - » Majority of SF Bicycle Plan constructed.
- Parking management and road pricing are key concepts in discussions about managing San Francisco's transportation system:
  - » SFMTA piloted variable parking pricing and management (SFpark).
  - » The Transportation Authority Board adopted the Mobility Access and Pricing Study exploring various scenarios for possible congestion charge downtown.
  - » The Board of Supervisors unanimously adopted the innovative road and parking pricing program for Treasure Island.
- Multiple Neighborhood Transportation Plans adopted by the Authority Board have established a pipeline of community-supported neighborhood transportation projects, many of which have been implemented, including in the Outer Mission, Mission South of Chavez, Tenderloin/Little Saigon, Bayview, Western South of Market, and Balboa Park.
- Numerous state of good repair investments to improve the reliability of the transportation network:
  - » Construction of the Muni Metro East Maintenance Facility, the first major expansion to the SFMTA's Light Rail Vehicle maintenance facilities since the 1970s.
  - » Acquisition of nearly 200 new hybrid buses for Muni and the construction of the Islais Creek Maintenance Facility, the first new rubber-tire maintenance facility in 60 years.
  - » Street resurfacing, traffic signal upgrades, sidewalk repairs, and new curb ramps on sidewalks citywide.

1 The 2004 Plan is available on the authority web site: http://www.sfcta.org/documents-and-data/documents/2004-countywide-transportation-plan

Top to bottom: Projects as diverse as the Central Subway, new bicycle facilities, the T-Third light rail line, and Western SoMa streetscape enhancements are all part of the legacy of the 2004 Countywide Transportation Plan.

THE SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

Created in 1989, the Transportation Authority:

- Develops San Francisco's long-range transportation plan (SFTP)
- Helps analyze and fund transportation system improvements
- Administers the Prop K half-cent local transportation sales tax program and the Prop AA vehicle license fee.
- Manages the Transportation Fund for Clean Air (TFCA).
- Serves as Congestion Management Agency (CMA) for San Francisco under state law. Prop 111, passed in 1990, increased the state fuel tax and required urban counties to designate a CMA responsible for coordinating transportation planning, funding and other activities in a congestion management program. To learn more about the Transportation Authority, visit our web site at www.sfcta.org.

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CHAPTER TWO

OUR TRANSPORTATION CHALLENGES AND OPPORTUNITIES

SEVERAL CRITICAL CHALLENGES AND OPPORTUNITIES must be considered as we strive to achieve our transportation system goals for livability, world-class infrastructure, economic competitiveness, and a healthy environment. The following section highlights these issues, and Appendix B provides additional detail. Appendix K (San Francisco Travel at a Glance) depicts three key travel trends that shaped the SFTP.

LIVABILITY

San Francisco aims to be a livable city—one where walking, bicycling, and transit are safe, comfortable, and convenient modes of travel. Accordingly,

- The SFMTA has set a goal of more than 50% of trips by walking, bicycling, and transit by 2018.
- The Mayor's Executive Directive 10-03 called for a 50% reduction in severe and fatal pedestrian injuries by 2021.
- The Board of Supervisors set a goal of achieving a 20% bicycle mode share by 2020.

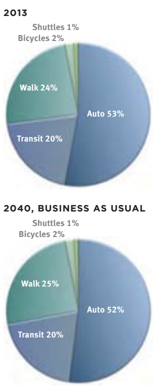
Achieving the desired growth in bicycling, walking, and transit trips while reducing the rate of injuries and fatalities will require increased investment, education, and re-allocation of street space—sometimes with difficult trade-offs—to these modes.

We asked "what would it take?" to achieve San Francisco's ambitious goals. Some of our goals, such as world-class infrastructure would require major increases in funding. Others require both new funding and bold policies that prioritize transit, walking, and bicycling in our limited rights of way. See page 19 for a summary.

MANY WANT TO WALK AND BIKE TODAY, BUT DON'T DUE TO SAFETY CONCERNS

Supporting travel by walking and bicycling requires safety improvements. Safety concerns discourage pedestrians: about 820 pedestrians are killed or injured every year in San Francisco, many on arterials roadways identified in the Walkfirst Investment Plan (Figure 6). Without

FIGURE 7. SHARE OF TRIPS BY MODE OF TRAVEL, 2013 (TOP) AND 2040 BUSINESS AS USUAL (BOTTOM)



SOURCE: SFCTA, SF CHAMP

significant new investment, this number could grow as high as 980[1] by 2040 due to projected increases in automobile trips.

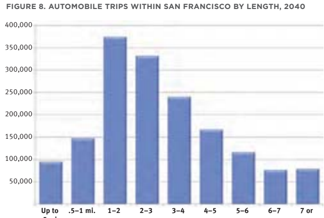
San Francisco's aging population also adds to the challenge of achieving this goal. San Francisco is projected to experience 68% growth in number of people 65 and older by 2040, making this group 20% of the population (compared to 16% today[2]). Older pedestrians are more vulnerable to serious injury or death when struck by an automobile.

Safety concerns also discourage bicycling. Surveys conducted for the SFMTA's 2012 State of Cycling Report indicate that almost half of those who do not currently bicycle say they are uncomfortable bicycling in mixed flow traffic with cars, and only 13% said they feel safe from traffic when bicycling. At the same time, 94% of respondents said they would feel comfortable riding in bicycle lanes.

UNRELIABLE TRANSIT DISPROPORTIONATELY AFFECTS OUTER NEIGHBORHOODS

Livable neighborhoods are accessible by transit, not just during peak commute periods, but throughout the day and evening. This

FIGURE 8. AUTOMOBILE TRIPS WITHIN SAN FRANCISCO BY LENGTH, 2040



SOURCE: SFCTA, SF CHAMP

1 Based on SFDPH Eastern Neighborhoods Impact Analysis which indicated that holding all other variables constant, a 15% increase in vehicle volume produces a 10% increase in pedestrian injury collisions.

2 Based on Association of Bay Area Governments population projections for San Francisco.

FIGURE 6. HIGH-INJURY PEDESTRIAN CORRIDORS

supports San Franciscans' ability to get to and from school, medical appointments and recreational activities by transit. Analysis of transit transfer rates and input received during outreach indicate that outlying neighborhoods, including the Bayview and Sunset, are less accessible throughout the day by transit. A shortage of maintained vehicles results in turning back buses and light rail vehicles before they serve outer neighborhoods, forcing riders into extra waits. The transit network in the lower-density Sunset neighborhoods and hilly Eastern Neighborhoods is less dense, resulting in fewer transit alternatives and fewer direct rides—and making reliability all the more important.

PLANNED INFILL LAND USE PATTERNS SUPPORT WALKING, BICYCLING, AND TRANSIT

The land use plans adopted by the San Francisco Planning Commission and Board of Supervisors over the last decade are expected to move us in the right direction, supporting infill and making walking and bicycling easier. As new residents and jobs locate in areas already convenient for bicycling and walking, the share of trips made by bicycling and walking is expected to grow slightly (Figure

7) but additional investment is needed to meet the city's goal of more than 50% of trips by walking, bicycling and transit. San Francisco has a great potential for further increasing rates of walking and bicycling—as Figure 8 (previous page) shows, nearly 60% of all local automobile trips projected in 2040 will be less than three miles in length, a convenient distance for non-motorized travel.

COMMUNITY SUPPORT FOR TRADEOFFS IS CRITICAL TO ACHIEVE SAFE, EFFICIENT NETWORKS

Research shows that walkability contributes to the livability and affordability of neighborhoods and overall competitiveness of cities. Accordingly, the City has developed strategies that provide a vision for significantly improving the safety of pedestrian and bicycle networks (specifically, the SFMTA Bicycle Strategy and the Mayor's Pedestrian Strategy), but implementation requires investment and, at times, challenging tradeoffs. This is especially so where many of the easy, lower-cost fixes to improve bicycling and walking infrastructure (e.g., striping and signage) are already complete.

Improvements that more significantly benefit bicyclists and pedestrians do so by physically separating these travelers from vehicular traffic or by reducing vehicle traffic and speeds, which may require parking removal or increased signal delay for vehicles. Implementing these improvements requires leadership and community acceptance in return for increased safety for bicyclists and pedestrians.

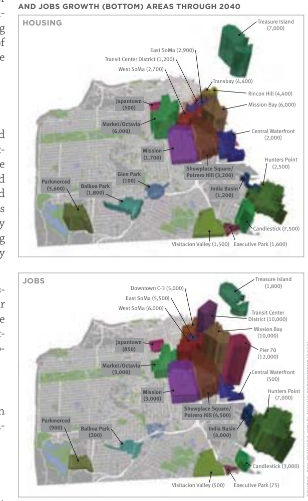
ECONOMIC COMPETITIVENESS

San Francisco's economic competitiveness depends on having an affordable and reliable transportation system with sufficient capacity to accommodate our travel needs efficiently.

PLANNED HOUSING AND JOB GROWTH CONTRIBUTES TO A MORE SUSTAINABLE CITY AND REGION

The Association of Bay Area Governments has forecast significant job and housing growth in the city. A city of about 800,000 residents and 570,000 jobs today is forecast to house nearly 1.1 million residents and more than 750,000 jobs by 2040—much of this

FIGURE 9. SAN FRANCISCO'S PROJECTED HOUSING GROWTH (TOP) AND JOBS GROWTH (BOTTOM) AREAS THROUGH 2040



San Francisco's economic competitiveness depends on having an affordable and reliable transportation system with sufficient capacity to accommodate our travel needs efficiently.

By 2040, new growth will result in about 300,000 new transit trips per day on a system that is already strained by crowding and reliability issues.

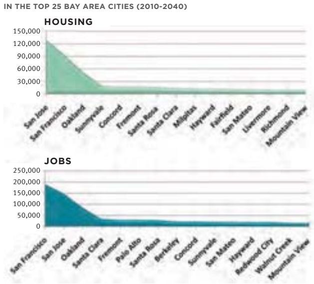
growth is expected in the downtown core, southeast, and southwest (Figure 9). This would mean adding about 9,800 new residents each year for the next thirty years, compared to about 4,200 residents that have been added per year over the prior thirty years.

These projections reflect expectations for robust regional growth and regional policy stemming from Senate Bill 375 (2008), which required regional governments to reduce greenhouse gases from transportation. To meet the SB 375 target, the Regional Transportation Plan, known as Plan Bay Area, calls for concentration of growth in densely developed areas with good transit access especially in San Francisco, San Jose, and Oakland (Figure 10)—a pattern that supports less driving and produces fewer greenhouse gases.

INCREASED TRANSIT CAPACITY AND SERVICES ARE NEEDED TO ACCOMMODATE GROWTH

Concentrating jobs and housing in San Francisco is good for the city's economy as well as the environment, but will also increase congestion and transit system crowding in downtown San Francisco and Eastern neighborhoods. By 2040, new growth will result in about 300,000 new transit trips per day on a local and regional system that is already strained by crowding and reliability issues. The San Francisco Planning Commission has adopted land use plans that direct much of the city's projected growth in the central and eastern neighborhoods, where crowding is already acute. Figure 11 compares transit crowding today and in 2040, and shows that crowding will grow most on the lines expected to serve these areas and the new development areas, such as the southeast waterfront, Treasure Island, and Parkmerced.

FIGURE 10. POPULATION AND EMPLOYMENT GROWTH PROJECTIONS IN THE TOP 25 BAY AREA CITIES (2010-2040)



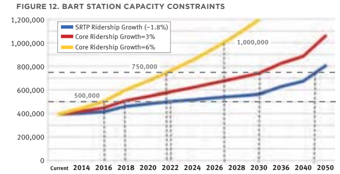
SOURCE: METROPOLITAN TRANSPORTATION COMMISSION, PLAN BAY AREA (2013)

FIGURE 11. CROWDING* ON MUNI IN 2013 (TOP) AND IN 2040 (BOTTOM)

SOURCE: SFCTA, SF CHAMP

* Crowding is defined by the percent of person-hours traveled in crowded (passenger-volume-to-vehicle-capacity ratio is 85% or higher) or over-capacity conditions (volume to capacity ratio is more than 100%).

FIGURE 12. BART STATION CAPACITY CONSTRAINTS



SOURCE: BART

Many regional bus and rail operators already face peak-period crowding and would also see that increase significantly by 2040. BART ridership to, from, and within San Francisco is projected to grow by 37%, and as such, the system's two most crowded stations, Embarcadero and Montgomery, are forecast to hit limits in their person-carrying capacity. BART estimates that at 500,000 daily system riders, stations will be at capacity in 2016, and at 750,000 system riders, the stations will experience significant backups at escalators and overcapacity platforms (Figure 12).

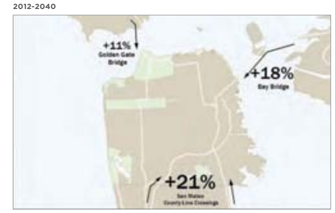
CAPACITY NEEDS MOST ACUTE IN THE CORE: DOWNTOWN, SOUTH OF MARKET, MARKET/OCTAVIA, AND EASTERN NEIGHBORHOODS

36% of trips to, from, or within San Francisco begin or end in the downtown and South of Market neighborhoods, more than any other neighborhood (Figure 13). Expected growth will significantly increase transit crowding and street congestion downtown. With projected growth and no new investment beyond already-planned projects, increased traffic will slow speeds to gridlocked conditions for cars and buses alike during peak hours. A nearly 30% reduction in projected private vehicle traffic would be necessary to avoid this condition (see Appendix C for detail). Strategies recommended to achieve this reduction are discussed on pages 29–30, and are incorporated into the SFTP Investment Plan, SF Investment Vision, and associated policy recommendations.

FIGURE 13. DAILY PERSON TRIPS BY SAN FRANCISCO NEIGHBORHOOD

SOURCE: SFCTA, SF CHAMP. EACH BAR INCLUDES ALL TRIPS TO, FROM, AND WITHIN THE NEIGHBORHOOD.

FIGURE 14. CHANGE IN DAILY COUNTY LINE CROSSINGS BY AUTOMOBILE, 2012-2040



SOURCE: SFCTA, SF CHAMP

NETWORK DEVELOPMENT AND MANAGEMENT NEEDED FOR THE SOUTHEAST AND PENINSULA CORRIDORS

Over the SFTP period, daily automobile trips entering San Francisco from the South Bay are expected to grow by 21% (Figure 14). This results in worsening congestion on Highway 101 and 280. The planned extension of Caltrain to the new Transbay Transit Center would help accommodate this growth and provide access for the future high speed rail system, but funding is incomplete. Better management of existing freeway space through high-occupancy vehicle lanes or other solutions is also needed.

WORLD CLASS INFRASTRUCTURE

San Francisco's transportation system relies on aging infrastructure that will need significant repair or replacement in the next decades. Without a significantly increased financial commitment to reach and maintain a state of good repair, riders will see increasing delays and crowding related to vehicle breakdowns, reduced service levels, and worsening pavement condition.

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TRANSIT VEHICLE REPLACEMENT AND BETTER MAINTENANCE WOULD IMPROVE RELIABILITY

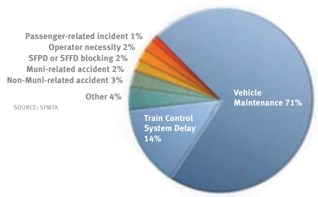
After decades of underinvestment, Muni and regional transit agencies that serve San Francisco have significant unfunded capital needs amounting to more than $5 billion through 2040 (see Appendix B for detail). These needs include new or updated facilities for maintaining transit vehicles, rail and overhead wire replacement, vehicle maintenance and replacement, and other needs.

As a result of resource limitations, Muni's vehicles have not received mid-life rehabilitations or timely replacement, resulting in a fleet that has high service unreliability and frequent expensive emergency repairs, as well as frequent unscheduled vehicle turnbacks. Figure 15 shows that vehicle maintenance is responsible for a large share of transit-service delays. Increased investment in routine maintenance and timely vehicle replacement would significantly reduce these delays and improve reliability. Figure 16 shows how breakdowns can be minimized with proper maintenance and mid-life replacement.

TRANSIT OPERATING COSTS ARE GROWING FASTER THAN REVENUES

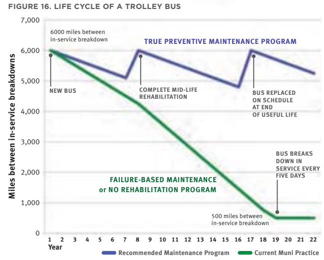
The cost of providing transit service has risen rapidly in recent years, a trend which destabilizes Bay Area transit systems and affects riders impacted by resulting service cuts. Figure 17 (next page) shows the rising real (inflation-adjusted) costs of transit

FIGURE 15. MUNI LIGHT RAIL: MAY 2013 REASONS FOR DELAY



SOURCE: SFMTA

FIGURE 16. LIFE CYCLE OF A TROLLEY BUS



SOURCE: SFMTA (FIGURE IS CONCEPTUAL)

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SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY • DECEMBER 2013

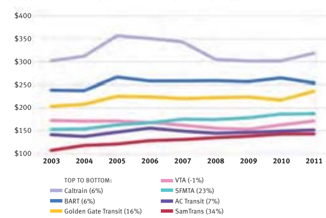
service for major Bay Area transit operators. In its Transit Sustainability Project (TSP) Report, the Bay Area MTC found that cost increases are primarily the product of employee fringe benefit cost growth (e.g. health care and pensions). Between 1997 and 2008, real fringe benefit costs at SFTMA, BART, and AC Transit grew by 72% (after adjusting for inflation), or about 5% per year.

Declining transit performance also affects operating costs. The TSP indicated that speeds on SFMTA's bus and light-rail system fell by more than 10% between 1997 and 2008. Slower speeds mean the same driver and vehicle can complete fewer route runs in a day, leading to less service for the same price.

RECENT IMPROVEMENT IN AVERAGE PAVEMENT CONDITION NEEDS INVESTMENT TO MAINTAIN

The city's Pavement Condition Index (PCI) has slowly fallen over time to the low 60s (fair) from 70s (good). The 2011 Proposition B streets bond enabled an increase in the PCI from 64 to 66 and provides increased funding levels until 2016. The PCI score is projected to fall into the 50s (at risk) by 2030. Without an additional investment in street rehabilitation and replacement, reaching and maintaining a PCI of 70 in the longer term will require about $2 billion more than what is already committed to street resurfacing over the life of the SFTP, but this is ultimately more cost-effective than further deferring maintenance needs. Maintaining pavement at a good condition costs $9,000 per block. If the PCI score lowers below 50, the cost to maintain pavement would balloon to $436,000 per block.

FIGURE 17. TRANSIT COSTS PER REVENUE SERVICE HOUR



SOURCE: NATIONAL TRANSIT DATABASE TS2.2, SERVICE DATA AND OPERATING EXPENSES TIME-SERIES BY SYSTEM, AND THE CALIFORNIA DEPARMENT OF FINANCE (FOR BAY AREA INFLATION DATA).

MORE EFFICIENT AND EFFECTIVE PROJECT DELIVERY IS NEEDED GIVEN GROWING CITYWIDE NEEDS

Small project delivery research indicates consensus that small projects and complete street projects can be delivered more efficiently, helping to lower unit costs or make improvements more quickly. As discussed on page 11, the scope of the city's goals for supporting bicycling, pedestrians, and efficient transit require that we construct improvements faster than we have historically. The Project Delivery Strategic Initiative of the SFTP (Appendices H and I) sought to identify opportunities to improve the timeliness, transparency, and efficiency of project implementation in San Francisco's transportation sector.

Research indicates that small projects and complete streets can be delivered more efficiently, resulting in more improvements and more "bang for the buck" as we invest in our streets.

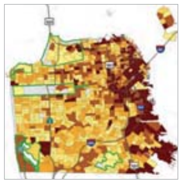
HEALTHY ENVIRONMENT

Reducing vehicle pollution—including greenhouse gases and other pollutants—is critical for a healthy environment. More stringent state vehicle emissions regulations will reduce vehicle pollution over the SFTP period, but growth in driving means that additional action will be necessary to for San Francisco to meets our aggressive greenhouse gas reduction goals.

VEHICLE TRAVEL GROWTH EXPECTED, ESPECIALLY TO AND FROM THE EASTERN NEIGHBORHOODS AND SOUTHWEST SAN FRANCISCO, THE PENINSULA

Miles driven by private vehicles, or VMT (vehicle miles of travel), are the main source of greenhouse gases and air pollutants from the transportation sector. Growing population and employment in San Francisco and regionally is expected to result in VMT in-

FIGURE 18. VEHICLE MILES TRAVELED IN 2040. (DARKER COLORS INDICATE MORE VEHICLE MILES OF TRAVEL.)



Workplace Vehicle Miles of Travel per Worker

Household Vehicle Miles of Travel per Household Automobile

SOURCE: SFCTA, SF CHAMP

creases of approximately 30% by 2040 under a business as usual scenario. Much of this VMT will be generated by driving trips to and from the downtown core (for workplace VMT), and outlying southwest and southeast neighborhoods (for household VMT)—(Figure 18).

VEHICLE TECHNOLOGY ALONE WILL NOT ACHIEVE SAN FRANCISCO'S AMBITIOUS GOALS

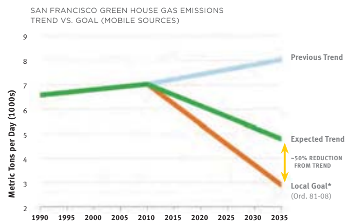
Technology will do much to reduce climate change impacts from private vehicles. Tough state laws (Pavley I and II) regulating vehicle emissions are expected to reduce greenhouse gases by more than 40%. However, this is not sufficient to allow San Francisco to achieve its aggressive greenhouse gas reduction goals, set by ordinance 81-08, which call for an 80% reduction below 1990 levels by 2050 (Figure 19). This is five times more aggressive than regional greenhouse gas reduction goals, and will take tremendous local committment and regional, state, and Federal support to achieve.

DEMAND MANAGEMENT STRATEGIES ARE CRITICAL TO ACHIEVING PROGRESS TOWARD OUR GOALS

Scenario testing conducted for the SFTP (see the "What would it take" sidebar box on page 19) revealed that, though necessary, supply-side investments such as major new transit lines and transit frequency are alone not very cost-effective at reducing greenhouse gases. Among the more cost-effective strategies are those that reduce vehicle tripmaking by more directly linking the cost or impact of driving to the decision to make a trip:

- **CONGESTION MANAGEMENT.** The Transportation Authority's 2010 Mobility, Access and Pricing study found that implementation of a peak-period congestion charge in San Francisco's northeast cordon would reduce vehicle delay by 21%, and greenhouse gases by 5% citywide, among other benefits. Congestion can also be managed through direct regulation of vehicle trips to the worksite.
- **EMPLOYER OUTREACH AND INCENTIVES.** Incentive and outreach programs in partnership with employers can provide employee travel counseling, transit promotions, tools to facilitate shared rides, and supportive services such as guaranteed ride home programs.

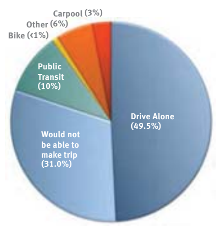
FIGURE 19. SAN FRANCISCO GREENHOUSE GAS (GHG) REDUCTION GOALS



* Assumes on-road mobile sector is responsible for proportional share of economy-wide goals set by Ordinance 81-08

SOURCE: SFMTA, SAN FRANCISCO CLIMATE ACTION PLAN

FIGURE 20. SHARE OF SHUTTLE USERS WHO WOULD DRIVE ALONE WITHOUT THE SHUTTLE*



SOURCE: SFMTA

*Surveys have indicated that shuttles are serving about 35,000 commute trips per day, or about 1% of all trips to, from, and within San Francisco.

- **PARTNERSHIPS WITH THE PRIVATE SECTOR AND COMMUNITY BASED ORGANIZATIONS.** The private sector is increasingly involved in providing transportation services, many of which could reduce single occupancy vehicle trips and greenhouse gases. The SFMTA Shuttle Partners program, for example, seeks to allow private employer shuttles to use Muni stops in exchange for a fee. SFMTA's data indicates that shuttles displace over 45 million vehicle miles traveled and 11,000 metric tons of GHG per year, and about half of shuttle riders say they would drive alone without shuttle access (Figure 20).

WHAT WOULD IT TAKE TO MEET SFTP GOALS?

To meet our adopted goals and targets for livability, world-class infrastructure, economic competitiveness, and a healthy environment would require significantly increased funding; commitments to prioritize our limited rights of way for transit, walking, and bicycling; and closer linking of the cost of driving to the decision to make a trip. Each of the aspirational scenarios described below includes a package of supply-side and demand-side improvements valued at about $10 billion above and beyond revenues we expect to have. The complete findings of "what it would take" to meet San Francisco's ambitious goals are included in Appendix B and summarized below.

LIVABILITY. We examined what it would take to meet the city's "transit first" goal of no more than 50% of daily trips by car. Expanding the capacity of transit (such as a with a second BART tube across the bay) and elevating safety through citywide traffic calming, road diets, a cycle track network, and more, decreased the expected share of trips by car by 6 percentage points to 53%. Only when paired with demand-management measures (congestion pricing) is the goal achieved (Muni and San Francisco's share of BART and Caltrain).

WORLD-CLASS INFRASTRUCTURE. We asked how much funding would be required to maintain our road conditions and transit system in a state of good repair in 2040. The unfunded cost to meet this goal is approximately $5 billion for the transit system and $1.5 billion for streets, which is in excess of the uncommitted funding available over the plan period. New revenues will be required just to meet these basic needs.

ECONOMIC COMPETITIVENESS. Competitive and reliable travel times are critical for businesses and their workers, customers, and suppliers. We analyzed what it would take to keep commute travel times from worsening in the future, given the large projected increase in new residents and jobs in the city. We found that transit and driving commute times in 2035 could be maintained at today's levels (average of 40 minutes), but it would take $5 billion worth of investments in new transit supply including an extension of Caltrain to downtown, bus rapid transit projects on key corridors, and other improvements, as well as demand management approaches including peak period area pricing and related mobility improvements.

HEALTHY ENVIRONMENT. In partnership with the city's Climate Action Plan team, we tested what it would take to meet the city's goal of reducing greenhouse gas emissions to 80% below 1990 levels by 2050. We found this goal is only possibly attainable with a robust combination of aggressive local and regional vehicle pricing, widespread use of electric vehicles, and major new infrastructure (including a new BART tube across the Bay at a cost of $10 billion).

A consistent finding across all scenarios was that strategies to manage travel demand, such as community outreach and education campaigns, employee programs, peak-period or area pricing, and parking pricing, are much more cost-effective in achieving desired goals than supply-side investments.

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CHAPTER THREE

FUNDING OUR TRANSPORTATION NEEDS

SAN FRANCISCO'S NEEDS FOR TRANSPORTATION FUNDING—even to maintain the existing transit and street networks in today's condition—far exceed expected revenues, and most funds are already committed to specific projects and purposes. The SFTP proposes ways to invest expected funding most effectively to make progress toward our goals, but analysis shows that this progress is limited without policy changes and additional investment from new revenues. Based on public input and technical analysis, we have developed two scenarios (Figure 21) that invest strategically in a diverse set of projects to make meaningful progress towards each of the SFTP's four goals. Because there is far more need than available revenues for transportation, each scenario anticipates some new revenues:

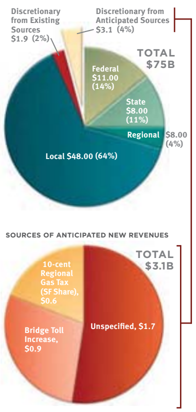
- The Investment Plan shows how existing and some anticipated new federal, state, and regional revenue (consistent with the Bay Area's long-range transportation plan, Plan Bay Area) could be spent.
- The SF Investment Vision imagines how we could get further towards our goals with major new sources of local revenue.

This chapter summarizes the revenue forecasts for the two scenarios. The next chapter describes the investments we could make and what they could achieve, along with supporting policy recommendations to get the most out of our investments.

FIGURE 21. THE INVESTMENT PLAN AND SF INVESTMENT VISION

moveSmartSF SAN FRANCISCO TRANSPORTATION PLAN 2040

FIGURE 22. PLAN REVENUES BY SOURCE
(IN BILLIONS OF YEAR-OF-EXPENDITURE DOLLARS THROUGH 2040)



SOURCE: SFCTA (SEE APPENDIX D FOR DETAIL)

INVESTMENT PLAN: INCLUDES BOTH EXISTING AND ANTICIPATED NEW FEDERAL, STATE, AND REGIONAL REVENUE

The SFTP Investment Plan proposes how we should invest revenues we expect to have through 2040, including some expected new federal, state, and regional funds. About $75 billion in federal, state, regional and local revenue is expected for transportation in San Francisco through 2040. Figure 22 illustrates the sources of existing and anticipated new revenues for the Investment Plan. SFTP Appendix D describes the assumptions used to estimate expected revenues in more detail. All revenues are expressed in billions of year-of-expenditure dollars over the SFTP period.

MOST EXPECTED REVENUE IS FROM LOCAL AND REGIONAL SOURCES

The federal gas tax that funds transportation is not indexed to inflation, and has not been increased since 1992. Similarly, the state has struggled with budget deficits for years. As a result, the responsibility of paying for our transportation system increasingly falls on the shoulders of local and regional governments, or through direct user payment. Over 65% of the $75 billion expected for the Investment Plan comes from local and regional funding sources, such as the Prop K transportation sales tax and the $10 Prop AA vehicle registration fee.

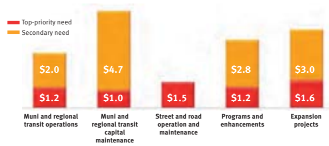
MOST EXPECTED REVENUES ARE ALREADY COMMITTED

Over 90% ($70 billion) of the expected funds are already committed to specific projects (such as the Presidio Parkway, Central Subway, and Caltrain Electrification) and purposes (such as transit and local streets operations and maintenance). This means that of the $75 billion in revenue we expect through 2040, only about $5 billion (or 7%) is discretionary, meaning we can decide how it should be invested to improve our transportation system.

ANTICIPATED REVENUES ARE INSUFFICIENT TO MEET OUR EXISTING AND FUTURE SYSTEM NEEDS

San Francisco's unfunded transportation needs far exceed the expected $5 billion in uncommitted revenue. Even if we spent every cent of discretionary funds on transit and streets maintenance, repair and replacement projects, we still would not have enough just to maintain the existing transportation system in a state of good repair—let alone make safety and livability enhancements or address planned growth. Figure 23 summarizes the transportation system investment need by category.

FIGURE 23. UNFUNDED TRANSPORTATION NEEDS BY CATEGORY



SOURCE: SFCTA, SFMTA, SFDPW, BART, MTC

TWO-PRONGED REVENUE STRATEGY

The SFTP (through its investment plans and policy recommendations) proposes ways to cost-effectively invest expected transportation funds, but analysis shows that this progress is limited unless we identify new revenues. So, the SFTP recommends a two-pronged revenue strategy. First, the Investment Plan seeks to position San Francisco well to compete for the anticipated additional new federal, state, and regional funding sources. Second, the SF Investment Vision calls for an additional $7.5 billion in locally-controlled transportation revenues. With $7.5 billion in additional local revenues, the SF Investment Vision achieves more of our maintenance, livability, and economic competitiveness goals, and makes more progress towards our ambitious environmental goals.

SF INVESTMENT VISION

NEW LOCAL SOURCES OF FUNDING UNDER CONSIDERATION

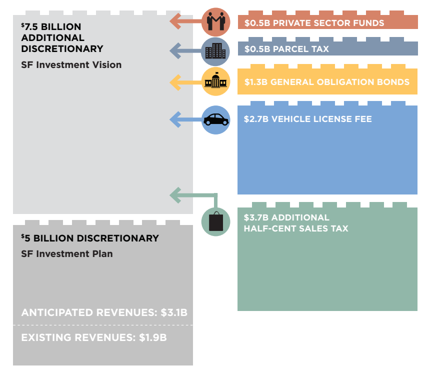
For the SFTP, we evaluated a range of potential new local revenue sources, considering factors like revenue stability, growth potential, equity, and likelihood of being put into place. The SFTP Revenue White Paper provides a comparison table and information on the primary local sources we evaluated. A combination of sources pictured in Figure 24—such as general obligation bonds, a Vehicle License Fee, additional half-cent sales tax, or others could provide the $7.5 billion needed beyond the Investment Plan to achieve the $82.5 billion SF Investment Vision.

MAYOR'S 2030 TRANSPORTATION TASK FORCE

We coordinated SFTP development with the Mayor's 2030 Transportation Task Force. The Task Force has developed recommendations for potential new local transportation revenues, and has recommended that voters approve $1 billion in general obligation bonds, a half-cent increase in the sales tax, and a 1.35% increase in the vehicle license fee to generate just over $2.95 billion ($2013) in new transportation revenues between 2015 and 2030.

FIGURE 24. A COMBINATION OF SOURCES CAN PROVIDE $7.5 BILLION ADDITIONAL DISCRETIONARY

$12.5 BILLION TOTAL IN DISCRETIONARY TRANSPORTATION FUNDS



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CHAPTER FOUR

INVESTMENT PLANS AND POLICY RECOMMENDATIONS

THE SFTP IS THE BLUEPRINT for the future of our city's transportation system through 2040. With input from the public (detailed in Appendix E), and informed by other agencies and robust technical analysis (Appendices A, B, and F), we've developed two investment scenarios that will allow us to make meaningful progress toward our transportation goals: the Investment Plan and SF Investment Vision. The result is a diverse investment plan paired with specific policy actions and new revenues.

CONTENTS OF THE INVESTMENT SCENARIOS

The Investment Plan and SF Investment Vision are organized into three major categories of spending:

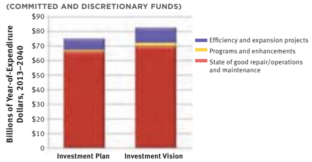
- **ONGOING MAINTENANCE AND OPERATIONS FUNDING.** Each investment scenario recommends funding levels for the ongoing maintenance and operations of our street network (including roadway-repaving street sweeping, traffic signal maintenance); and transit system operation, maintenance and replacement. The vast majority of funding is dedicated to this category.
- **TRANSPORTATION PROGRAMS AND ENHANCEMENTS.** This category includes funding for seven transportation programs that improve safety, expand or enhance the transportation system through small-to-medium scale improvements for all modes.
- **EFFICIENCY AND EXPANSION PROJECTS.** This category recommends funding for a list of major capital projects that would improve the efficiency of the existing system or cost-effectively expand system capacity.

Figure 25 (next page) provides an overview of the amount of funding dedicated to these categories in the Investment Plan and Investment Vision, and the remaining sections describe each category in detail.

The SFTP also recommends policy actions. This chapter highlights some of the key policy recommendations. For a complete list, see Appendix G.

We've developed two investment scenarios that will allow us to make meaningful progress toward our transportation goals: the Investment Plan and SF Investment Vision. What it takes is a diverse investment plan paired with specific policy actions and new revenues.

FIGURE 25. MAJOR USES OF INVESTMENT AND VISION REVENUES (COMMITTED AND DISCRETIONARY FUNDS)



SOURCE: SFCTA

DISCRETIONARY INVESTMENT: USES OF $5B AND $12.5B IN DISCRETIONARY FUNDS

As discussed in Chapter 3, 90% of the expected $75 billion in transportation revenue is dedicated to specific projects or purposes. This leaves $5 billion in expected and new revenues that we can decide how to spend. With the SF Investment Vision, a combination of new local funding sources can provide the additional $7.5 billion needed beyond the Investment Plan to go further toward our goals. Figure 26 summarizes the uses of expected and new discretionary funds in the Investment Plan and SF Investment Vision.

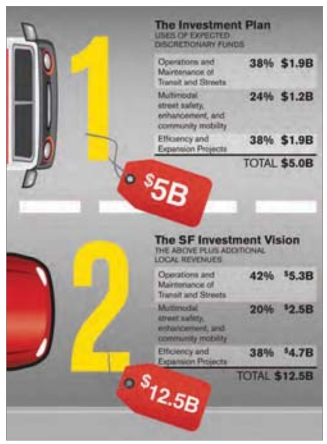
PLAN AND VISION INVESTMENTS

The following sections describe the investments proposed in the SFTP Investment Plan and SF Investment Vision.

DEDICATED MAINTENANCE AND OPERATING FUNDING

About $60 billion of the expected $75 billion in transportation revenue is already committed to operations and maintenance of the existing system and major projects that rehabilitate existing infrastructure. These include the Presidio Parkway, Yerba Buena Island Ramp Improvements, and Transbay Transit Center Phase 1. As discussed on page 16, an additional $5 billion is needed to maintain transit capital assets in an optimal state of good repair. Another $1.54 billion is needed to achieve the city's pavement condition goals. An additional $1.2 billion would be required to provide all of the transit service Muni is scheduled to provide today.[1] Figure 27 shows how we allocated funding to help address some of these maintenance and operations needs.

FIGURE 26. USES OF DISCRETIONARY FUNDS



SOURCE: SFCTA

1 Funding constraints are one factor that currently prevents Muni from operating all scheduled service.

FIGURE 27. COMPARISON OF PLAN AND VISION FUNDING LEVELS FOR MAINTENANCE AND OPERATION

INVESTMENT CATEGORY	INVESTMENT LEVEL	PLAN	VISION
State of Good Repair / Operations and Maintenance			
Muni and Regional Transit: Operations. Provides funding to operate Muni and regional transit service.	**PLAN:** Maintain today's funding and actual service levels. **VISION:** Fully fund all today's scheduled service levels.	$43.80	$45.00
Muni and Regional Transit: Capital Asset Maintenance. Provides funding to maintain and replace Muni and regional transit vehicles, stations, and maintenance facilities.	**PLAN:** Fully fund transit vehicle replacement needs for all operators; all MTA vehicle mid-life overhauls; and 70% of Score 16 (most important) assets. **VISION:** Fund 100% of Muni Score 16 needs.	$12.41	$14.06
Local Streets and Roads: System Preservation. Provides funding to re-pave streets and roads.	**PLAN:** Maintain today's pavement condition. **VISION:** Reach and maintain pavement condition index of 70 ("good").	$3.27	$3.83
Local Streets and Roads: Operations. Provides funding for street sweeping, signal maintenance, and other roadway upkeep.	**PLAN AND VISION:** Maintain today's levels of street operations.	$2.80	$2.80
Local Street and Bridges Structures: Capital Maintenance. Provides funding to maintain or replace aging structures (e.g. bridges and tunnels).	**PLAN AND VISION:** Fund unmet need of $3M/decade.	$0.01	$0.02
State of Good Repair Projects. Funds major capital replacement and rehabilitation projects.	**PLAN AND VISION:** Provide full funding for the Presidio Parkway; Transbay Transit Center Phase I Improvements; and Yerba Buena Island Ramp Improvements.	$4.01	$4.01
	SUBTOTAL (AMOUNT IN $BILLIONS YOE)	$66.30	$69.72
	PERCENT OF TOTAL INVESTMENT	88%	84%

The Investment Plan provides sufficient funding to support mid-life vehicle overhauls for Muni, extending the life of each vehicle and reducing the incidence of vehicles that are out of service.

RECOMMENDATION:
PRIORITIZE REVENUES TO FULLY FUND TIMELY VEHICLE REPLACEMENT AND REHABILITATION

Underfunding vehicle maintenance contributes to reduced reliability and unscheduled service turnbacks in outlying neighborhoods, a top concern recorded during public outreach. The Investment Plan provides sufficient funding to meet vehicle replacement needs for all transit operators as well as to support mid-life vehicle overhauls for Muni, extending the life of each vehicle and reducing the incidence of vehicles that are out of service.

Local funds prioritized for this purpose will leverage significant regional and federal monies. An example is MTC's Transit Core Capacity program, which benefits Muni, BART, and AC Transit (all of which provide San Francisco service).

RECOMMENDATION:
EXPAND TRANSIT SERVICE WHILE SUPPORTING STEPS TO STABILIZE COSTS

New funding will be necessary to increase transit service frequencies to reduce crowding and serve new riders. However, new funding should be accompanied by measures to stabilize the rapid rise in transit operating costs (described on page 17). Such measures could include prioritizing projects to speed up Muni vehicles, such as the Transit Effectiveness Project; implementing transit operator fringe benefit cost control strategies recommended in the MTC's Transit Sustainability Project; and seeking a regional funding solution to stabilize Caltrain operating and capital funding. SFMTA and other transit agencies have already committed to a 5% real reduction in costs by fiscal year 2016–2017.

RECOMMENDATION:

ACHIEVE CITY GOALS FOR AVERAGE PAVEMENT CONDITION

Smoother roads benefit all modes of travel. The SFTP Investment Vision dedicates sufficient funding for San Francisco to achieve and maintain an average pavement condition index of 70, or "good," over the life of the plan. Streets maintained at pavement score 70 are several times less expensive to keep up than streets which aren't maintained at this level.

FIGURE 28. COMPARISON OF PLAN AND VISION FUNDING LEVELS FOR PROGRAMS AND ENHANCEMENTS

INVESTMENT CATEGORY	INVESTMENT LEVEL	PLAN	VISION
Programs			
Walking and Traffic Calming. Supports new and widened sidewalk construction, sidewalk bulb outs to shorten crossing distances, crosswalk upgrades, pedestrian countdown signals, landscaping, and vehicle speed control treatments.	**PLAN:** Provides $10m/year (exceeds historic funding levels). **VISION:** Funds full build out of the Mayor's Pedestrian Strategy.	$0.28	$0.63
Bicycling. Supports physical improvements on the citywide bicycle network, such as new cycle tracks (bike lanes physically separated from moving cars), bike lanes and paths, repair of existing lanes, bicycle parking, and bicycle outreach and education.	**PLAN:** Funds a citywide cycle track network. **VISION:** Funds full buildout of the SFMTA Bicycle Strategy.	$0.15	$0.60
Regional Transit Enhancements. Supports improvements for regional transit operators serving San Francisco, including BART, Caltrain, and Golden Gate Transit, such as additional escalators at stations, new signage, and station access improvements (e.g. more bike parking).	**PLAN:** Maintain historic levels. **VISION:** Increase moderately over historic levels.	$0.20	$0.35
Muni Enhancements and Customer First Treatments. Supports new Muni equipment to improve transit reliability and passenger amenities, such as on-vehicle cameras, ticket vending machines, and new station platform information displays, as well as new and improved transit stops.	**PLAN:** Maintain historic levels. **VISION:** Increase moderately over historic levels.	$0.19	$0.29
Street and Signal Upgrades and Street Network Development. Supports new traffic signs and signals, red light photo enforcement equipment, management of major arterials such as Guerrero or Lincoln, and new streets in developing areas of the City such as Hunters Point and Candlestick Point.	**PLAN:** Doubles historic funding levels. **VISION:** Triples historic funding levels.	$0.21	$0.28
Transportation Demand Management. Supports educational, outreach, and regulatory programs that reduce single-occupant vehicle use for commuters, schools and universities, and institutions.	**PLAN:** Increase of 20% over historic funding. **VISION:** Doubles historic funding levels.	$0.06	$0.10
Equity. Supports planning, project development, and service to promote equitable access and investment.	Provides $10M/year for planning, operations, and/or implementation	$0.14	$0.28
	SUBTOTAL (AMOUNT IN $BILLIONS YOE)	$1.23	$2.53
	PERCENT OF TOTAL INVESTMENT	2%	3%

TRANSPORTATION PROGRAMS AND ENHANCEMENTS

The Investment and SF Vision Plans provide $1.2 and $2.5 billion, respectively, to eight transportation safety and enhancement programs. Figure 28 describes how the funding levels compare to historic funding and the need.

RECOMMENDATION:

BUILD THE PEDESTRIAN AND BICYCLE STRATEGIES TO ESTABLISH SAFER NEIGHBORHOOD NETWORKS CITYWIDE

As discussed on page 11, the City has set aggressive goals for increasing the share of trips made by bicycling and walking while improving safety. Public outreach indicated that bicycling and walking infrastructure are top public priorities after basic transit operations and maintenance (See Appendix E). Accordingly, the plan and vision scenarios increase funding for traffic calming, walking, and bicycling programs (combined) by 80% and 400%, respectively, over historic funding levels. The vision-level funding is sufficient to support full implementation of the SFMTA's Bicycle and Pedestrian Strategies.

Funding for pedestrian and bicycle safety can be spent most effectively by focusing it on the roadways with the highest incidence of pedestrian and bicyclist injuries and fatalities, many of which are arterial roadways. The Pedestrian Strategy has identified these 70 miles of High-Injury Corridors, which represent only 6% of San Francisco's street miles, but 60% of severe and fatal injuries.

RECOMMENDATION:

CREATE MORE COMPLETE STREETS (AT LOWER COST) THROUGH COORDINATION WITH REPAVING

Safety and enhancement projects can be implemented more efficiently through coordination with roadway repaving, which occurs on a regular schedule city-wide. The SFTP recommends setting aside some Prop K funds to advance safety project coordination with re-paving projects, utility projects, and/or major capital investments. It also recommends developing a checklist for all re-paving projects to facilitate consideration of complete streets elements.

RECOMMENDATION:

INCREASE INVESTMENT IN EMPLOYER, SCHOOL, AND COMMUNITY TRIP REDUCTION PROGRAMS

As described on page 16, San Francisco's downtown—especially as growth expands in SoMa and Mission Bay—will see transit performance decline if growth occurs as expected and travel behavior remains the same. The City's 1985 Downtown Plan introduced then-innovative demand management strategies, such as incentives for employers to provide employee travel counseling, helping to reduce peak period congestion and the need for parking. A new generation of incentive and outreach programs is needed for our growing downtown, especially South of Market and Eastern Neighborhoods. These partnerships with employers, institutions, and residential associations can provide travel counseling, incentives for taking transit, tools to facilitate shared rides, and supportive services such as guaranteed ride home programs. The SFTP increases funding for these travel demand management incentive programs by 20% and 100% over historic levels in the Investment Plan and Investment Vision, respectively.

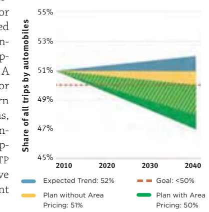
RECOMMENDATION:

INCREASE TRANSPARENCY AND PROMOTE PUBLIC INVOLVEMENT BY SHARING AGENCY PRIORITIZATION AND DEVELOPMENT PROCESSES

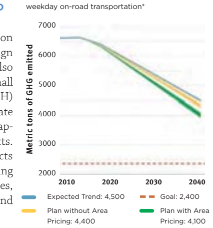
Often during SFTP outreach, the public would express confusion about how San Francisco agencies identify, prioritize, and design street improvements. Fragmented institutional roles can also contribute to slower-than-desired project delivery rates. Small Project Delivery research conducted for the SFTP (Appendix H) found that coordination within and among agencies is inadequate to deliver a multi-modal vision, and that a consensus-based approach to project design diminishes the benefits of many projects. Strategies to increase project delivery and support quality projects include dedicating funds for increasing agency capacity, increasing transparency and coordination of agency prioritization processes, and enhancing public involvement in project development and planning efforts.

FIGURE 29. CONTRIBUTION OF AREA PRICING TO PLAN GREENHOUSE GAS AND AUTOMOBILE TRIP REDUCTION BENEFITS

LIVABILITY
Percent of all trips made by auto*



HEALTHY ENVIRONMENT
Greenhouse Gas Emissions
weekday on-road transportation*



* 2040 forecasts are derived from the Transportation Authority's regional travel demand Model, SF-CHAMP; the more ambitions end of the range represents additional travel demand management (TDM) program assumptions such as bikesharing, shuttles, carsharing, and other TDM policy efforts, which are calculated outside of the SF-CHAMP model and applied on top of modeling results.

A COMPREHENSIVE STRATEGY FOR THE SOUTH OF MARKET AND EASTERN NEIGHBORHOODS

The City's original 1984 Downtown Plan introduced new measures such as Transportation Management Associations (TMAs) to address the congestion caused by employment growth. Now a new wave of growth in the downtown, South of Market, and Mission Bay will significantly increase core crowding conflicts and congestion (see Appendix C). A comprehensive strategy is needed for the new, expanded core to manage congestion and maintain livability, including: transit capacity and other infrastructure; dedicated transit and bicycle networks; pedestrian safety measures; area-wide congestion and freeway management measures; and strengthened trip-reduction programs in partnership with employers.

RECOMMENDATION:
CONTINUE TO DEVELOP PRICING APPROACHES TO CONGESTION MANAGEMENT

Scenario testing conducted for the SFTP (see the "what would it take" sidebar box on page 19) revealed that the most cost-effective ways to reduce greenhouse gas emissions are those that reduce vehicle tripmaking by more directly linking the cost or impact of driving to the decision to make a trip. The Investment and SF Vision Plans recommend considering peak or area pricing in the Northeast Cordon, in addition to the pricing already approved for Treasure Island.[2] These projects require about $0.03 billion in start-up capital costs, which is less than .01% of the Investment Plan Cost, but generate almost half the benefits of the Plan (Figure 29). They would also generate as much as $2.5 billion in revenue that could be re-invested into multimodal projects and programs.

2 Analysis of Congestion Pricing can be found in the Mobility, Access, and Pricing Study (2008) on the Transportation Authority web site at www.sfcta.org. Information about Treasure Island pricing can be found at www.sfcta.org/TIMMA.

FIGURE 30. SFTP EFFICIENCY AND ENHANCEMENT PROJECT LIST

PROJECT	PLAN	VISION
Transbay Transit Center Phase 2/Caltrain Downtown Extension: Extension of Caltrain to the Transbay terminal	$2.60	$2.60
Central Subway: Extension of the T-Third light rail to downtown and Chinatown	$1.58	$1.58
Developer Funded Projects (Parkmerced, Mission Bay, Treasure Island, SE Waterfront Local Streets)	$0.90	$0.90
Caltrain Electrification/Signal System (SF remaining share of total cost)	$0.48	$0.48
Van Ness Avenue Bus Rapid Transit: Dedicated bus lanes and transit-priority treatments.	$0.13	$0.13
Long-Range Transit Network Development, including Transit Performance Initiative, one or more major projects to improve BART/Muni transit travel time, and reliability at key bottlenecks, such as the Embarcadero Muni Metro turnaround, the J-Church and N-Judah merge point, and at West Portal.	$0.14	$1.54
Expanded Transit Service and New Vehicles, Muni and Regional Operators: Increases funding for transit service by 1% over expected revenues and purchases new vehicles.	$0.41	$0.71
BART Metro: One or more major construction projects that allow BART to run more frequent transbay service to the core of San Francisco	$0.00	$0.50
M-Line West Side Alignment and Grade Separation: Relocate the M-Ocean View light rail line from the center of 19th Avenue near Stonestown to a dedicated transit lane on the west side of the road to remove conflicts with 19th Avenue auto traffic, improving pedestrian safety and transit travel speed/reliability (only environmental phase funded).	$0.12	$0.43
Better Market Street (transportation elements only): Re-designs and improves Market Street for transit, bicycling, and pedestrians.	$0.20	$0.39
Transit Effectiveness Project: Improves Muni reliability and reduces travel times system-wide through stop improvements such as bus bulb-outs, stop placement, lane modifications, signals, and other tools to prioritize transit.	$0.34	$0.34
Geary Corridor Bus Rapid Transit: Dedicated bus lanes and other transit priority treatments on Geary Boulevard to increase the speed and reliability of the 38/38-Limited lines.	$0.24	$0.24
Bayshore/Potrero Bus Rapid Transit: Dedicated bus lanes and other transit-priority treatments on Potrero Avenue and Bayshore Boulevard to increase the speed and reliability of the 9/9-Limited lines.	$0.13	$0.13
Freeway Performance Initiative: Convert freeway lanes and ramps to carpool and transit lanes, such as on I-280 between 6th Street and US 101.	$0.04	$0.13
Bi-County Program: Includes extension of the T-Third Street to Caltrain Bayshore Station and the Geneva-Harney Bus Rapid Transit	$0.09	$0.09
Bi-County Program, T-Third Street to Caltrain Bayshore Station: Extend the T-Third Muni Metro line and provide new service from Bayshore/Sunnydale to the Bayshore Caltrain station.	$0.05	$0.05
Bi-County Program, Geneva-Harney Bus Rapid Transit: Dedicated bus lanes from Bayshore Boulevard to Prague Street and transit-preferential treatments such as transit signal priority in mixed-traffic lanes from Prague to Ocean Avenue to increase the speed and reliability of the 28-Limited line.	$0.04	$0.04
Oakdale Caltrain Station: New Caltrain station at Oakdale Avenue in the Bayview.	$0.05	$0.05
Waterfront transit capacity and performance, e.g., E-Historic Streetcar Service between Fisherman's Wharf and the 4th Street Caltrain Station: Construct a turn-around track for streetcars at the Caltrain station necessary to provide permanent direct historic streetcar service between Fisherman's Wharf and the 4th Street Caltrain station.	$0.05	$0.05
Express Bus Service: Service from Candlestick and Hunters Point to Downtown.	$0.03	$0.03
Area Pricing, Capital Startup Costs: Northeast Cordon and Treasure Island.	$0.03	$0.03
Area Pricing, Ongoing Operations: Northeast Cordon and Treasure Island: Install a peak period congestion charge for cars entering or leaving downtown or Treasure Island, and invest net revenues in its implementation and related transit, pedestrian, bicycle and carpool alternatives.	N/A*	
Southeast Waterfront Transit Priority and Increased Service	N/A**	
SUBTOTAL (AMOUNT IN $BILLIONS YOE)	$7.57	$10.35
PERCENT OF TOTAL INVESTMENT	10%	13%

FIGURE 30 (CONTINUED)

* The area pricing program raises approximately $2.5 billion in revenue (not reflected above) that is invested into supportive multimodal projects and programs.

** Southeast Waterfront improvements proposed to be funded by future growth in the general fund resulting from development.

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SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY • DECEMBER 2013

EFFICIENCY AND EXPANSION PROJECTS

About six billion of the expected $75 billion in transportation revenue is dedicated to committed efficiency or expansion projects, including those under construction (Central Subway), fully funded (some development-related projects), or prioritized in regional agreements (e.g., Van Ness Avenue Bus Rapid Transit). The Investment Plan recommends dedicating about $2 billion in discretionary funding to plan our long-range transit network and provide efficiency and expansion investments. This includes new transit service and defined capital projects beyond existing commitments. See Appendix A for detail on how we prioritized projects for inclusion. Figure 30 lists project costs, and Figures 31 and 32 (pages 32, 33) illustrate project locations.

RECOMMENDATION:
CONTINUE RAPID TRANSIT NETWORK DEVELOPMENT, INCLUDING BUS RAPID TRANSIT

The most cost-effective transportation projects are those that make the most efficient possible use of existing infrastructure. Bus Rapid Transit is an affordable approach to creating a network of rapid transit along key corridors throughout San Francisco, including Geneva Avenue and Potrero / Bayshore Boulevard. Another example of making the most efficient use of existing infrastructure is the Transit Effectiveness Project, which cost-effectively improves transit travel times and reliability through transit-priority treatments on Muni's Rapid Network, the top lines that carry 75% of total transit ridership. Bus Rapid Transit could also be deployed to fill gaps in regional transit connections to the city's west side.

RECOMMENDATION:
CONTINUE TO COORDINATE TRANSIT INVESTMENT WITH LAND USE DEVELOPMENT PLANS

With new state requirements to focus on reducing greenhouse gas emissions through more coordinated land use and transportation planning, regional funding frameworks increasingly emphasize Priority Development Areas (PDAs), where cities are planning for infill, transit-oriented growth. San Francisco agencies have identified PDAs, generally in the eastern part of the city. The Transportation Investment and Growth Strategy identifies the transportation needs to support this growth. As area plans and major developments are contemplated, such as along the Eastern Waterfront, transportation needs in all categories—operations and maintenance, safety and enhancements, and efficiency and expansion—should be identified and prioritized.

RECOMMENDATION: INVEST IN PLANNING AND PROJECT DEVELOPMENT TO REDUCE DISPARITIES

In response to concerns heard during SFTP outreach, we analyzed how transportation conditions such as safety, transit access, and reliability vary geographically in the city (see Appendix F). We found some disparities. For example, low-income communities experience disproportionately high numbers of pedestrian and bicyclist injuries and fatalities, and outlying neighborhoods experience worse transit reliability. We responded by proposing a set-aside equity funding program with $140 million for projects that improve equity and including equity as a consideration in project prioritization.

RECOMMENDATION:

SET A VISION FOR MANAGING THE CITY'S FREEWAY NETWORK

San Francisco's greatest increases in vehicle travel are projected to be to and from the eastern neighborhoods and the Peninsula/South Bay. Overall development and management strategies are needed for the US 101 and I-280 corridors. As the region develops the Bay Area Express Lane Network, San Francisco agencies should partner with Caltrans, the MTC, and neighboring cities and counties to develop a local strategy for managing our freeway network and related surface streets such as Potrero and Bayshore.

RECOMMENDATION:

IDENTIFY THE NEXT GENERATION TRANSIT NETWORK PRIORITIES FOR BART, CALTRAIN, AND MUNI

Addressing bottleneck points in our local and regional rail networks will significantly improve rides for existing and passengers and allow for new passengers on our system. and The SFTP identifies the need to establish a long-range, multi-operator transit network development strategy. The SF Investment Vision identifies up to $1.5 billion in expected and potential new revenues for expanding the capacity of BART, Caltrain, and Muni.

RECOMMENDATION:

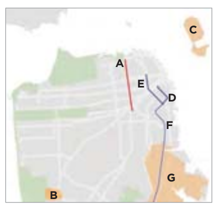
CONSIDER ALL OPTIONS FOR DELIVERING PROJECTS

Transportation projects may fall behind schedule and experience cost increases, and the public generally perceives delivery as taking too long. The SFTP Small and Large Project Delivery White Papers (Appendices H and I) explore strategies to aid project delivery. Key recommendations include consideration of a wide range of public-private partnership opportunities for major capital improvements such as the Caltrain Downtown Extension to the rebuilt Transbay Terminal, and the Treasure Island Transportation Improvement Plan.

INVESTMENT PLAN AND VISION SCENARIO BENEFITS

San Francisco's needs for transportation funding far exceed expected revenue. The SFTP proposes ways to invest the dollars we expect to have to most effectively make progress towards our goals, but analysis shows that our progress will be limited unless we identify new revenues. Figure 33 (pages 34–35) illustrates the additional benefits possible through higher funding levels. See Appendix J for more detail on plan performance results.

FIGURE 31. COMMITTED EFFICIENCY AND ENHANCEMENT PROJECTS



$9.43 billion in expected revenue is dedicated to projects that San Francisco has already committed to building.

A. Van Ness Bus Rapid Transit

B. Improvements to support development of Parkmerced

C. Improvements to support development on Treasure Island including

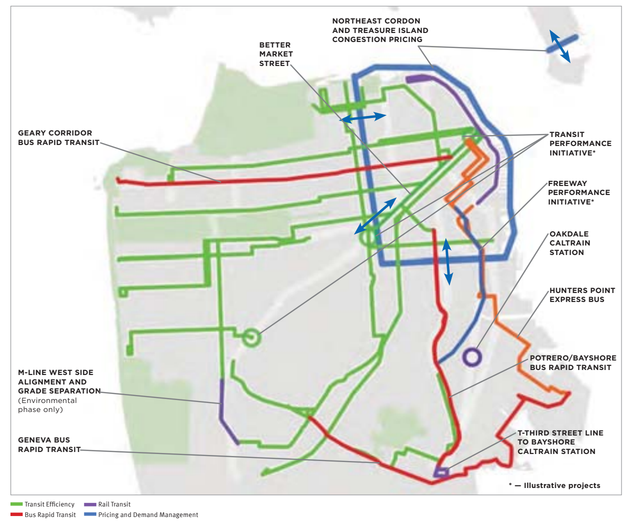
D. Extension of Caltrain to Downtown

E. Central Subway

F. Caltrain Electrification and signal system upgrade

G. Improvements to support development of Candlestick Point/Hunters Point-Shipyards

FIGURE 32. INVESTMENT PLAN DISCRETIONARY EFFICIENCY AND ENHANCEMENT PROJECTS



WORLD CLASS INFRASTRUCTURE

SAFE STREETS AND VIBRANT NEIGHBORHOODS

HEALTHY ENVIRONMENT

ECONOMIC COMPETITIVENESS

1

$5B

The Investment Plan

USES OF EXPECTED DISCRETIONARY FUNDS

Operations and Maintenance of Transit and Streets	38%	$1.9B
Multimodal street safety, enhancement, and community mobility	24%	$1.2B
Efficiency and Expansion Projects	38%	$1.9B
	TOTAL	$5.0B

World Class Infrastructure

- **70%** — 70% of highest priority transit maintenance needs met. Increased vehicle maintenance to reduce service turnbacks, increase reliability
- **19%** — Reduce transit crowding 19% on ten most crowded Muni lines. Maintains today's pavement condition

Safe Streets and Vibrant Neighborhoods

- **20MI** — About 40% of the City's Pedestrian Safety Strategy funded (nearly 20 miles) of pedestrian safety improvements
- **22%** — Nearly 22% of the City's Bicycle Strategy funded

Healthy Environment

- **10%** — Up to 10% reduction in auto trips. Expanded employer, school and community trip reduction partnerships
- **12%** — Up to 12% reduction in GHG emissions

Economic Competitiveness

- **15MI** — 15 miles of protected transit lanes including Bus Rapid Transit on key corridors
- **14%** — 14% improvement in Muni speeds on rapid network

2

$12.5B

The SF Investment Vision

THE ABOVE PLUS ADDITIONAL LOCAL REVENUES

Operations and Maintenance of Transit and Streets	42%	$5.3B
Multimodal street safety, enhancement, and community mobility	20%	$2.5B
Efficiency and Expansion Projects	38%	$4.7B
	TOTAL	$12.5B

World Class Infrastructure

- **100%** — 100% of Highest Priority Transit Maintenance Needs Met
- **38%** — Reduce transit crowding 38% of ten most crowded Muni lines. Pavement condition improves to "good" levels

The SF Investment Vision also funds some maintenance of local bridges and street structures.

Safe Streets and Vibrant Neighborhoods

- **40MI** — 100% of the City's Pedestrian Safety and Bicycle Strategies (Over 40 miles of pedestrian safety improvements)
- **100%** — 100% of the City's Bicycle Strategy funded

Both scenarios include dedicated planning funds to develop safety and mobility projects in Communities of Concern and neighborhoods citywide

Healthy Environment

- **14%** — Up to 14% reduction in auto trips. Freeway management and transit efficiency strategies to increase safety and encourage carpools.
- **15%** — Up to 15% reduction in GHG emissions

Multimodal investments and demand management, including area pricing, downtown and on Treasure Island account for half of these benefits in both scenarios

Economic Competitiveness

- **33MI** — Up to 33 miles of protected transit lanes. Increased BART capacity and reliability
- **18%** — 18% improvement in Muni speeds on rapid network. Muni Metro system bottlenecks addressed to improve reliability and travel times

Additional Caltrain service and/or BART express buses increase rapid connections to the South and East Bays.

FIGURE 33. COMPARISON OF PLAN AND VISION SCENARIO BENEFITS

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CHAPTER FIVE

NEXT STEPS

THE SFTP WILL SHAPE THE WORK of the Transportation Authority and our partner agencies in the years to come. Major next steps are:

- Rolling out the first five years of SFTP investments through an Early Action Program.
- Coordinating with the Mayor's 2030 Transportation Task Force and other local and regional partners to pursue new local revenues to address unmet transportation needs.
- Conducting monitoring and evaluation to ensure efficient and equitable progress towards SFTP goals.

Additionally, the SFTP itself will be updated approximately every several years.

EARLY ACTION PROGRAM

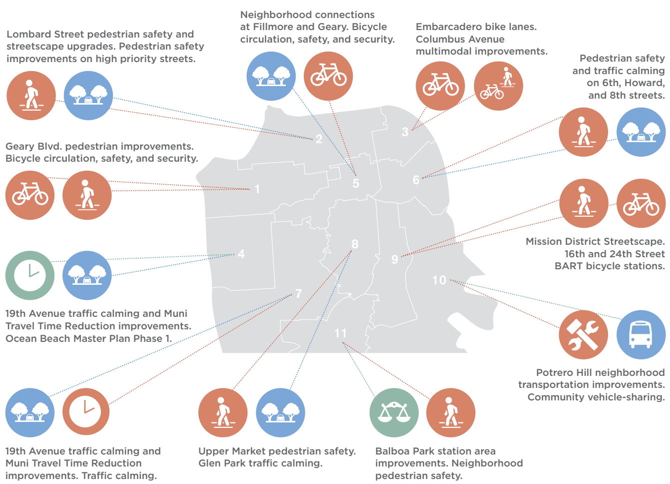
The Early Action Program represents the first five years of the 30-year SFTP and will fund improvements in every part of the city for every mode of travel. The Early Action Program uses the Prop K transportation sales tax and its ability to leverage federal, state and other funds to direct hundreds of millions of dollars toward SFTP investments. Over the next five years, city and regional agencies will work to define and implement these projects. The Figure 34 (next page) shows a representative sample of potential Early Action Program projects. We anticipate Early Action Program projects in each District. Information about these projects is available through the Authority's interactive web site, www.mystreetsf.com. We anticipate Transportation Authority Board approval of the Early Action Program in Spring 2014.

NEW REVENUES

We evaluated a range of potential new local revenue sources to meet existing and future transportation needs. A combination of sources such as private sector funds, a parcel tax, sales tax, and vehicle license fee are possible candidates for generating the additional $7.5 billion recommended for the SFTP vision. Over the past year, we worked closely with the Mayor's 2030 Transportation Task Force, which has recommended a vehicle license fee, general obligation bonds, and a half-cent sales tax increase for the 2014 and 2016 ballots. We will continue

The Early Action Program represents the first five years of investments for the 30-year SFTP and will fund improvements in every part of the city for every mode of travel.

FIGURE 34. EARLY ACTION PROGRAM: REPRESENTATIVE PROJECTS IN THE FIRST FIVE YEARS OF THE SFTP



to work with the Mayor's Office, partner agencies, and stakeholders to pursue new local, regional, state, and federal transportation funding sources. The Mayor's Transportation Task Force is further analyzing next steps for potential new local revenues.

MONITORING AND EVALUATION

Performance measurement is one of the Transportation Authority's statutory functions in its capacity as Congestion Management Agency, and as administrator of the Prop K half-cent transportation sales tax. The Transportation Authority will focus on performance tracking and evaluation in the following areas of policy interest, spanning the monitoring of system needs and trends, project delivery, and project effectiveness:

- **ONGOING MONITORING AND REPORTING.** Through biennial monitoring as Congestion Management Agency, and through www.mystreetsf.com, the Transportation Authority will track and provide information to the public on the delivery of transportation projects, including those identified for implementation in the Early Action Program. The Transportation Authority will also support the City's efforts to monitor the transportation obligations within development agreements.
- **DEMOGRAPHIC AND TRIP-MAKING TRENDS.** The Transportation Authority will continue to monitor demographic and travel behavior trends and the effect of new growth on the transportation system.
- **TRANSIT SYSTEM PERFORMANCE, ESPECIALLY EQUITY AND RELIABILITY.** SFTP outreach revealed that transit reliability is a socioeconomic and geographic equity issue, as well as a top priority for the general public. Yet data measuring and tracking reliability are limited. More research is needed to improve reliability measurement. Equity monitoring should additionally track safety trends and affordability outcomes.
- **DOCUMENTING THE COST EFFECTIVENESS OF TRANSPORTATION INVESTMENTS THROUGH BEFORE-AND-AFTER STUDIES.** The Transportation Authority will work with implementing agencies to strategically evaluate the effectiveness of new projects and programs to inform future project selection and prioritization, especially in the areas of pedestrian safety, traffic calming, and travel demand management.

Major next steps are: Rolling out the first five years of SFTP investments through an Early Action Program, pursuing new local revenues to address unmet transportation needs, and conducting monitoring and evaluation to ensure efficient and equitable progress towards SFTP goals.

STAFF ACKNOWLEDGEMENTS

The Transportation Authority gratefully acknowledges the staff who produced this document. Rachel Hiatt, Principal Transportation Planner, served as project manager, and was assisted by: Bill Bacon, Liz Brisson, Colin Dentel-Post, Kyle Gebhart, Ryan Greene-Roesel, Chad Rathmann, Bridget Smith, Dan Tischler, and Lisa Zorn under the direction of Elizabeth Sall, Maria Lombardo and Anna LaForte.

Assisting consultants included: Barbary Coast Consulting, Zabe Bent, Cambridge Systematics, Eisen | Letunic, and lowercase productions.

Numerous interns also contributed to this work including Matthew Bruno, Melanie Curry, Arthur Dao, Ted Graves, Becca Homa, Joshua Karlin-Resnick, Kim Lucas, Stephen Newhouse, and John Urgo.

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EXHIBITS 5-8

To Mission Bay Alliance Comment Letter dated July 27, 2015

Re: **Transportation Impacts** - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

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EXHIBIT 5

Appendix B: White Paper

TRANSPORTATION NEEDS

KEY TOPICS

- The performance of San Francisco's transportation system, under both current and future (2040) baseline conditions
- Issues that need to be addressed to make progress towards the four major SFTP goal areas: world-class infrastructure; economic competitiveness; livability; and healthy environment
- "What it would take" to achieve San Francisco's ambitious goals in these four areas
- Issues and opportunities related to visitor and student travel and goods movement

1 Introduction

In 2040, San Francisco will host 200,000 new jobs and more than 250,000 additional residents, bringing its population over one million for the first time. Over the next 30 years, the city's transportation system will need to adjust to accommodate the trips made by these new residents and visitors. It will also need to confront the significant challenges it faces today, including years of underinvestment in system upkeep, escalating operating costs, challenges delivering new projects in advance of growth, an overcrowded transit system, and a road network that lacks capacity to absorb the projected growth in driving (even assuming the emerging innovations from the technology sector, including car- and ride-sharing and private commuter shuttles).

We analyzed these trends and their implications for San Francisco's transportation system to inform development of the San Francisco Transportation Plan (SFTP). This report describes the analysis in detail. It is organized in four sections corresponding to the four SFTP goal areas: world-class infrastructure, economic competitiveness, healthy environment, and livability, with a final section analyzing the transportation needs of specific groups of travelers – visitors, students, and companies making deliveries in the city. Specifically:

- **SECTION 2: ECONOMIC COMPETITIVENESS** describes projected housing and employment growth through 2040 and resulting roadway congestion and transit crowding. It shows how system expansion, especially in the downtown core, is needed to ensure new workers, visitors, and residents can be accommodated.

- **SECTION 3: WORLD-CLASS INFRASTRUCTURE** examines what will be required to maintain a state of good repair across our transit and roadway systems. It details the transit system performance impacts of capital asset maintenance deficiencies, identifies key transit systems' capital asset maintenance funding needs, and discusses the condition of the city's roads and bridges. Key needs include a large unfunded backlog of vehicle maintenance needs that will contribute to further declines in transit system reliability if not addressed.

- **SECTION 4: LIVABILITY** analyzes trends in bicycling and walking, especially safety, relative to San Francisco's goals for nonmotorized transportation and describes future investments needed to ensure the city can meet its goals for the share of trips made by bicycling and walking while ensuring safety.

- **SECTION 5: HEALTHY ENVIRONMENT** describes environmental goals for our transportation sector, including those stemming from SB 375 (which set greenhouse gas emission reduction targets for the Bay Area). It describes trends in GHG emissions and vehicle travel under current and future baseline "business as usual" conditions, and explains what it would take to achieve our ambitious environmental goals. The section identifies strategies such as congestion pricing and travel demand management that could help reduce existing vehicle traffic and greenhouse gases.

- **SECTION 6: VISITOR, GOODS MOVEMENT, AND SCHOOL TRANSPORTATION NEEDS** describes the transportation issues faced by these three groups, whose needs do not fit neatly into the sections above. This section discusses strategies to reduce visitors' reliance on private automobile travel to help reduce congestion. It describes the effects of increasing congestion on goods movement and proposes some ways to solve the problems. Then it presents information from a survey of students and their parents about factors that prevent them from taking transit, walking, or riding a bicycle to school.

In addition to the analysis in these sections, we also assessed the performance of the future transportation system through the lens of geographic and socioeconomic equity (see SFTP Appendix F), and did a focused study of future conditions in the downtown core where transportation congestion and crowding are expected to be most acute (see SFTP Appendix C).

THE FUTURE BASELINE:
THE TRANSPORTATION SYSTEM OF THE FUTURE ASSUMING BUSINESS AS USUAL

Most of the quantitative transportation system performance measures in this document are generated by the SFCTA's travel demand model, SF CHAMP. To identify emerging needs, we compared performance today with performance in a 2040 future baseline scenario. The future baseline includes all projected housing and job growth as well as committed transportation improvements (See SFTP Appendix A for a definition of committed improvements) such as the Central Subway, the Van Ness Bus Rapid Transit, and the Presidio Parkway, among others. The future baseline represents conditions without any new investment beyond what is already committed, and illustrates performance gaps where additional investment is needed.

2 Economic Competitiveness

SECTION SUMMARY:
- San Francisco is planning for jobs and housing to each grow by 30 percent over the plan period.
- Crowding in transit vehicles and at popular transit stations will worsen without investments in new capacity, especially in the highest-growth areas such as the northeast core and southeast waterfront.
- Projected levels of new development will increase street congestion, particularly in the northeast core. Traffic forecasts predict that the city would need to reduce private-vehicle traffic by more than 25 percent to avoid peak-period gridlock in this area.
- Trip-making patterns will evolve with increased density along the eastern waterfront and in the city's southwest, suggesting a need for more investment in these areas.

This section describes the transportation performance indicators most closely related to economic competitiveness, the city's ability to continue drawing jobs and talent. Today, San Francisco is home to 11 percent of Bay Area residents and 17 percent of Bay Area jobs. While the city is projected to grow significantly over the plan period, the ability of San Francisco's transportation system to handle the trips of hundreds of thousands of new residents and workers will determine whether these projections can, in fact, become reality. This section analyzes key aspects of the transportation system and assesses what new investments will be necessary for it to handle forecast growth.

2.1 | Goals and Performance Measures

The SFTP economic competitiveness goal is to ensure the transportation system can accommodate new demands from a growing population and employment, and in doing so, ensure that Bay Area residents, employers, and visitors continue to want to live, work, and play here.

Key metrics associated with this goal are:

- Major changes in trip making patterns in growing markets
- Commute travel times
- Transit crowding (expressed as person-hours traveled in crowded conditions)
- Street congestion (expressed as percent of roadways experiencing congestion)
- Transit speeds

2.2 | Trends and future conditions

2.2.1 | OVERALL GROWTH TRENDS

San Francisco's economy has seen dramatic growth over the last two decades. As Figure 1 shows, even with the national downturns in 2001 and 2008, the per-capita gross domestic product of the metropolitan area centered on San Francisco outpaced both statewide and national economic productivity over the first decade of the 21st century. This robust economy has led to steady increases in real-estate demand, making San Francisco one of the most expensive places to live in the United States.[10]

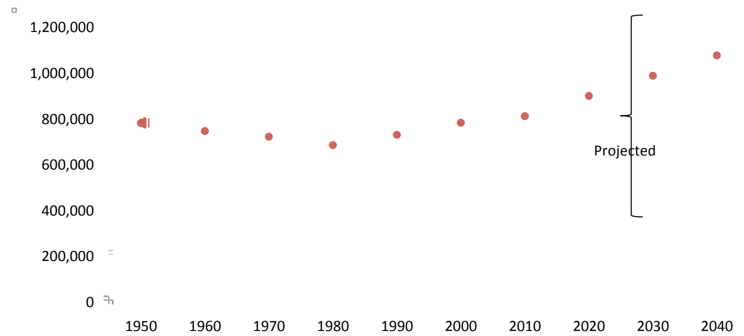
Figure 1 Economic Productivity in Per Capita Private-Sector GDP, 2001-2012 (2005 dollars)

Source: United States Bureau of Economic Analysis. State and Regional Data, Per Capita Real GDP (Chained 2005 Dollars). Retrieved from www.bea.gov on 10/17/13.

Those economic dynamics, combined with state and regional policies aimed at encouraging development in areas that are already urbanized and transit-oriented (see Section 5 for more on these policies), are why the Association of Bay Area Governments has forecast significant job and housing growth in the city. A city of 800,000 residents and 570,000 jobs today is forecast to house nearly 1.1 million residents and more than 750,000 jobs by 2040.[11] This would be the fastest growth in population and jobs since the 1950s (see Figure 2).

[10] Bloomberg.com. "Most Expensive Housing Markets: U.S. Cities." Retrieved from http://www.bloomberg.com/visual-data/best-and-worst/most-expensive-housing-markets-us-cities on 10/7/13.
[11] United States Census Bureau. *American Community Survey*, 2011.

Figure 2 San Francisco: Historic Population Growth, 1850-2013



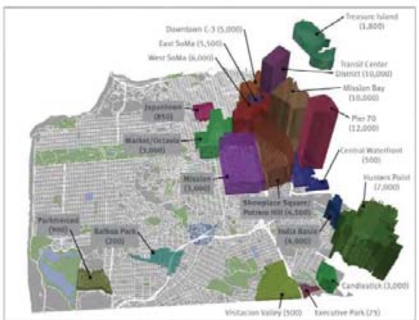
Source, 1950-2010: United States Census Bureau via Bay Area Census. San Francisco City and County Decennial Census Data. Retrieved from http://www.bayareacensus.ca.gov/counties/SanFranciscoCounty40.htm on 10/17/13. 2020-2040 estimated based on projected 2040 from the Association of Bay Area Governments.

The SF Planning Department is planning to accommodate much of the city's projected growth in the northeast core and along the eastern waterfront, both areas the city and region have identified as appropriate for densification given their central locations or access to transit (Figures 3 and 4). Major development projects like those in Mission Bay, Hunters Point/Candlestick Point, Treasure Island, the Schlage Lock site in Visitacion Valley, and Parkmerced will contribute a great deal to this projected growth, but smaller-site projects throughout the eastern third of the city will also house a significant portion of the planned growth.

Much of the new development will also be concentrated in SoMa, which already has significant new transit infrastructure that is already under construction. Two major Planning Department efforts demonstrate this focus. The Central Corridor Plan, for the area around the new Central Subway, includes zoning changes and increases in height limits for a 28-square-block area between Market, Townsend, 2nd, and 6th streets. The Transit Center District Plan, for the area around the new Transbay Terminal, also includes significant increases in zoned density and height limits, among other changes, for the area between Market, Folsom, Steuart, and 3rd streets. The Central Subway and the new Transbay Transit center will help accommodate some of this growth.

Figure 3 Projected Housing Growth by Neighborhood

Figure 4 Projected Job Growth by Neighborhood



Source: SF Planning Department

The forecast growth in jobs and residents over the plan period is projected to lead to major increases in trip-making across all modes in San Francisco. The city is projected to see 600,000 daily new person-auto trips by 2040.[12] A portion of these new trips are forecast to come from outside the city, and as Figure 5 shows, the bridges and major San Mateo county line crossings are projected to see major increases in daily traffic volumes. However, almost three quarters of all daily auto trips to downtown are forecast to come from elsewhere in San Francisco.

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[12] SF-CHAMP 4.3.

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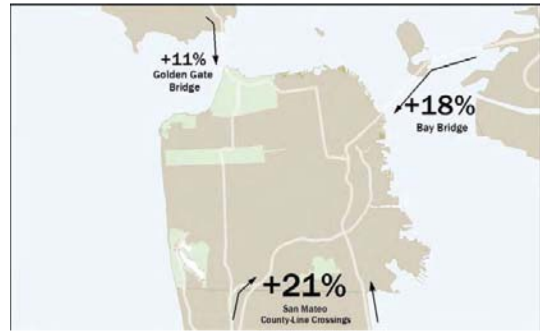
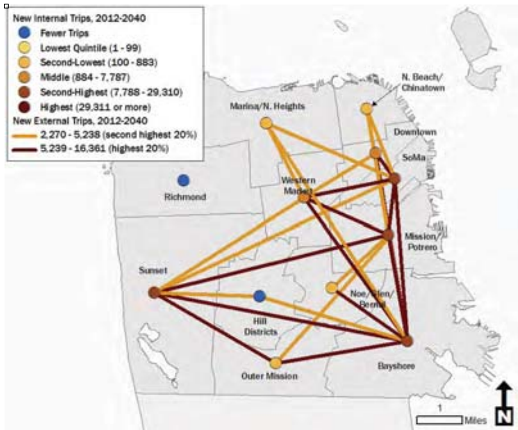
Figure 5 Change in Daily County Line Crossings by Automobile, 2012-2040



Source: SF-CHAMP 4.3.

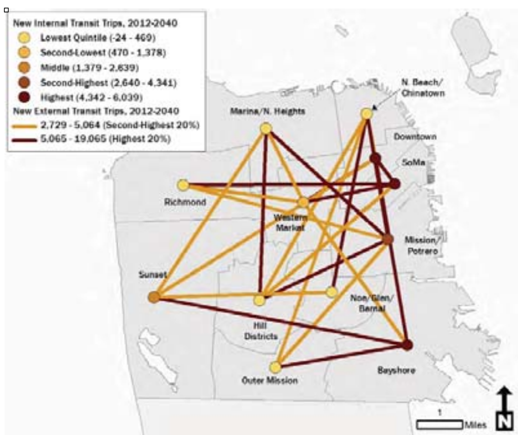
Figure 6 illustrates changes in auto trip-making patterns within the city: darker lines show the neighborhood pairs that will see the highest growth in auto trips between them, and these lines are concentrated along the city's eastern and southern borders. Darker brown circles indicate the neighborhoods that will see the biggest growth in internal auto trips, and again, they concentrate in the east and south. The transit system is also projected to see changes in trip-making patterns (Figure 7). The transit system is centered on the northeast core today, but the biggest increases in transit demand will be for trips across town, to and from the eastern neighborhoods.

Figure 6 Changes in Daily Auto Trip-Making Patterns within San Francisco, 2012-2040



Source: SF-CHAMP 4.3.

Figure 7 Change in Daily Transit Trip-Making Patterns within San Francisco, 2012-2040



Source: SF-CHAMP 4.3.

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Economic Competitiveness: What Would it Take?

The SFCTA analyzed what it would take to meet specific quantitative transportation system performance targets for each SFTP goal area. The analysis results for economic competitiveness are presented below.

- **CHALLENGE:** One of the transportation-related factors that affects where employers choose to locate or expand is commute travel times for their employees. Commute travel times are expected to worsen in the future due to new growth.
- **TARGET:** Keep commute travel times (combined for car and transit commuters) to and from downtown San Francisco in 2035 from degrading relative to 2010.
- **IMPROVEMENTS:** This scenario analyzed three levels of investment, as described below.
  - **LOW:** Frequency improvements to local and regional transit service, Caltrain electrification, and lower-cost capital projects such as bus priority measures and more extensive traffic management on key commute corridors.
  - **MEDIUM:** The above plus more extensive programmatic investments in transit, congestion pricing, and higher-cost capital projects such as Caltrain's downtown extension and bus rapid transit on key corridors. A sensitivity test was conducted to determine the effect of a hypothetical regional policy that modestly increases parking prices in other major Bay Area employment centers.
  - **HIGH:** The above plus major capital projects, namely a new cross-bay BART tube and high-speed rail service.

Table 1: Performance of Economic Competitiveness Scenarios

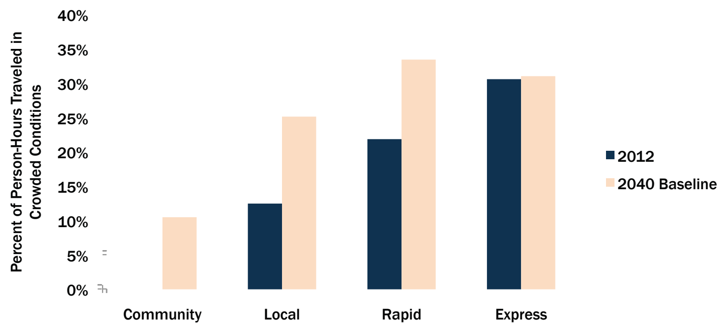
	2010	2035 BASE	2035 LOW	2035 MED	2035 MED + PARKING PRICING	2035 HIGH
Total average commute time to SF including non-motorized (minutes)	40	42	41	40	40	41
Auto	38	39	39	35	35	36
Transit	48	51	49	48	48	49
Cost (millions of $)	–	–	$2,000	$5,000	$5,000	$20,000
Cost Effectiveness	—	–	High	Med	Med	Low

- **COST:** From $2 billion (low level of investment) to $15 billion (high level of investment).
- **RESULTS:** Three of the scenarios (medium, medium with pricing, and high) keep combined car/transit commute travel times from degrading (see table above).
- **CONCLUSIONS:** The target under this scenario appears achievable. Between the low and medium levels, it takes an extra $3 billion in improvements to reduce travel times by one minute. The high level performs worse than the medium level perhaps because major investments such as a new BART tube increase overall travel significantly by improving accessibility. An additional finding was that because so many of San Francisco's commute trips begin or end in other cities, San Francisco's progress is greatly affected by policies implemented elsewhere. SF needs to take an active role in supporting regional policies that support its goals.

2.2.2 | TRANSIT CROWDING

By 2040, the city is forecast to see 300,000 new transit trips per day on a system that already suffers from crowding and reliability issues. Figure 8 shows that a significant percentage of transit passengers experience crowded conditions when traveling during peak hours today and that the issue is projected to get significantly worse under a 2040 baseline scenario. The baseline scenario includes the existing transit system and expansions or enhancements that have already secured significant funding or are already under construction. Crowded conditions are defined as vehicles with loads at 85 percent of capacity or more. As the figure shows, crowding is expected to increase significantly on all Muni service types except the express series.

Figure 8 Daily Person Hours of Travel in Crowded Conditions for Different Muni Service Types



Source: SF-CHAMP 4.3.

ADDRESSING CROWDED CONDITIONS

Expected crowding can be addressed, in part, by providing additional transit service during peak periods. However, the need to add peak-hour service should be balanced with consideration of cost-effectiveness (peak service is costly to provide), and equity concerns. Some lower-income shift workers depend on having adequate service during off-peak periods.

Crowding is particularly acute on the ten most crowded lines, with more than 60 percent of person-hours traveled spent in crowded conditions and a slight worsening of conditions on these lines by 2040. The total number of lines with any crowding is projected to grow from 31 to 50 over the plan period.

Figure 9 shows the current and projected spatial distributions of crowding. While Muni vehicles typically reach their most crowded points near the center of the system today, the extent of crowding moves outward from the core by 2040, in part as a result of significant new development at the end of several key lines and in part because of the increased employment pull of downtown and the eastern waterfront.

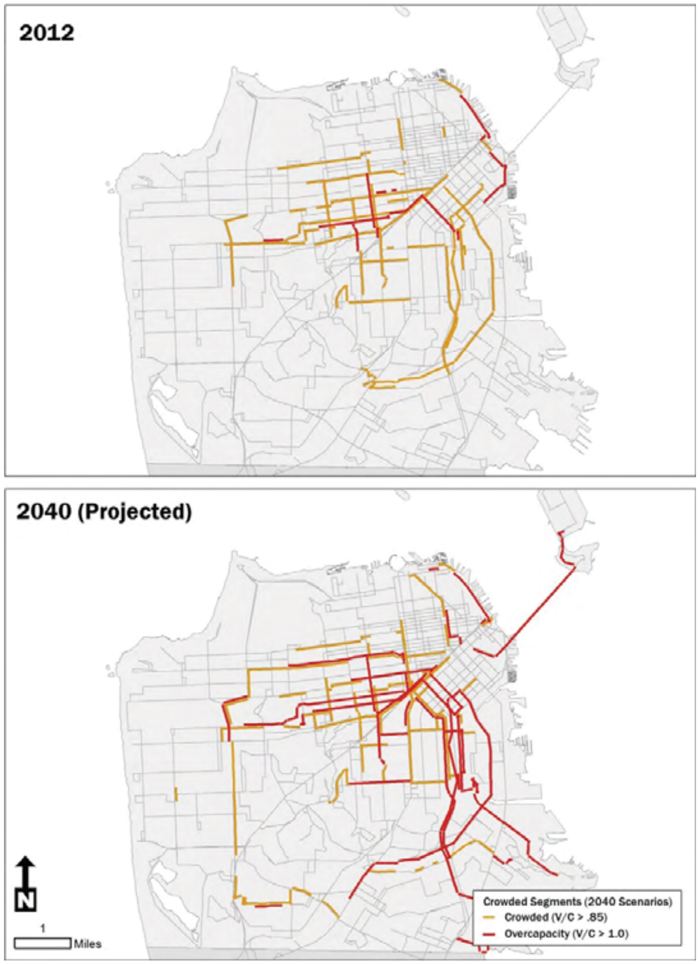
Regional operators will also feel the effects of San Francisco's growth. As Figure 10 shows, bus operators, including SamTrans, Golden Gate Transit, and AC Transit, already face peak-period crowding and would see that increase significantly by 2040. Caltrain and BART are both currently below 85 percent full during peak periods but would see some lines go over the threshold during the SFTP plan period.

For regional operators, crowding will have noticeable effects outside of transit vehicles as well. Projected ridership growth will make it more difficult to access stations and could make stations themselves crowded at key points in the system. BART ridership to, from, and within San Francisco is projected to grow by 37 percent, and as such, the system's two most crowded stations, Embarcadero and Montgomery, are forecast to hit limits in their capacity.[13] According to a BART study, delayed peak-hour conditions could lead to significant backups at escalators and crowding-related safety issues on platforms. Demand for travel to the system's core will also create station access issues outside San Francisco. Even with new transit-oriented developments around stations, BART will likely see issues like full parking lots and crowded feeder-bus routes throughout the system.

The agency has started to work solutions to all of these problems, exploring ways to redesign Embarcadero and Montgomery stations and improve parking management and bike and bus access,[14] but the agency and partner municipalities, including San Francisco, will need to identify funding for such changes once plans are in place. Caltrain could see similar problems up and down its corridor with projected ridership growth.

[13] Capacity Planning: Board Workshop, January 2013 (http://www.bart.gov/docs/capacity.pdf)
14 Capacity Planning: Board Workshop, January 2013 (http://www.bart.gov/docs/capacity.pdf), page 6.

Figure 9 Crowding on Muni, 2012 and 2040



Source: SF-CHAMP 4.3. O:\Active Studies\CWTP Update\Data\Zonal Maps\Crowding for map; Q:\Model Projects\sftp\ch430.JHC.2040.SFTP.NoProject\Outputs – SFTP Transit AM mdb 4040 and 2012

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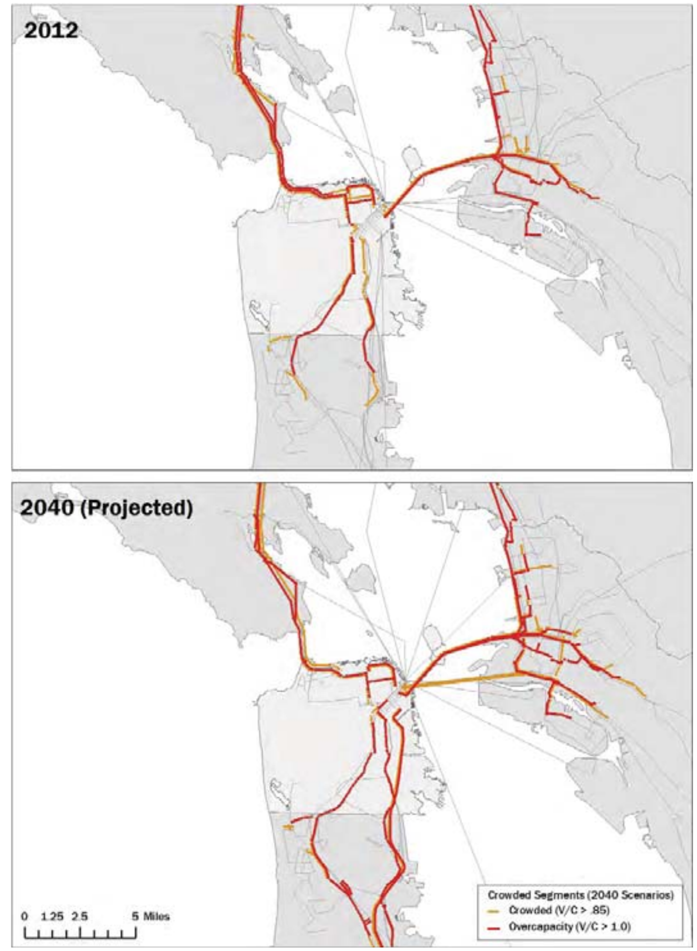
Figure 10 Regional Transit Crowding, 2012 and 2040.



Source: SF-CHAMP 4.3.

2.2.3 | STREET CONGESTION

New population and employment will result in about 30 percent more automobile trips on the network compared to today, or an increase of about 600,000. Figure 11 illustrates the effects of this increase on the street network, and shows that many streets will reach or exceed levels considered congested or overcapacity.[15]

2.2.4 | TRANSIT SPEEDS

Overall modeled daily average speeds on the Muni network are around 11 miles per hour today. Projections for the 2040 baseline scenario show those speeds remaining the same in the future although street congestion worsens due to population growth. This is in part because several major transportation improvements included in the future baseline (such as the Van Ness Bus Rapid Transit Project, the Central Subway, and others) improve conditions for transit and offset the negative effects of congestion.

[15] Congestion is defined as a ratio between a road's volume and its capacity of between .8 and 1.0. "Congested" means vehicle volumes are between 80% and 100% of the volumes the road was designed to handle. "Overcapacity" is defined as a ratio of more than 1.0, in which a road carries volumes that are greater than the levels for which it was designed.

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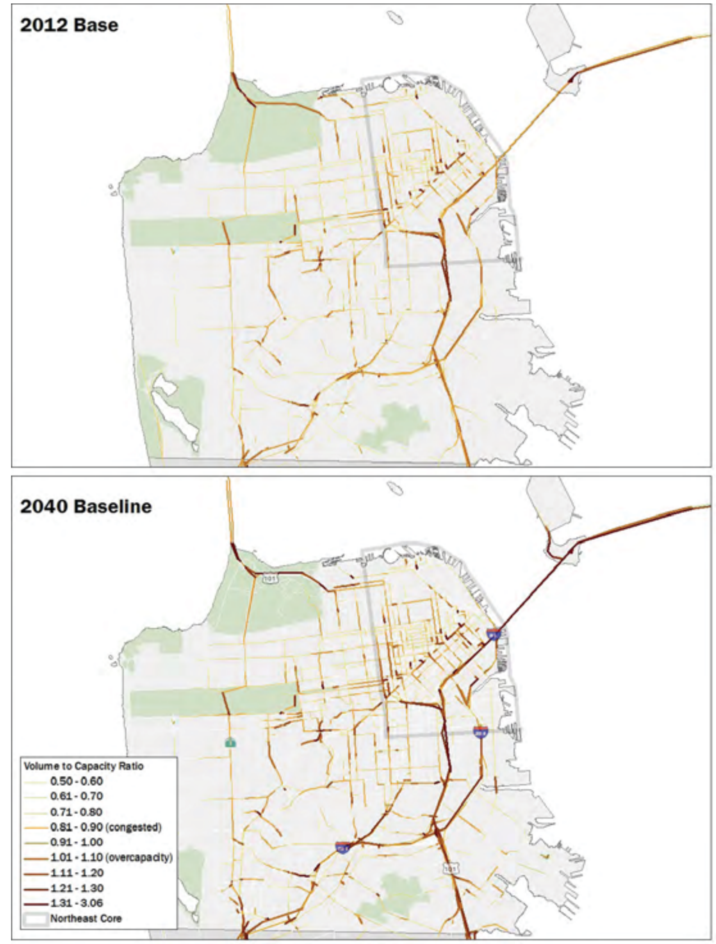
Figure 11 Congestion, 2012 and 2040



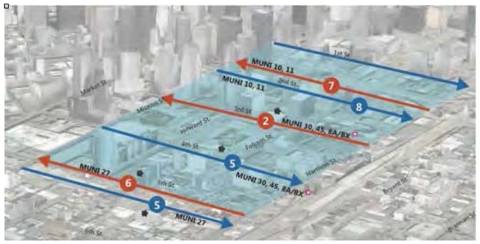
Source: SF-CHAMP 4.3.

2.2.5 | CONGESTION IN THE NORTHEAST CORE

The effects of increased congestion will be most acute in SoMa, given the area's significant projected job and housing growth and its location between Interstate 80 and the city's dense job core. The forecast increase in auto traffic is projected to lead to gridlock during peak periods, with queues at traffic lights spilling into downstream intersections and bringing multi-block areas to a standstill. Avoiding these cascading effects in this critical part of the system would require a 27 percent reduction in private-vehicle traffic in SoMa.[16]

Gridlocked conditions in SoMa would slow transit vehicles as well as cars. As Figure 12 shows, some of the bus lines that run through the neighborhood would slow to the low single digits during the evening peak hour. Such slow speeds would have a ripple effect across Muni's bus system, tying up drivers and vehicles and exacerbating reliability issues throughout the city.

Figure 12 Projected 2035 SoMa Bus Speeds (miles per hour), Evening Peak Hour



Source: SF-CHAMP 4.3 volumes for "Baseline Prime," Fehr + Peers SimTraffic Analysis, 2012

2.3 | Summary of needs

San Francisco needs to improve its transportation system, especially in the downtown core, to accommodate new growth. The following strategies could help address transit and roadway crowding caused by development growth:

- **ENHANCED TRANSIT CAPACITY IN GROWING AREAS (E.G. CORE, SOUTHWEST, SOUTHEAST), ESPECIALLY ON REGIONAL TRANSIT.** BART has already started to explore increasing its capacity in the most heavily used parts of its system through the BART Metro concept, which could increase service levels, platform capacity, and/or the number of stops between the Mission in San Francisco and downtown Oakland. Caltrain is also working to increase the number of trains it can run every hour through electrification (see Section 2) and new communications equipment that would allow the system to safely run trains closer together during peak times. Implementing these ideas could help reduce auto traffic on downtown streets.
- **IMPROVED DIRECT REGIONAL TRANSIT SERVICES FOR AREAS OF THE CITY LESS WELL SERVED BY TRANSIT.** Much of the west side of San Francisco is at least a bus ride away from the Bay Area's regional transit system. A regional express-bus system providing direct connections from San Francisco's west side to regional transit and regional employment centers could help address the growing numbers of trips expected between the west and east sides of the city.

[16] Brisson, Liz, Kyle Gebhart, and John Urgo. "Core Network Circulation Study – Evaluation Framework and Baseline Analysis Findings." 9/14/2012.

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- **IMPLEMENTATION OF INVESTMENTS CRITICAL TO MEET NEW DEMAND GENERATED BY DEVELOPMENT.** The city and developers have already agreed to a set of transit enhancements to serve the major developments that will come online between now and 2040. Timely implementation of these investments – including enhanced bus and ferry service to and from Treasure Island, light-rail enhancements serving San Francisco State University and Parkmerced, express-bus service to Candlestick and Hunters points, and the other enhancements already underway as part of the Southeast Waterfront Transportation Plan –will be critical to accommodating new growth in these areas.
- **MORE EFFICIENT USE OF FREEWAY CAPACITY TO SERVE TRAVELERS, ESPECIALLY IN THE SOUTH BAY MARKET.** High occupancy vehicle lanes on the city's freeway system and other performance enhancements could encourage carpooling and ensure that commuters are making efficient use of ever more crowded infrastructure.
- **DIRECT CONGESTION MANAGEMENT AND PARTNERSHIPS WITH PRIVATE OPERATORS.** The city will also need to provide financial disincentives to driving alone into the congested core through congestion pricing and transportation demand management partnerships with private companies. See Section 5 for more detail.

3 World-Class Infrastructure

SECTION SUMMARY:

- After years of underinvestment, Muni and regional transit agencies that serve San Francisco have significant unfunded capital needs.
- Poor vehicle condition is already responsible for many transit service delays and the situation will worsen without increased investment.
- Operating costs are growing rapidly and will crowd out critical capital investments if transit agencies do not take steps to control growth in costs.
- Pavements will require significant new investment to maintain adequate conditions.

San Francisco's transportation system relies on aging infrastructure that will need significant repair or replacement over the course of the plan period. This section discusses investments needed to achieve the goal of world-class infrastructure and maintain a state of good repair.

It includes the following sections:

- **TRANSIT OPERATING NEEDS** discusses what it will take to keep the existing system running given rising transit operating costs. It does not discuss the additional service expansion necessary to accommodate San Francisco's growing population and employment, which were covered in the prior section on Economic Competiveness.
- **TRANSIT MAINTENANCE NEEDS** discusses what it will take to repair and replace vehicles and fixed infrastructure at the appropriate times in their lifecycles over the course of the plan period and the performance consequences of not investing sufficiently in capital asset maintenance.
- **ROADS, BRIDGES, AND STRUCTURES** discusses investments needed to meet city pavement-condition goals and keep bridges and other structures in safe operating conditions for all users.

3.1 | Goals and Performance Measures

The SFTP world class infrastructure goal is to improve the condition of San Francisco's infrastructure so that it is reliable and can be maintained cost-effectively. Key goals and performance measures for this section include:

- Stabilize transit operating costs
- Improve transit system reliability through adequate maintenance
- Achieve a pavement condition index of 70 [Proposition B streets bond goal]
- Maintain road and bridge structural sufficiency

3.2 | Trends and future conditions

3.2.1 | TRANSIT OPERATING NEEDS

Transit operating expenses include the cost of wages for vehicle drivers, maintenance and customer-service staff, system administrators, and others. They also include the cost of fuel or energy to power transit

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vehicles and parts or other materials for regular maintenance tasks. Transit operating needs alone will take up nearly 60 percent of available revenues. If current trends continue, funding needs could be even higher and could crowd out system-efficiency projects and those aimed at serving new trip patterns. Among these trends:

- **RISING COSTS:** The real cost of providing transit service has been rising over the last several decades (Figure 13). According to the Metropolitan Transportation Commission's Transit Sustainability Project, rising fringe benefit costs are a major contributor to cost growth. The cost of fringe benefits like health care and pensions nearly doubled between 1997 and 2008 (Figure 14).
- **SLOWER SPEEDS AND LOWER RELIABILITY FOR SFMTA AND REGIONAL BUS OPERATORS:** A less direct but still important operating-cost driver, speeds slowed significantly on SFMTA's bus and light-rail systems between 1997 and 2008 (see Figure 15). Slower speeds mean a driver and vehicle can complete fewer route runs in a day, leading to less service for the same price.

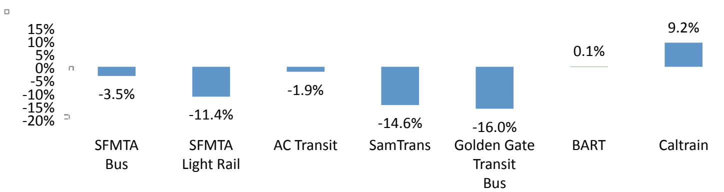
Figure 13 Cost per Hour of Service, 2003-2011 (Inflation-Adjusted)

SOURCE: NATIONAL TRANSIT DATABASE TS2.2 - SERVICE DATA AND OPERATING EXPENSES TIME-SERIES BY SYSTEM, AND THE CALIFORNIA DEPARMENT OF FINANCE (FOR BAY AREA INFLATION DATA).

Figure 14 Growth in General and Fringe Benefit Costs for Agencies Serving San Francisco, 1997-2011 (Inflation-Adjusted)

Agencies included: SFMTA, BART, AC Transit, Golden Gate Transit, and SamTrans. Caltrain contracts for operations and maintenance, so fringe benefit data only covers administration and was not included.

Figure 15 Change in Average Speed, 1997-2008



Source: Metropolitan Transportation Commission. Transit Sustainability Project: Background and Findings. September 2011, page 8.

Agencies are already taking steps to make their operations more efficient. The MTC's Transit Sustainability Project created an incentive program that is aimed at reducing agencies' operating costs[17] by 5 percent by the middle of this decade. Implementation of additional cost-control recommendations from the TSP, such as capping agency contributions to health insurance costs, could also be explored.

Strategies to improve transit vehicle speeds and reliability can also help address crowding, since faster-moving vehicles are less expensive to operate. SFMTA is moving forward with its Transit Effectiveness Project, which aims to improve speeds and make operations across the system more efficient through route changes, stop consolidation, and small-scale investments like curb bulb-outs and painted transit-only lanes at key bottlenecks. Caltrain is moving forward with a plan to power its trains by overhead wires rather than diesel locomotives, which is projected to save fuel costs and trim travel times up and down the corridor due to faster acceleration and deceleration rates. BART is also studying expanded service in the system's core, between downtown Oakland and the Mission in San Francisco, allowing it to more efficiently meet demand in the highest ridership portion of the system. Many of these projects support both the world class infrastructure and economic competitiveness goals.

3.2.2 | PARATRANSIT

Growth in San Francisco's senior population and accompanying demand for paratransit services may also put additional growth pressure on operating costs, though SFMTA and other large paratransit operators in

[17] The MTC Transit Sustainability Project's final recommendations say these reductions can be per service hour, per passenger, or per passenger mile.

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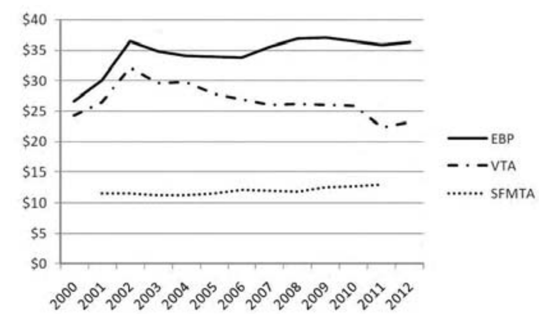
the Bay Area have effectively controlled the cost of such services on a per-trip basis in recent years (see Figure 16).[18] As of 2011, paratransit services made up just over 5 percent of transit operating costs region-wide.

Figure 16 Paratransit Operating Cost per Eligible Passenger Trip, Large Bay Area Operators



Source: Metropolitan Transportation Commission. "Transit Sustainability Project: Draft Paratransit Final Report." August 29, 2011. Page 3-10. Note: Dollars adjusted for inflation. VTA is Valley Transportation Agency, EBP is East Bay Paratransit.

San Francisco's senior population is projected to grow by 68 percent over the plan period, which should increase demand and thus the total cost of paratransit over time. However, several recent research reports on the strength of the relationship between the size of a city's elderly population and the level of paratransit demand have reached conflicting conclusions. While data shows that paratransit demand increased by 37% nationally between 2000 and 2009, and the American Public Transportation Association forecasts a 32% increase in paratransit demand by seniors between 2010 and 2020, a 2007 report concluded that demand is more closely related to an area's total population than to its senior population.[19] Further study is needed to quantify precisely how costs will increase as the elderly population grows.

[18] Metropolitan Transportation Commission. "Transit Sustainability Project: Draft Paratransit Final Report." San Francisco: August 29, 2011, page 3-10.
[19] *Ibid*, 3-18.

3.2.3 | TRANSIT CAPITAL NEEDS

Bay area transit operators face significant transit capital shortfalls totaling approximately $5 billion over the SFTP plan period. These capital needs include new vehicles and mid-life overhauls and for repairing or rebuilding existing infrastructure. Table 1 shows the total need, San Francisco share, and projected funding shortfall for Muni and the regional operators that serve San Francisco.

Table 1 Transit Capital Revenue and Need, 2012-2040 (In Billions, Year-of-Expenditure Dollars)

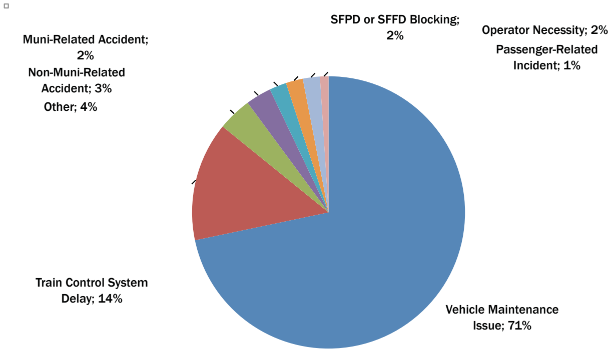
Operator	Total Need[1]	Revenue Vehicle and Score 16[3] Need	Revenue Vehicle and 70% of Score 16 Need	Expected Transit Capital Revenue	Total Shortfall
SFMTA	$12.7	$9.1	$7.6	$8.4	$4.3
Caltrain (SF Share)	$1.1	$0.7	$0.5	$0.4	$0.8
BART (SF Share)[2]	$2.1	$2.1	$2.1	$2.1	N/A
GGBHTD (SF Share)[2]	$0.3	$0.3	$0.3	$0.3	N/A
Grand Total	$16.16	$12.13	$10.48	$11.10	$5.07

[1] Need to meet target of 0% of assets past useful life.
[2] For the purpose of this assessment we are not expecting SF to have a discretionary share of the BART and GGBHTD capital need. BART and GGBHTD needs will be addressed at the regional/partner level.
[3] Score 16 vehicles are those the regional government has identified as top priority for replacement.

Shortfalls in state-of-good-repair investments can lead to significant reliability, safety, and customer-satisfaction issues. Specifically, they can, over time, cause:

- **VEHICLE BREAKDOWNS.** Failing to perform routine service on buses and rail cars can increase maintenance issues later in vehicles' lives. Poor transit vehicle maintenance has significant reliability impacts, resulting in service breakdowns, unscheduled turnbacks, and delays in tunnels. Illustrating this point, Muni's aging light-rail fleet had on-time performance of 50 percent in May 2013, and vehicle mechanical issues were responsible for 71 percent of the delays (see Figure 17).
- **INFRASTRUCTURE PROBLEMS.** Failing to invest appropriate amounts in fixed infrastructure can lead to cracked or worn-down rails, electricity issues, and communications problems along whole segments of the system, causing more frequent service suspensions for emergency repairs. It can also require initiation of "go slow" zones, further reducing speeds. As shown in Figure 17, train-control system delays were the second-largest cause of light-rail delay in May 2013. These maintenance-related delays are experienced on top of the routine delays associated with street congestion, traffic signals, and so forth.
- **DEGRADATION IN PASSENGER SAFETY AND COMFORT.** All of these issues have an impact on passenger safety and comfort, as they lead to lower adherence to service schedules and more frequent inconveniences like vehicle turn-backs and pass-ups. Additionally, they can lead to unevenness in passenger loads, with significant crowding on delayed vehicles.

Figure 17 Muni Light Rail Reasons for Delay, May 2013



Source: SFMTA 2013.

Table 1 shows that transit capital needs are very large and that much of the need is unfunded. This is because of the age of the region's transit systems, many of which are among the oldest in the state. The region as a whole, and San Francisco in particular, relies heavily on rail systems, which require higher ongoing maintenance investments than other modes because of the significant amount of fixed infrastructure they require.[20] Budget pressure over the last several years, which resulted in some deferred maintenance in addition to service cuts, also contributed to the large amount of need going forward. The following sections describe operator capital needs in more detail.

MUNI

Based on the direction set in its 2010 Fleet Plan, the agency aims to steadily lower the average age of its fleet through smaller vehicle procurements every few years instead of large procurements every five or 10 years, as it has done in the past.[21] As of 2010, the average Muni vehicle age was 7.5 years, but the agency projects that it can reduce that to 4 to 6 years by 2030. This approach would help keep enough operational vehicles available for peak service and reduce stress on the agency's maintenance department by spreading out lifecycle maintenance demands.

[20] Metropolitan Transportation Commission. *Plan Bay Area.* Draft, March 2013. Page 67.
[21] San Francisco Municipal Transportation Agency. *2010 SFMTA Transit Fleet Management Plan.* Revised April 2011. Retrieved from http://beta.sfmta.com/cms/rhome/documents/2010FleetPlan_MainText-FinalAccessible.pdf on 9/16/13.

Beyond vehicles, Muni has several other areas of need related to maintaining a state of good repair. The agency estimates that, given the need for more vehicles of all types due to increased peak-hour demand, it will need more than 17 additional acres for maintenance facilities through 2030.[22] A portion of the total need also includes repairing or replacing rails, wires, and systems for train control and communication.[23]

REGIONAL TRANSIT OPERATORS

Caltrain will be transitioning from its current diesel-powered trains to new electric-powered trains by 2019. As such, the system's needs are related to both existing vehicles' ages and the need to buy train cars that are compatible with the new technology. Many of Caltrain's locomotives are more than 25 years old, near the end of their useful lives, and their age is already resulting in increased delays and maintenance issues.[24]

BART's vehicle fleet is one of the oldest and most heavily used in the industry, with an annual average of 95,000 miles of use per car.[25] As such, the agency's vehicle-replacement and maintenance needs make up a significant proportion of its total capital needs over the plan period. The agency also expects that it will need 30 percent more rail cars by 2030 to serve a growing number of riders. Given all of these factors, the agency's total capital shortfall is the largest of any Bay Area operator.[26]

Golden Gate Transit's capital needs are all related to replacing its more than 200 buses and 5 ferries at the end of their useful lives and growing its fleet as needed to meet passenger demand.[27]

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[22] SFMTA (2011), page 38.
[23] SFMTA. *2011 20-Year Capital Plan.* Page 9. Retrieved from https://www.sfmta.com/sites/default/files/FInalCapitalPlanMTAB_accessibleplan.pdf on 9/16/13.
[24] Emslie, Alex. "Aging Caltrain fleet leading to longer delays." San Francisco Examiner. September 18, 2013. Retrieved from http://www.sfexaminer.com/sanfrancisco/aging-caltrain-fleet-leading-to-longer-delays/Content?oid=2580990.
[25] Bay Area Rapid Transit. "New Rail Vehicle Program: Board Workshop." January 2013, Slide 11. Retrieved from http://www.bart.gov/docs/NewVehicleProgram.pdf on 9/16/13.
[26] MTC. *Plan Bay Area: Transit Operating and Capital Needs and Revenue Assessment.* Draft March 2013. Retrieved from http://onebayarea.org/pdf/Draft_Plan_Bay_Area/Draft_PBA_Transit_Operating_and_Capital_Needs_and_Revenue_Assessment.pdf on 9/16/13.
[27] Golden Gate Bridge, Highway, and Transportation District. *Short-Range Transit Plan, Fiscal Years 2008-2017.* Page 3-2. Retrieved from http://goldengatetransit.org/services/documents/SRTP-Chapter3.pdf on 10/2/13.

World Class Infrastructure: What Would it Take?

- **CHALLENGE:** San Francisco has an extensive and aging transportation infrastructure. Funding is not sufficient to adequately maintain the system in a state of good repair.
- **TARGET:** Raise the city's transportation system to a state of good repair, defined as:
    - Transit: fully fund transit vehicle replacement and mid-life overhauls and replace all capital assets at the end of their useful life; maintain today's levels of transit operations.
    - Roads: achieve a pavement quality index of 70 and maintain today's levels of street operation.
- **IMPROVEMENTS:** This scenario estimated the funding needed to achieve the state of good repair performance measures listed above. It does not include any needs associated with meeting additional demand due to population and employment growth.
- **CONCLUSIONS:** An additional $5 billion in year-of-expenditure dollars through 2040 would be needed to fully fund all transit capital maintenance needs. An additional $1.5 billion is necessary to reach and maintain a pavement condition index of 70. Existing revenues are sufficient to maintain today's levels of street and transit operation.

3.2.4 | STREETS AND BRIDGES

Maintaining San Francisco's road and bridge infrastructure is another key element of achieving the goal of world-class infrastructure. Smooth and well maintained streets increase safety and reduce wear and tear on both private cars and transit vehicles and make conditions safer for bikers and pedestrians.

As of 2011, the average pavement condition on local streets was "fair," with a pavement condition index rating of 64 out of 100, although TRIP: A National Transportation Research Group recently ranked the San Francisco-Oakland metropolitan area's roads the second worst in the country, with 60 percent of roadways in poor condition.[28]

In developing the Proposition B streets bond in 2011, the Department of Public Works and the San Francisco Capital Planning Committee set a goal of achieving an average citywide PCI score of 70, which is considered "good" condition, by 2021. Proposition B increased San Francisco's annual street resurfacing budget from $26 million in 2011 to $65.5 million in 2012 and provided funds for this increased investment level for four additional years. Achieving and maintaining a PCI score of 70 over the long term will require a total investment of $3.83 billion over the life of the plan, $1.53 billion more than is already committed to street resurfacing. Without a sustained, long-term increase in street resurfacing funding, San Francisco's PCI score will fall below 60 and into "poor" condition by 2030.

Streets and roads also require an investment of $2.84 billion in street operations like street cleaning, pothole filling, and signal maintenance; this funding is available through existing sources.

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[28] TRIP: A National Transportation Research Group. "Bumpy Roads Ahead: America's Roughest Rides and Strategies to Make our Roads Smoother." Washington, DC: October 3, 2013. Retrieved from http://www.tripnet.org/docs/Urban_Roads_Report_Oct_2013.pdf on 10/11/13.

Bridges and other structures, including the state-owned freeways that run through San Francisco, will require additional investments over the coming decades. According to a recent study by Transportation for America, most of San Francisco's bridges are in good condition, but segments of U.S. 101 and a few non-freeway bridges will be in need of attention in the next 20 years.[29] In many cases, bridge decks (the concrete road beds on which surface asphalt rests) are the element that needs the most urgent attention, rather than deeper structural elements.

Caltrans owns and maintains state and US highways and interstates and will be responsible for funding the upkeep and replacement of highway bridges and structures. San Francisco government agencies can play an important role in advocating for timely investment in these structures. The Department of Public Works maintains a number of additional local-road bridges, retaining walls, and stairways that will need to be repaired or rebuilt over the life of the plan. The department prioritizes and funds maintenance needs through a citywide 10-year capital planning process.

[29] Transportation for America. "The Fix We're In For: The State of Our Bridges." Retrieved from http://t4america.org/resources/bridges/#?latlng=37.77583200000001,-122.4180973&bridge_id=%0A340034 on 9/16/13.

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4 Livability

SECTION SUMMARY:

- Infill development near transit within San Francisco is expected to slightly increase the share of trips made by bicycling and walking by 2040, but this will be insufficient to achieve the city's aggressive goals. Additional investment will be needed.
- Investments in safety for walkers and bicyclists is a critical step necessary to allow growth in walking and bicycling.
- The SFMTA's Bicycle Strategy provides a vision for a safe, interconnected network of protected bicycle-ways, but funding is not sufficient to complete the network.
- The SFMTA's Pedestrian Strategy provides a vision for reducing collisions on the 44 miles of the most dangerous roadways. Funding is not sufficient to implement the strategy.

The concept of livability has become a key focus in recent years. Former U.S. Secretary of Transportation Ray LaHood described livability as "being able to take your kids to school, go to work, see a doctor, drop by the grocery or post office, go out to dinner and a movie, and play with your kids in a park, all without having to get in your car.[30]" The SFCTA also recently held a twitter contest to define livability and received numerous creative responses (Figure 18).

Figure 18 Responses to SFCTA Twitter Contest on Defining Livability

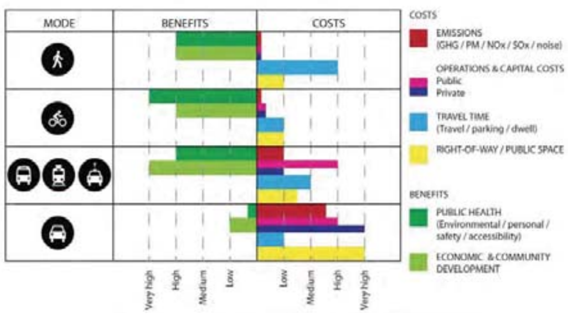
This section reviews recent trends and future needs with respect to improving the quality of alternatives to the automobile, with a particular emphasis on bicycling and walking.[31] It includes discussion of the current

[30] See the U.S. DOT's livability web page: http://www.dot.gov/livability
[31] Mass transit is covered in the World Class Infrastructure and Economic Competitiveness sections.

condition of bicycling and walking infrastructure, recent planning efforts in the area of bicycling and walking, and a summary of future investments needed to make bicycling and walking as safe and attractive as possible.

Bicycling and walking are the focus of efforts to improve livability because they are environmentally sustainable, pollution-free, and healthful modes of travel, and are inexpensive relative to other modes of travel, as illustrated in Figure 19. Additionally, if bicycling and walking investments shift even a small number of trips out of crowded transit vehicles, significant savings can be realized since peak-period demand is a key driver of the cost of providing transit service.

Figure 19 Cost Effectiveness of Bicycling, Walking, Transit, and Automobile Use



Source: SFMTA Bicycle Strategy.

4.1 | Goals and performance measures

The SFTP livability goal is to improve the quality and safety of the bicycle, pedestrian, and transit networks so that San Franciscans can have multiple attractive options for getting where they need to go. Performance measures for this area include:

- **THE SHARE OF TRIPS MADE BY BICYCLING, WALKING, AND TRANSIT.** SFMTA has set a goal of greater than 50 percent of trips by these non-automobile modes. The Board of Supervisors set a goal of a 20 percent bicycle mode share by 2020.
- **BICYCLE AND PEDESTRIAN SAFETY.** The Mayor's Pedestrian Safety Task Force set a goal of reducing severe and fatal pedestrian collisions by 50 percent by 2021.
- **TRIP LENGTHS** (shorter trips are more easily made with non-motorized modes).

4.2 | Trends and future conditions

The outlook for increased rates of bicycling and walking is good. As San Francisco adds population and employment to areas already convenient for bicycling and walking (see the Economic Competitiveness section for a discussion of land use projections), the share of trips made by bicycling and walking is expected to grow slightly (by about a percentage point) without any additional infrastructure investment (Figure 20).

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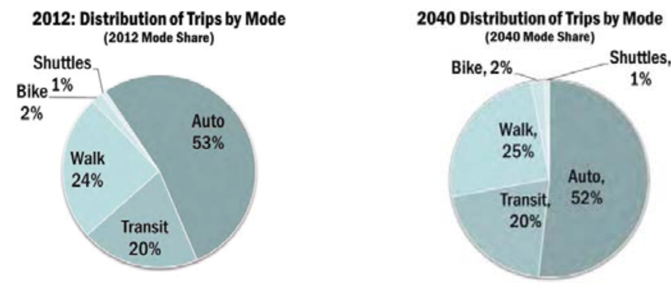
Nevertheless, as the following discussions demonstrate, additional investment will be needed for the city to meet its aggressive goals for increasing the share of trips made by bicycling and walking.

Figure 20 Distribution of All Trips To, From, and Within San Francisco by Mode, 2012 and 2040 Baseline

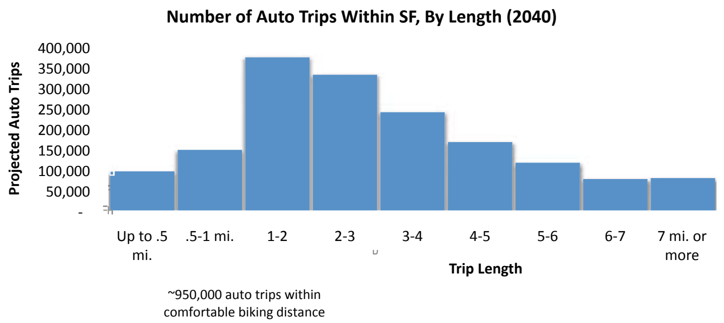


Source: SF-CHAMP 4.3 with manual adjustments to include private shuttle sector.

4.2.1 | BICYCLING

Bicycling is on the rise in San Francisco. The SFMTA's State of Cycling Report indicates that bicycle trip volumes are approaching 75,000 bicycle trips per day; nearly a third of San Francisco residents report bicycling at least occasionally. Rates of commuting by bicycle are also growing, and San Francisco now ranks third in the nation behind Portland, Oregon and Seattle, Washington in bicycle commuting rates among major US cities. The potential for further increasing rates of bicycling is high – as Figure 21 shows, nearly 60 percent of all local automobile trips will be less than three miles in length by 2040, a convenient distance for bicycling.

Figure 21 Projected Auto Trip Lengths, 2040



The SFMTA and its partners are making rapid progress towards improving infrastructure. Since completion of the city's Bicycle Plan in 2009, 50 bicycle projects and nearly 30 miles of bicycle lanes have been added, along with more than four thousand shared lane markings (sharrows), hundreds of new bicycle racks, numerous innovative pilot projects such as the Green Wave on Market Street, and initiation of a regional bicycle sharing system in San Francisco.

These improvements are helping support the trend towards more and more bicycling, but are not sufficient to allow achievement of the aggressive goal – set by the San Francisco Board of Supervisors in 2010 – of achieving a 20 percent bicycle mode share by 2020. To grow bicycling further, San Francisco must do more to address cyclist safety. Surveys conducted for the SFMTA's 2012 State of Cycling Report indicated that almost half of those who do not currently bicycle say they are uncomfortable bicycling in mixed-flow traffic with cars, and only 13 percent said they feel safe from traffic when bicycling. At the same time, 94 percent of respondents say they would feel comfortable riding in bicycle lanes. Network fragmentation is also a challenge to improving cyclists' sense of safety. Many of the existing bicycle facilities are disconnected from one another (Figure 22), and cyclists may find it impossible to complete their whole trip on protected bicycle ways or bicycle lanes.

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Figure 22 Bicycle Network Fragmentation

The SFMTA's recent Bicycle Strategy (2013) envisions a world-class bicycle facility network for San Francisco – one on which cyclists of all ages and abilities would be safe and comfortable. Full network build-out would include the following actions:

- Complete the bicycle plan (10 miles)
- Upgrade 200 miles of the existing bicycle network to premium bicycle facilities
- Construct 35 miles of new bicycle facilities
- Upgrade 200 intersections to accommodate bicycles
- Install 50,000 bicycle parking spaces
- Deploy and maintain a 3000+ bicycle / 300+ station bicycle sharing system. Support electric bicycles. This system was recently launched with the implementation of the Bay Area Bike Share Program in 2013, which includes an initial 700 bicycles and 70 stations throughout the Bay Area (including San Francisco).
- Provide supportive programs ($10m/yr).

CHALLENGES IN IMPROVING BICYCLING AND WALKING INFRASTRUCTURE

Many of the "easy fixes" to improve bicycling and walking infrastructure have already been completed or are underway. These include pedestrian crosswalk restriping, countdown signals, curb cuts, and striping of new bicycle lanes and sharrows.

Improvements that more significantly benefit bicyclists and pedestrians by physically separating them from vehicular traffic or by reducing vehicle traffic and speeds are frequently more challenging to implement, as they may require re-allocation of roadway space. These include road diets, widened sidewalks, and separated bike-ways, or signal timing changes such as more crossing time for pedestrians. Implementing these improvements requires political and community acceptance of parking or lane removal, or signal delays for vehicles.

The SFMTA's Strategy estimates the total cost of this strategy to be approximately $600 million in year-of-expenditure dollars through 2040; most of this is unfunded.

4.2.2 | WALKING

San Francisco is a walking city, with nearly 20 percent of trips made by walking. The condition of the city's streets – whether noisy or calm, crowded or spacious, clean or dirty, safe or scary – greatly impacts how San Franciscans and visitors experience the city as they walk around, and is a major determinant of livability.

Although many of San Francisco's streets are inviting and pleasant, many are not, and some are inhospitable to pedestrians. This is evidenced by the fact that on average, 20 pedestrians are killed and 800 injured in collisions with motor vehicles every year.[32] In 2008, Gavin Newson initiated the Mayor's pedestrian safety task force and set a goal of reducing serious and fatal pedestrian injuries by 25% by 2016 and by 50% by 2021. The Task Force's report identified key sources of pedestrian danger, including speeding, failure to yield, and conflicts involving drivers making left turns, and identified 70 miles of the highest-injury corridors for pedestrians. These miles account for 60 percent of all pedestrian collisions in the city, and include most of the city's busiest arterial roadways (Figure 23).

Figure 23 High-Injury Corridors and Pedestrian-Injury Collisions

Source: SFMTA 2013.

Achieving the Mayor's goals will be a major challenge and will require high levels of investment in pedestrian infrastructure. The challenge is compounded by growing population and employment, which will bring an increase in walking trips, automobile trips, and pedestrian-automobile collisions unless aggressive action is taken.

[32] SFMTA Pedestrian Strategy, page 5

Aging of the population is another major challenge for pedestrian safety. San Francisco is projected to experience a 68 percent growth in the number of people 65 and older by 2040, making this group 20 percent of the population (compared to 16 percent today[33]). Older pedestrians are more likely to be killed when struck by an automobile.

Another notable recent effort to improve pedestrian safety and livability is the Better Streets Plan, which creates a unified set of standards, guidelines, and implementation strategies to govern how the city designs, builds, and maintains its pedestrian environment. The Plan seeks to balance the needs of all street users, with a particular focus on the pedestrian environment and how streets can be used as public space.

The Mayor's Pedestrian Safety Task Force report presented a vision for improving pedestrian safety and walkability in San Francisco. Key strategies referenced in the plan include:

- Upgrading the 44 miles of high-injury corridors to provide pedestrian safety features throughout
- Providing extra pedestrian crossing time at 800 intersections citywide
- Re-engineering streets around at least five schools and in 2 areas with high numbers of senior injuries annually
- Updating or creating at least nine plazas
- Re-opening 20 closed crosswalks
- Planning a city-wide network of 140 miles of green streets to help people walk safely to parks and the waterfront
- Upgrading 13,000 curb ramps
- Installing pedestrian countdown signals at 184 intersections by 2021
- Targeting enforcement of high-risk behaviors such as speeding and red-light running on high-injury corridors and intersections, and reporting quarterly on injury collisions and enforcement
- Pursuing state legislation for prioritizing sustainable transportation and targeted enforcement, such as speed cameras, congestion pricing, and vulnerable user laws

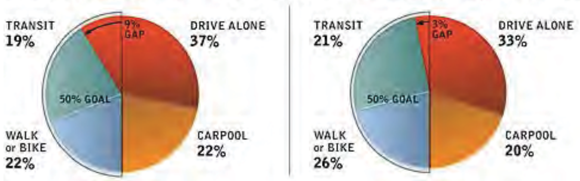
Full funding of the SFMTA Pedestrian Strategy would require approximately $600 million over the life of the SFTP; most of this is unfunded.

[33] Association of Bay Area Governments population projections

Livability: What Would it Take?

- **CHALLENGE:** San Francisco has a "Transit First" policy, yet under the Baseline almost 60% of trips in the city will be made by car (this includes carpooling). Such high levels of car use will have significant negative impacts on traffic safety, neighborhood cohesion, noise levels and other important aspects of urban livability.
- **TARGET:** Less than 50% of trips to, from and within San Francisco are made by car. Reaching this target means shifting approximately 430,000 trips daily in 2035 from cars to "Transit First" modes (transit, walking and biking).
- **IMPROVEMENTS:**
  - Transit projects that improve frequency or reliability or that reduce travel times, transfers or crowding; includes big-ticket items such as new rail lines and a second cross-bay tube for BART
  - Projects to promote walking, such as traffic calming, road diets, street closures and streetscaping
  - Projects to encourage bicycling, such as a network of cycletracks, more secure bike parking (including bike stations at major transit hubs) and bike sharing
  - In order to make it sufficiently different from other scenarios, this scenario did not incorporate congestion pricing
- **COST:** $15 billion.
- **RESULTS:** This scenario results in a shift in mode share from cars to "Transit First" modes of 6 percentage points compared to the Baseline scenario: the percentage of trips made by car decreases from 59% of all trips to 53% while the percentage of trips made by transit, walking and bicycling increases from 41% to 47% (see figure below).

Figure 1. Performance of Livability Scenario: 2035 Baseline (LEFT), Livability Scenario (RIGHT)



- **CONCLUSIONS:** The scenario makes significant progress toward its target but does not reach it. To achieve the target, an additional shift in mode share of 3 percentage points is necessary. That shift could be accomplished through congestion pricing: based on other analyses, congestion pricing would yield an additional shift in mode share from cars to "Transit First" modes of 3–5 percentage points.

5 Healthy Environment

SECTION SUMMARY:

- San Francisco has set aggressive goals for reducing greenhouse gas emissions from transportation; the goals would require 80 percent reduction in greenhouse gas below 1990 levels, which is five times more aggressive than regional greenhouse gas reduction goals.
- More stringent state vehicle emissions regulations will cause greenhouse gas emissions to fall by about 30 percent by 2040, but this is insufficient to achieve the goal.
- Some of the most promising strategies to achieve additional progress include congestion management, employer outreach, and partnerships with the private sector.

Transportation has significant environmental impacts. For example, emissions from cars and trucks account for one third of San Francisco's greenhouse gas emissions.[34] Addressing these impacts, particularly greenhouse gas emissions, is a key focus of the SFTP. This section reviews trends in greenhouse gas emissions, and discusses possible additional strategies that could help San Francisco achieve its goals, especially congestion management, employer outreach, and private sector partnerships.

5.1 | Goals and performance measures

The SFTP healthy environment goal focuses on minimizing the negative environmental effects of motorized transportation. Key performance measures include:

- Vehicle miles of travel
- Greenhouse gases associated with vehicle travel

5.2 | Trends and future conditions

Technology will do much to reduce climate change impacts from private vehicles. Tough state laws (Pavley I and II) regulating vehicle emissions are expected to reduce greenhouse gases by more than 40% compared to a business-as-usual scenario. However, this is not sufficient to allow San Francisco to achieve its goal of an 80% reduction below 1990 levels by 2050,[35] especially given the large amount of population and employment growth San Francisco expects to absorb. Additional, aggressive strategies will be needed to meet these goals.

[34] Brisson, Elizabeth, Elizabeth Sall, and Jeffrey Ang-Olson. "Achieving Goals of San Francisco, California, for Greenhouse Gas Reductions in Transportation Sector: What Would it Take?" Transportation Research Record: Journal of the Transportation Research Board. No. 2287, 2012, p89.

[35] From local ordinance 81-08. This is the amount climate scientists say is needed to stabilize the climate and prevent major sea level rise, extreme heat events, and other impacts.

Miles driven by private vehicles, or "VMT" (vehicle miles of travel) is the main source of greenhouse gases and air pollutants from the transportation sector. Growing population and employment in San Francisco and regionally is expected to result in a VMT increase of approximately 30% by 2040 under a business-as-usual scenario.[36] As shown in Figures 24 and 25, much of this VMT will come from the downtown core (for workplace VMT), and outlying southwest and southeast neighborhoods (for household VMT). The maps illustrate that major institutions such as medical centers and universities generate significant vehicle miles of travel.

PLAN BAY AREA: REGIONAL GREENHOUSE GAS REDUCTION GOALS

Plan Bay Area is the regional transportation plan developed by the Bay Area's regional transportation planning agency (the Metropolitan Transportation Commission). Approved in 2013, it sets a goal of reducing greenhouse gas emissions by 15% between 2005 and 2035, a statutory requirement of the California Air Resources Board.

Plan Bay Area shows how this reduction will be met by concentrating new growth in already built-up transit-accessible areas and through regional transportation investments and policies. Notably, San Francisco is expected to take on more new jobs than any other city, and more new housing than all other cities except San Jose. Concentrating jobs and housing in San Francisco supports efficient travel patterns and greenhouse gas reduction, but could also result in severe congestion and transit system crowding in downtown San Francisco unless major new system investments are made. See the Economic Competitiveness section for more detail.

[36] O:\Active Studies\CWTP Update\Data\Scenarios\Data\GraphicsSheets-E.xlsx Economic competitiveness. Includes VMT within SF only.

SAN FRANCISCO TRANSPORTATION PLAN 2040 FINAL REPORT APPENDICES

Figure 24 Household Vehicle Miles of Travel, 2040

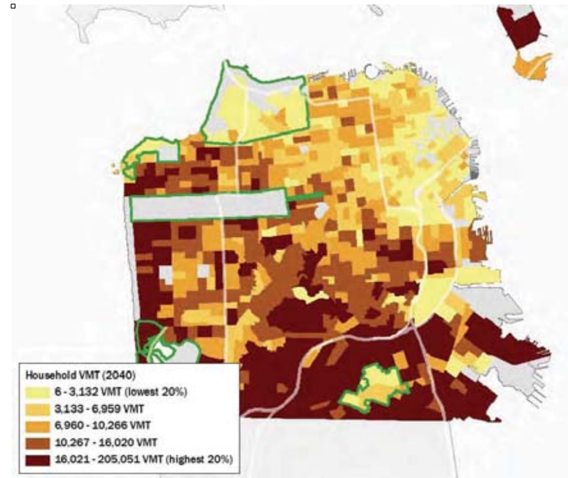
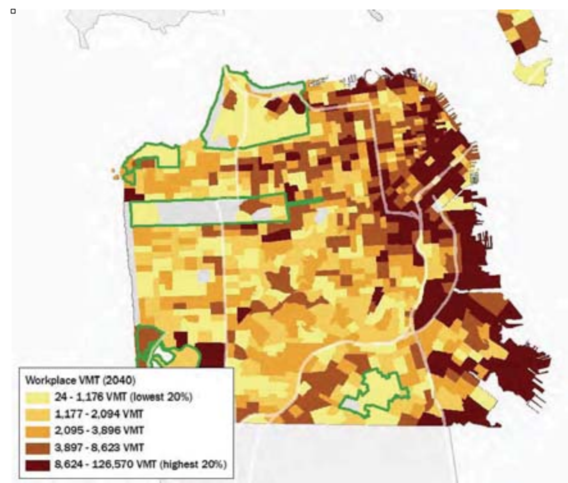
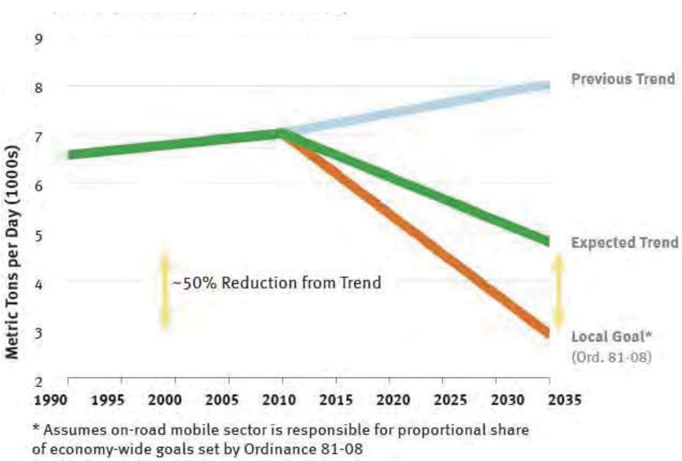


Figure 25 Vehicle Miles of Travel to Workplaces, 2040



Despite this VMT growth, greenhouse gases are expected to fall by about 30 percent between 2012 and 2040 due to the state emissions regulations described above. As shown in Figure 26, this will be insufficient to achieve the levels of GHG necessary to meet San Francisco's goals expressed in the city's Climate Action Strategy, which sets a very aggressive goal of reducing GHGs by 80 percent below 1990 levels by 2050, the reduction scientists consider necessary to stabilize the climate.[37] This goal is five times more aggressive than regional GHG reduction goals outlined in the One Bay Area Plan.

Figure 26 San Francisco Greenhouse Gas Reduction Goal Compared to Expected Trend



As described in the sidebar box above, the SFCTA conducted scenario testing to determine what it would take to achieve this goal. Multiple strategies were tested, focusing on road pricing, transit investments, and travel demand management activities. While even the most aggressive scenarios were insufficient to achieve San Francisco's goals, they allowed up to an 85 percent reduction relative to the expected trend.

The analysis also revealed which are the most cost-effective strategies for reducing greenhouse gases, namely congestion pricing, subsidized transit passes, and travel demand outreach programs. Investments in new mass transit services and electric vehicles were less cost-effective methods. The section below describes how the most cost-effective programs could be expanded and advanced in the future.

5.3 Approaches to achieving GHG reduction goals

This section describes three cost-effective approaches to reducing greenhouse gases in San Francisco: congestion management programs, outreach/incentive programs, and leveraging of private sector

[37] From ordinance 81-08.

investments. Ideas in this section are drawn from the city's Climate Action Plan and the Core Circulation Study (Appendix C).

5.3.1 | CONGESTION MANAGEMENT

Managing congestion through roadway pricing or similar means is one of the most effective tools available for reducing greenhouse gas emissions from transportation. One form of pricing already implemented in San Francisco is the SF*park* Program, which uses variable pricing on parking spots to reduce congestion (and associated greenhouse gases) associated with drivers searching for parking.

Another form of pricing has also been considered for downtown San Francisco. In 2010, the Transportation Authority published the Mobility, Access and Pricing study, which examined the feasibility of implementing a congestion charge for vehicles entering or leaving the northeast quadrant of San Francisco. The study found the following potential benefits of the program:

- 12 percent fewer peak-period vehicle trips
- 21 percent reduction in vehicle hours of delay
- 5 percent reduction in greenhouse gases citywide
- Increase in transit speeds of 20-25 percent
- Reduction in pedestrian incidents of 12%
- Generation of $60-$80 million in annual net revenue for mobility improvements

On December 14, 2010, the Transportation Authority Board unanimously approved the MAPS Final Report and voted 8–3 in favor of pursuing additional study of the concept.

Vehicle travel can also be limited through regulation. For example, a 1998 ordinance implemented in Cambridge, Massachusetts, requires any employer who expands available parking by more than five spaces to develop a plan for limiting vehicle trips to the worksite through employee incentives, parking pricing, technology, or other means. Implementation of the plan is enforced by the city and employers must demonstrate through surveys and driveway vehicle counts that they are not exceeding their vehicle trip allowance. The program has reduced vehicle miles of travel by 24 percent between 2000 and 2010, and has successfully allayed community concerns regarding traffic impacts from new development.

5.3.2 | INCENTIVE PROGRAMS AND OUTREACH

Incentive and outreach programs can also be a cost-effective method of reducing private vehicle travel and associated environmental impacts. Programs that involve personal interaction, monetary incentives, and tailored information are particularly effective in supporting behavioral change. One example is King County, Seattle's "In Motion" program, which involves provision of targeted marketing materials to encourage alternatives to driving paired with free transit passes to neighborhoods in King County on a rolling basis. Since 2004, about 13,000 residents have participated, and follow-up surveys indicate that vehicle miles of travel have been reduced by 2.4 million miles. Crowding on San Francisco's transit vehicles (covered in Section 3) and budget shortfalls make widespread provision of free transit passes impractical, but other types of incentives can be explored.

TRAVEL DEMAND PARTNERSHIP PROGRAM

The San Francisco Travel Demand Partnership Program is an innovative inter-agency effort to pilot test several innovative approaches to managing greenhouse gas emissions from transportation. Pilot projects include employer ridesharing and shuttle programs, a sustainability marketing campaign, and a flexible employee benefits program designed to reduce solo commuting. These pilot programs will inform development of the next generation of travel demand management strategies in San Francisco. The program is being funded through the Metropolitan Transportation Commission's Climate Initiatives Program.

5.3.3 | PRIVATE SECTOR TRANSPORTATION SERVICES AND TECHNOLOGY

Another approach to cost-effectively reducing greenhouse gases is to leverage private sector investment. In recent years, the private sector, and the technology sector in particular, have become more active in the transportation sector, both by providing direct transportation services to their employees in San Francisco, and by creating new services and technologies to serve the general public. Many of these innovations have significant potential to reduce single occupancy vehicle trips and greenhouse gases. Examples include:

- **CAR-SHARING AND SCOOTER-SHARING -** Private car-sharing companies have expanded rapidly, with multiple companies such as Zipcar, CityCarshare, Getaround, and the scooter-sharing company Scoot now offering services in many neighborhoods. Some companies, like Getaround and Relayrides, allow private vehicle owners to share their personal vehicles with others. Studies have indicated that access to car-sharing vehicles can allow residents to reduce the number of vehicles owned[38], which can support reductions in driving and associated greenhouse gas emissions. When car-sharing is offered at the worksite, it can also support employees who want to avoid driving to work but need access to a car during working hours.
- **RIDE-MATCHING -** Technological advances are allowing people to share rides more easily. Many private vendors are now offering customizable software programs that employers can offer to their employees to help them identify co-workers with similar travel needs – examples include Zimride, ride Amigos, rideShark, Greenride, TwoGo, and many others. Another set of companies, including Lyft, Uber, and Sidecar, have developed smartphone applications that allow drivers to find potential riders in exchange for a donation.
- **PRIVATE EMPLOYER SHUTTLES -** Many of the larger technology sector employers, such as Google and Genentech, are now offering private shuttles for their employees' commutes. Surveys have indicated that shuttles are serving about 35,000 commute trips per day, or about 1 percent of all trips to, from, and within San Francisco. About half of riders indicate they would drive alone if the shuttle were not provided.

[38] Martin, E., Shaheen, S., Lidicker, J. Carsharing's Impact on Household Vehicle Holdings: Results from a North American Shared Used Vehicle Survey. 2010 Transportation Research Record, March 15, 2010.

The public sector can play a key role in supporting growth of these services while minimizing any negative impacts on the transportation system. Some examples of possible roles the public sector can play include:

- **ADOPTING REGULATORY POLICY THAT SUPPORTS GROWTH IN PRIVATE SECTOR TRANSPORTATION SERVICES.** One such effort is the Shuttle Partners Program, a pilot program within the TDM Partners Project described previously. The program would allow private employer shuttles access to select MUNI stops in exchange for a fee. Successful implementation of this program will clear a path toward expansion of the private shuttle sector while addressing community concerns around shuttle impacts. Another example is the city planning department's policy of allowing developers to purchase residential car-share accounts to justify exceptions to maximum parking allowances.
- **ALLOWING PRIVATE SERVICES ACCESS TO STREET SPACE.** In July 2013 the SFMTA adopted a formal policy to guide the agency's facilitation of car-sharing in its off-street parking lots and garages, as well as approving a two-year pilot to test the use of on-street parking spaces as car-share spaces ("pods"). This pilot builds on lessons learned from a small-scale pilot of on-street car-share pods carried out in 2011 and 2012, and will make as many as 900 on-street parking spaces available across all districts of the city for use by qualified car-share organizations over the two years of the pilot.
- **SUPPORTING MARKETING OF PRIVATE SERVICES.** City staff can aid in the marketing of private sector services that support sustainability goals by incorporating information on these services into marketing materials provided to employees, and on city web sites.

Healthy Environment: What Would it Take?

- **CHALLENGE:** The city has an ambitious official policy to reduce emissions of greenhouse gases to 80% below 1990 levels by 2050. However, the large number of new residents and workers anticipated for San Francisco in coming decades will greatly blunt the impact of even such effective measures as the state's "Pavley Law," which tightens fuel-economy standards for cars and light trucks.
- **TARGET:** To reduce the city's transportation-related emissions of greenhouse gases by 2035 to 2,900 metric tons daily below the post-Pavley trend (this translates the city's official policy to the SFTP's horizon year and to the percentage contributed by transportation sources to total emissions).
- **IMPROVEMENTS:** This scenario included the projects, programs, and policies identified below. An additional, more aggressive sensitivity analysis was also conducted incorporating a regional road-pricing strategy that doubles the operating cost for a car and estimates a penetration rate for electric vehicles of 25%.
  - Increased penetration of electric vehicles into San Francisco's private-vehicle fleet to 9–16%
  - A $6 congestion-pricing toll in downtown San Francisco during peak periods
  - New designated transit lanes and rail extensions
  - Employer-subsidized transit passes and additional employer-based TDM measures
  - Mandatory transit passes for new housing units and other residential TDM measures, including personalized outreach on commute alternatives and increased car-sharing
  - Bicycle improvements, including a network of cycle tracks
  - School-based TDM measures, including Safe Routes to School-type investments, and outreach and other tools to facilitate carpools and school-pools, at both primary and secondary schools
- **COST:** $10 billion ($4 billion excluding second cross-bay BART tube and high-speed rail service).
- **RESULTS:** The basic scenario reduces post-Pavley emissions by 1,600–1,800 metric tons daily (see chart below). With the aggressive sensitivity analysis, the reduction is 2,200–2,600 metric tons daily.
- **CONCLUSIONS:** The basic scenario falls well short of its target even with the most aggressive measures. It is worth noting that each improvement analyzed presents trade-offs in terms of performance, cost-effectiveness, political acceptability, and co-benefits. Electric vehicles, for example, reduce emissions very cost-effectively but lack the co-benefits of strategies aimed at reducing car travel, such as reducing congestion or improving traffic safety. These tradeoffs were considered in the evaluation of improvements for inclusion in the preferred and vision alternatives.

6 Visitor, Goods Movement, and School Transportation Needs

SECTION SUMMARY:

- Of the thousands of people who visit San Francisco every day, more than 25 percent are from the Bay Area, and many of these visitors drive. Reducing this group's reliance on automobile travel could have a significant impact on congestion in the northeast core, where many visitor trips end.
- Increasing congestion could have an impact on goods movement, delaying delivery vehicles and causing inconveniences and economic hardships for delivery recipients. A combination of citywide congestion-mitigation programs and neighborhood-level parking-management strategies will be required to solve this problem.
- Reliability, safety, and other factors prevent students from taking transit to school instead of getting a ride from a parent.

The prior sections discussed the transportation investments necessary to make progress towards the SFTP goals of world-class infrastructure, economic competitiveness, a healthy environment, and livability,. This section discusses the transportation needs of three important constituencies whose needs do not fit neatly within the SFTP goal areas: visitors, companies moving goods through the city, and students.

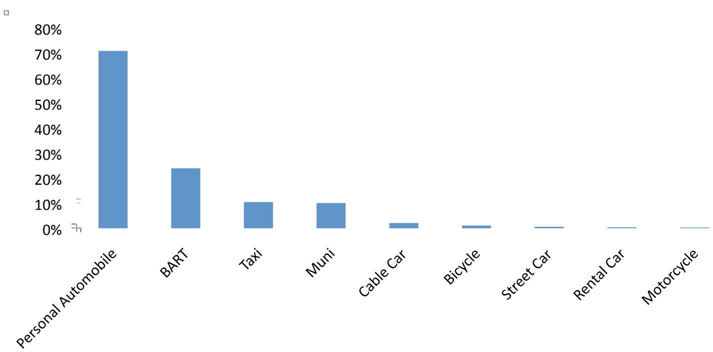
6.1 | Visitors

The San Francisco Convention and Visitors Bureau estimates that approximately 131,000 people visit San Francisco every day,[39] generating an estimated 500,000 miles of daily vehicle travel[40]. While this is far less vehicle travel than generated by daily commutes, it can still contribute to intense congestion as it clusters in specific times and places, such as around popular tourist sites, for major sports events, and during Sunday afternoons.

Visitor travel is concentrated in the city's congested northeast core, and as Figure 27 shows, many visitors from the Bay Area, who make up nearly a quarter of all visitors, come to the city by car.[41] Shifting them to other modes will be critical in reaching the San Francisco Transportation Plan's goals.

[39] San Francisco Convention and Visitors Bureau. "San Francisco Visitor Industry Statistics." Retrieved from http://www.sanfrancisco.travel/research/ on 10/7/13.
[40] Estimate assumes each visitor makes 4 trips per day; about 30 percent of trips are by automobile; and trips are three miles in length.
[41] San Francisco Convention and Visitors Bureau. "Visitor Profile Research." Presentation, January-September 2010. Slide 14.

Figure 27 Bay Area Residents' Mode of Travel to San Francisco for Day Trips



Source: San Francisco Convention and Visitors Bureau, 2010.

While visitors from further away have more varied travel patterns, they still center on the automobile. Seventy-six percent of international visitors and 61 percent of domestic visitors travel by taxi or rental car.

Some potential strategies for addressing congestion associated with visitor demand include:

- Distributing transportation information and, potentially, Clipper cards, to hotels. The SFMTA has already begun outreach to hotels and convention centers.
- Working with major event venues to manage demand, such as through advertising alternatives and facilitating shared rides or taxis to events.
- More clearly identifying designated areas for tour bus loading and unloading.
- Providing additional transit services in areas with the highest tourist demand, where appropriate.
- Piloting direct bus services from Bay Area locations to major San Francisco attractions not readily accessible by transit to serve high demand from Bay area visitors.
- Working to deploy bicycle sharing at the most visited locations.

6.2 | Goods Movement

Goods movement is critical to San Francisco's economic competitiveness and livability, two of the San Francisco Transportation Plan's four goal areas. Problems with goods movement in today's transportation

system center on delivery vehicles' competition with private automobiles for space on city roads and at the curbside.

In Spring 2011, the SFTP team conducted eight interviews with a variety of goods movement stakeholders, including merchants, delivery companies, and drivers, the United Parcel Service, and the San Francisco Municipal Transportation Agency. The conversations revealed a number of related issues that impede efficient deliveries:

- **INSUFFICIENT SPACE FOR LOADING AND UNLOADING.** Though yellow curb zones reserve some space for deliveries, delivery vehicles often must compete with cars, large employer shuttles, and other vehicles to drop off goods at local businesses. When there is no curbside space available, drivers double park or must take additional time to cart deliveries from more distant parking spots.
- **POOR MANAGEMENT OF AVAILABLE LOADING AND UNLOADING SPACE.** Stakeholders noted that loading and unloading zones are often too short, poorly placed, have inadequate hours, and are poorly enforced.
- **CONGESTION DURING PEAK TRAVEL PERIODS.** Many delivery-vehicle destinations are in the densest parts of the city, where traffic congestion is the biggest problem. For such vehicles, slower deliveries mean less productivity and, ultimately, lost money.

Shorter-term strategies to remedy these issues include continually refining and rationalizing the hours of yellow zones and determining locations through a community process. Delivery spaces should also be an additional consideration in crafting neighborhood plans.

In the longer term, congestion management strategies can support more efficient goods movement. As described in the Environment section, forecasts show that pricing will significantly reduce congestion in the city's dense northeast core, the destination of many deliveries and the area of the city in which competition between drivers and delivery vehicles is most intense

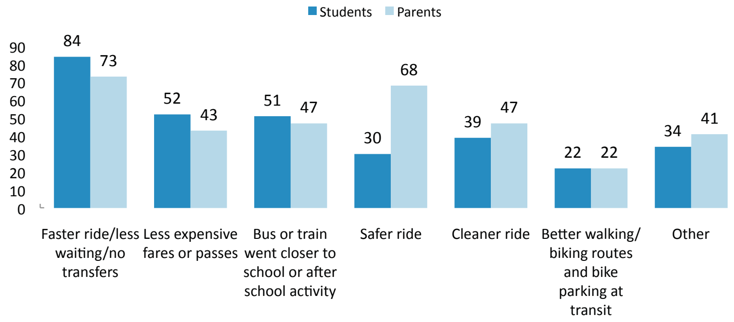
6.3 | School Transportation

Outreach for the SFTP (described fully in the SFTP Appendix E: Outreach Summary) included a survey of students and parents to gauge their transportation needs. The survey asked participants about factors that hold them back from taking transit, biking, or walking to school (or, in the case of parents, allowing their students to take those modes). More than 1,000 responses were received, and results revealed that the frequency and reliability of transit service is the top priority of students and parents. For students, reduced-price transit passes and transit stops closer to school were also important but significantly less so. For parents, transportation safety was another key area of importance (Figure 28).

The survey findings reveal that the top school transportation needs can be met through projects and programs designed to improve transit service quality, especially those that would serve major educational institutions. Sections 2 and 3 discuss current efforts and possible future strategies to improve transit service.

In addition, other efforts are already underway to support non-auto school transportation. In late 2012, the Board of Supervisors funded a short-term youth-pass pilot to provide students with free Muni passes, more than 18,000 students signed up for the program in the months before it officially began, in March 2013.[42] The pilot will continue for 16 months. The program was developed in response to cuts in San Francisco Unified School District's yellow school bus service and recent increases in the cost of Muni youth passes.[43]

Figure 28 Priority School Transportation Concerns of San Francisco Students and Parents



Source: SFCTA School Transportation Survey. Numbers indicate number of respondents who marked the issue as being of importance.

[42] Cabanatuan, Michael and Neal J. Riley. "18,000 youth sign up for free Muni pass." *San Francisco Chronicle*, February 7, 2013. Retrieved from http://www.sfgate.com/bayarea/article/18-000-youth-sign-up-for-free-Muni-pass-4261349.php on 10/15/13.
[43] Ciria-Cruz, Rene. "Youth Score Win for Free MUNI Passes." Retrieved from http://urbanhabitat.org/19-2/ciria-cruz-TJ on 10/15/13.

EXHIBIT 6

Appendix C

CORE CIRCULATION STUDY

Recognizing that a large share of San Francisco's future growth is planned for the city core (downtown, South of Market, and Mission Bay Neighborhoods), we undertook a study of current and projected circulation patterns in the core as part of SFTP development. The study resulted in a paper accepted for publication at the Transportation Research Board 2014 annual conference (attached). Study findings informed the SFTP Investment Plans and policy recommendations.

PREVENTING CARMAGEDDON IN SAN FRANCISCO'S RAPIDLY DENSIFYING CORE

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ABSTRACT

Several land use and transportation plans propose changes that would affect the "Core" of San Francisco. The Core encompasses the greater Downtown area, including the South of Market (SoMa) neighborhood. SoMa is currently comprised of a predominantly one-way street grid with long blocks of multi-lane arterial streets designed to carry traffic from Downtown to the city's major regional freeway access points. With at least 48,000 housing units and 122,000 more jobs expected in this area, San Francisco has developed plans to aggressively reduce number of general purpose travel lanes on many streets to improve livability and better balance travel options amongst modes. This paper presents analysis and findings of an effort to use quantitative analysis to identify the cumulative transportation performance effects of these proposed changes. The paper presents a combination of activity-based travel demand model, traffic microsimulation, and off-model analysis to describe one of the key problems identified – that plans for the Core could lead to a "carmaggedon" scenario (i.e perpetual gridlock) where the forecast level of auto demand "breaks" the Core network—a particular problem because of the negative impact perpetual gridlock would have for transit operating at-grade. A range of strategies to reduce auto demand are evaluated for their effectiveness, finding that demand management and mobility improvement strategies are essential. The paper closes with two key discussion areas: 1) opportunities and challenges to making transit, walking, and cycling function effectively in extremely congested conditions; 2) a need for the city evolve from the typical forecasting/analysis approaches to long-range transportation planning to solve tomorrow's transport challenges.

INTRODUCTION

To see an example of how traffic congestion impacts other modes of transportation today, you only need to stand for a moment on a street in Downtown, San Francisco during rush hour. You will likely see private autos illegally trespassing in unprotected bus lanes. You will see 50+ passengers on a bus waiting for a single motorist to make a right turn through a pedestrian-filled intersection. You will see frustrated motorists block intersections because they have already waited too long to cross. You will see cyclists risking their lives navigating the slim and unpredictable gaps between vehicles. This problem—of congestion, and its negative travel time, reliability, and safety impacts to all modes of transportation—has been of particular interest to San Francisco given plans underway to rapidly intensify land uses while reducing the number of general purpose travel lanes on many streets to increase livability. Given this context, the City has struggled with questions such as: how much can auto congestion's impacts on other modes be mitigated by simple low-cost solutions or are major capital investments needed? Can we, and/or should we strive to mitigate congestion? What level of intervention is needed to maintain a safe, habitable urban environment while providing sufficient mobility to maintain the City's economic competitiveness? This paper explores these challenging questions and analyzes potential solutions.

BACKGROUND

San Francisco is a city recognized for its leadership in planning for transit-oriented growth. The City's Charter even has a Transit First policy that states that, "decisions regarding the use of limited public street and sidewalk space shall encourage the use of public rights of way by pedestrians, bicyclists, and public transit."*(1)* The City's currently adopted or underway land use plans call for a significant increase of 48,000 housing units and 122,000 jobs within the city's Core *(2)*. The city has made planning for this growth a policy priority. In addition, the Bay Area region (population of approximately 7 million) looks to San Francisco, as well as the other core cities of the region (Oakland and San Jose) as the most important locations to focus most growth due to the existing infrastructure and density within these locations. In fact, in the recently adopted *Plan Bay Area* long-range land use and transportation plan., San Francisco is expected to take on approximately 92,000 housing units and 190,000 jobs to help achieve the region's greenhouse gas reduction goals (*3*). Citywide, this expected growth represents approximately a 25% increase in housing and a 34% increase in jobs, relative to today's levels citywide.

Within this context, San Francisco has placed emphasis on planning for growth within the "Core" of the city, generally those areas adjacent to the Downtown/Civic Center job centers. Combined, approximately 60% of growth in housing units and 85% growth in jobs has been planned to be accommodated in the Core, with a lot of it focused in the neighborhoods directly south of Downtown: the South of Market (SoMa) and Mission Bay neighborhoods *(4)*. SoMa is known for its multi-lane one-way arterial streets that provide access between Downtown and the regional freeway network. As a result of the needs of existing SoMa residents, as well as in response to growth planned, there have been significant efforts to develop and implement plans to increase the neighborhood's livability by re-purposing right-of-way of general purpose lanes to provide safer, more attractive non-motorized facilities and faster, more reliable transit. Mission Bay, just south of SoMa is a redevelopment area with a research and heath-care oriented master plan in the process of building out, and separated from SoMa by a channel to the Bay, with only two streets connecting north-south to SoMa (see Figure 1).

FIGURE 1 Core Study Area

The San Francisco County Transportation Authority (Transportation Authority) undertook a focused study of the Core to inform the 2013 update to the San Francisco Transportation Plan (SFTP), San Francisco's long-range, countywide transportation plan that prioritizes transportation investments and recommends policies to support the city's transportation goals. The purpose of this analysis, known as the Core Network Circulation Study (Study) was to analyze the cumulative impact of growth and changes to the transportation network; identify transportation performance problems; and propose recommendations.

The analysis revealed three key problems: 1) the forecast increase in auto trip-making caused by the intensifying land use would result in more auto demand than could be served, in particular given concurrent projects to promote livability through reducing private vehicle capacity—in other words, if the demand for vehicle travel forecast were realized, a perpetual gridlock or "carmageddon" scenario was expected given current plans; 2) even if auto demand was to be substantially reduced, significant transit performance challenges remained; and 3) the overall increase in trips of all modes would exacerbate multi-modal conflicts endangering the safety of pedestrian and cyclists. The purpose of this paper is to describe the methodology, findings, policy implications, limitations, and conclusions related to the first problem (the problem of "carmaggedon").

METHODOLOGY/ANALYSIS APPROACH

The Study's approach to identifying problems relied on an evaluation framework that included metrics related to performance of each mode of transportation, including transit, walking, cycling, and private vehicle travel. The analysis proceeded in three phases: first, a baseline **travel market analysis** was conducted to understand who is traveling in the Core, in particular which high auto trip markets affected the Core; next, transportation performance was assessed and problems identified, including the problem that is the focus of this paper, forecast **perpetual gridlock congestion** during peak hours; finally, **effectiveness of strategies** to respond to problem areas were identified and evaluated.

Two main scenarios were considered to inform the analysis: a "Base" year, representing current conditions, and a "Planned Future" horizon, that included all land use and transportation network changes planned for in the 2035-2040 timeframe. The study team chose the PM peak hour as representative of a typical daily "worst case" scenario.

A variety of analysis tools were used including:

- The Authority's activity-based travel demand model, the San Francisco Chained Activity Modeling Process (SF-CHAMP) *(5)*. SF-CHAMP incorporates a state-of-the-art approach to forecasting travel demand, sensitive to a broad array of conditions that influence travelers' choices. It incorporates the most recent 2010 Census household travel data, along with calibration to observed data including traffic volumes and transit ridership.
- Micro-simulation traffic analysis software, SimTraffic, which was used to determine how the level of auto trip-making demand forecast in SF-CHAMP would affect on-the-ground performance during PM peak hour conditions. As compared to SF-CHAMP, SimTraffic better accounts for delays under congested conditions and represents more detailed network characteristics such as traffic signal phasing, coordination, turn lanes, and the effects of queuing between intersections.
- Off-model techniques customized to understand the effectiveness of strategies that are not currently represented in SF-CHAMP or SimTraffic. These methodologies are summarized in the following section alongside descriptions of the strategies considered. More detailed documentation is available as a technical appendix *(6)*.

FINDINGS

This section presents findings from each of the three phases of the analysis: travel markets, transportation performance problems, and effectiveness of strategies.

1. Travel Markets

The Travel Market analysis investigates the purpose and characteristics of travel in the Core during PM peak hours including: travel mode, common origins and destinations, and breakdown between trips passing through versus originating or destined to the Core. This was a focus, as understanding the major and changing travel markets would inform which strategies would most effectively respond to problems identified.

Figure 2 summarizes overall trip-making levels in Downtown and SoMa/Mission Bay today and in the Planned Future using SF-CHAMP model output for each scenario. SoMa/Mission Bay is responsible for most of the growth in trip-making—about twice as many in the

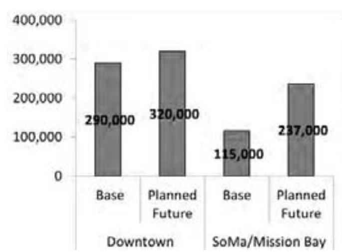

FIGURE 2 Trips to/from/within Downtown and SoMa/Mission Bay: Base vs. Planned Future, pm peak
Source: SF-CHAMP 4.3, Focused Growth

Planned Future than today. However, Downtown still attracts the most total trips. As shown in Figure 3, nearly all the new auto trips to or from the Core in the future are generated by SoMa/Mission Bay.

Figures 2 and 3 show travel occurring to, from, or within the Core, but many other trips pass through the Core without starting or ending there. Figure 4 includes this larger universe of trips and breaks down trips between those that start or end somewhere else within San Francisco (i.e. local), versus those that are regional and have their other end in another Bay Area county. Viewing trip ends and through trips together indicates that over half of the vehicles traveling on the SoMa street network are not going to a destination in SoMa; and, of the trips which pass through, half are local to San Francisco and half have regional destinations. Figure 4 also shows that the share of trips destined to or from this part of the City is increasing, while the share of trips passing through this area is decreasing, potentially indicating that as this part of the city densifies, the local streets are used by more core-related traffic, crowding out vehicles destined to other parts of the City.

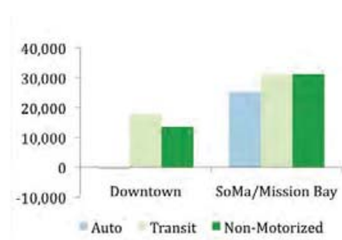

FIGURE 3 Change in Trips to/from/within Downtown and SoMa/Mission Bay: 2010-2035, pm peak
Source: SF-CHAMP 4.3, Focused Growth

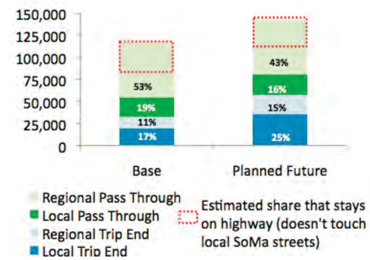

FIGURE 4 SoMa Auto Trips, Pass-Through vs. Trip Ends, Regional vs. Local, pm peak
Source: SF-CHAMP 4.3, Focused Growth

The Study team executed additional analysis focused on short auto trips, due to their greater potential to shift to walk and bicycle trips. Figure 5 shows "sub-areas" that were the focus of the analysis, as well as the number of short auto trips under 2 miles and under 0.5 miles in the Planned Future and the change relative to today.

In the aggregate, PM peak auto trips less than two miles more than double (233% increase) from today to

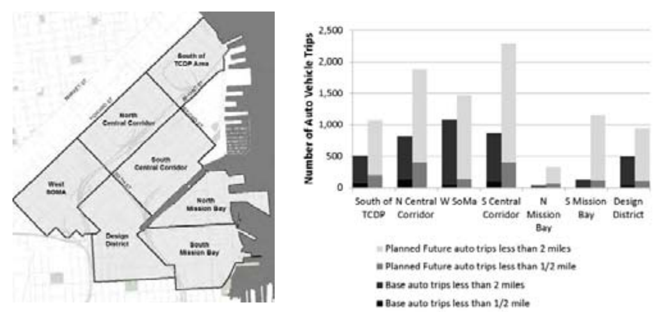

FIGURE 5 Short Auto Trip Analysis: Study Area, and Change in Auto Trips Under Two Miles, 2011 vs. 2035 Baseline
Source: SF-CHAMP 4.3, Focused Growth

the Planned Future. The auto mode share of trips less than two miles actually *decreases* (20% to 17%), yet the share of auto traffic in SoMa/Mission Bay that is completing a trip less than two miles *increases* (18% to 20%). In the context of an overall increase in trip-making, this means a lower percentage of people are choosing to drive for short trips, yet, more vehicles on the network are completing short trips due to changes in land use and density. Many of these short auto trips are likely a result of trip-chaining, which the Study team considered as it developed the strategy response (described in Part 3 of this section). The implication is that transportation demand management (TDM) strategies should be pursued to discourage people from arriving via automobile in the first place, allowing these short auto trips to more easily be shifted to walking and bicycling trips. By encouraging transit, shuttle use, ridesharing, parking policy, and other TDM measures people will be less likely to drive to these districts in the first place, and thus decreasing the possibility of short auto trips. Shifting to walking and cycling is a particular opportunity not only for short vehicle trips but also for short transit trips, which would free up room on overcrowded buses and trains for longer transit commutes.

2. Transportation Performance: Congestion Reduction to Avoid Gridlock

The study team analyzed the auto and transit performance impacts of the forecast increase in net auto travel in the Planned Future. The Study team prepared a SimTraffic microsimulation analysis, assuming the transportation network proposals (i.e. reduction in general purpose travel lanes) were in place, for a subset of SoMa that experiences some of the greatest levels of congestion today. The purpose of this analysis was to determine how much auto demand reduction would be necessary to prevent vehicle queues from spilling into upstream intersections and maintain a saturated, but flowing network. Results determined that an approximate 26% reduction of auto volumes during the PM peak period relative to Planned Future SF-CHAMP forecasted levels of demand was needed to reach an operational point at which traffic could flow (see Figure 6). In other words, the Core San Francisco road network can only accommodate about half of the forecasted auto demand increase before creating a perpetual gridlock condition.

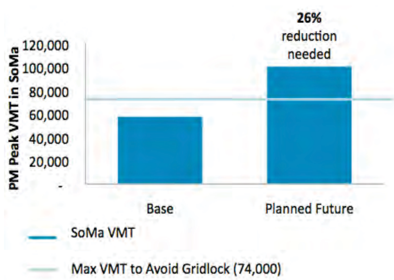

FIGURE 6 PM Peak Vehicle Miles Traveled on SoMa Streets: Comparison of Scenarios *Source: SF-CHAMP 4.3, Focused Growth*

3. Congestion Reduction Strategy Effectiveness

The final aspect of the analysis was to assess the effectiveness of a range of strategies in contributing to achieving the 26% reduction in PM peak VMT needed. Informed by the trip analysis findings, a set of potential strategies were identified for analysis.

Generally, strategies were identified in line with those that responded to a larger needs analysis conducted for the SFTP. In particular, there was a focus on newer and innovative demand management strategies that have

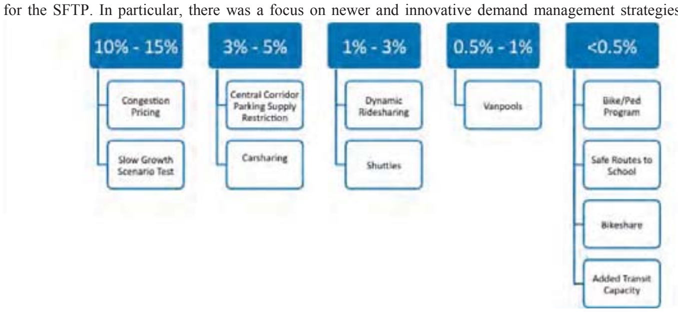

FIGURE 7 Relative Effectiveness of Strategies to Reduce PM Peak SoMa VMT
Source: SFCTA, 2013.

recently come into practice or are under consideration in San Francisco.

Figure 7 summarizes the range of potential impacts of selected strategies to further reduce core VMT from the Planned Future (each strategy listed could individually provide the level of reduction—e.g. congestion pricing and slow growth could each provide a 10-15% reduction in PM peak SoMa VMT). Results found that no single strategy alone could achieve the level of reduction needed, and even all strategies combined may not be able to. The rest of this section contains definitions of each strategy represented as well as the methodological approach to quantify the benefit. It should be noted that the impacts of these strategies are not additive: each strategy is evaluated assuming that no other strategies are implemented. Overlap is likely although in some cases synergies between strategies are also possible.

10% - 15% VMT Reduction

Congestion Pricing: The reduction estimate for congestion pricing is based on travel forecasts conducted as a part of the Mobility, Access, and Pricing Study that explored the feasibility of implementing congestion pricing in Downtown San Francisco (*7*). The 10-15% reduction represents the AM/PM Northeast Cordon scenario, where motorists would be charged a $3 per crossing fee for crossing into or out of the area bounded by Laguna Street, Guerrero Street, 18th Street, and the waterfront during peak periods with net revenue reinvested in multi-modal mobility improvement. Such a policy is still under consideration for San Francisco, and has recently come back into policy and media attention in context of major growth planned in the Core and the resurgence of San Francisco's economy after the recession.

Slow Growth Scenario Test: This scenario test was intended to be a point-of-information were San Francisco's growth to happen at a slower pace, akin to the level of growth forecast for 2020. Under this slower growth scenario, PM peak VMT would need to be reduced by 11%. Of course, growth would continue towards 2040 projections and further reduction strategies would ultimately be needed to avoid perpetual gridlock.

3% - 5% VMT Reduction

Central Corridor Residential Parking Supply Restrictions: This strategy describes results of a model scenario in SF-CHAMP representing the effect of a set of policies that would aggressively limit the growth of parking supply in a part of SoMa known as the Central Corridor (bounded by 2nd, 6th, Mission, and Townsend Streets). The Central Corridor is currently undergoing a planning process to upzone the area as it is adjacent to the route of a major transportation investment (the Central Subway that will connect Southeast San Francisco, SoMa, Union Square, and Chinatown). This policy scenario was specified for the Central Corridor area because the opportunity to regulate parking more aggressively (relative to previous area plans) may be an option, since this area is in the process of being re-zoned.

Carsharing Expansion: This strategy estimates the impacts of an aggressive expansion of carsharing consistent with analysis done by the Metropolitan Transportation Commission (MTC) as a part of *Plan Bay Area (8)*. Such an expansion would be achieved by policies that increase set-aside for off-street parking for car-sharing (current San Francisco policy is one car-share space for every 50 housing units in new developments *(9)*) or expansion of on-street carshare parking spaces as is currently in its nascency *(10)*. Additionally, MTC proposes subsidizing new start-up carshare offices throughout the region. This assumes that 15% of the "eligible population" (defined as adults 20-64) will be become carsharing members by 2040.

1% - 3% VMT Reduction

Dynamic Ridesharing: Dynamic ridesharing explores the potential of heavily investing in outreach and technology to match current single occupant vehicle (SOV) trip-makers to share rides with those having similar trip origins and destinations. In the Planned Future, 59,000 PM peak VMT (60%) are from SOVs. The analysis assumes the market for dynamic ridesharing to be 5% of those who currently drive alone, based on survey results of City and County of San Francisco employees *(11)* and the market research potential of dynamic ridesharing from UC Berkeley *(12)* and MIT (*13)*.

Shuttles: Employer-provided shuttles have emerged as a major new sector within San Francisco's transportation system recently, in particular for workers in certain employment sectors such as technology. According to a survey conducted for San Francisco's Transportation Demand Management (TDM) Partnership Project, regional shuttles represent at least 6,600 daily boardings, while intra-city shuttles account for at least 28,700 boardings *(14)*. The analysis assumes the market is projected to grow by approximately 40% for regional providers and 39% for intra-city providers based on forecast increase in employment in these categories. Using TDM Partnership Project survey results as to what mode would serve the trip if the shuttle was not an option, a Planned Future PM peak VMT reduction was calculated based on the share of shuttles that serve SoMa (27%). This strategy is intended to represent partnering with employers to enable the shuttle system to grow as it has been trending without interfering with public transportation, such as through the city's recent efforts to regulate use of bus stops for shuttles *(15).*

0.5% - 1% VMT Reduction

Vanpools*:* The Vanpool strategy applies the MTC *Plan Bay Area (16)* methodology of a strategy that would provide a $400/month/van subsidy to encourage ridesharing growth in the region. In SoMa, this translates to 1,800 new vanpool riders and 700 fewer vehicles in SoMa.

< 0.5% VMT Reduction

Bicycle and Pedestrian Program: This strategy represents major investments to the city's bike and pedestrian networks including building more than 100 miles of upgraded protected bike lanes or cycletracks, and improving pedestrian conditions through safer, redesigned streets and shorter crossing distances. Savings from the Bicycle and Pedestrian program were calculated using SF-CHAMP, which has recently been upgraded to better represent pedestrian *(17)* and cycling *(18)* trip-making behavior. The savings were calculated by comparing the Planned Future to a model scenario that represents upgraded cycletrack-level bike lanes city-wide, as well as representing improved pedestrian conditions through increasing the pedestrian environment factor and reducing facility type to represent slower streets. The resulting change in evening peak VMT in the core as a result of this strategy is forecast to be modest, which was initially surprising to some of the team members. Additional discussion to interpret this result included determining that many new bicycle riders and pedestrians in the modeling exercise were former transit riders, or those drivers who shifted to non-motorized modes, then freed up space for additional drivers, increasing the overall number of trips and biking and walking trips, rather than reducing SoMa VMT. Another point of information that was used to consider the potential effectiveness of this strategy was the short-trips analysis described in Part 1 of this section that found that in whole, removing all auto trips under a half-mile in SoMa/Mission Bay represents 7% of this desired reduction while trips under two miles (including under half-mile) represent 34%.

Safe Routes to School: This strategy models the effect of continuing and expanding the city's Safe Routes to School (SR2S) program. The San Francisco United School District (SFUSD) launched SR2S to increase the attractiveness and safety of walking or cycling to school beginning in the 2009-2010 school year with three schools and currently has 15 schools participating. Based on empirical evidence from the program and experience from SR2S programs in Marin and Alameda counties, an average family vehicle trip reduction of 14% is assumed to result from the program. Applying this to the 15 schools currently enrolled in the program results in 900 fewer daily vehicle trips in San Francisco. When extrapolated to all SFUSD schools plus private schools, 10,000 fewer daily vehicle trips are projected. The 2012-2013 program currently includes one school in SoMa. Therefore, the SoMa share of the current program translates to 100 fewer 2040 PM peak VMT. Accounting for expansion of the program plus private schools results in an additional 160 VMT decrease, or a total of less than 0.5% VMT decrease.

Bikeshare: This strategy represents the benefits from both a pilot program (500 bikes) that launched in San Francisco in August 2013 as well as a Phase 2 (2,750 bikes) that would launch at a later date (after this analysis was completed, the pilot program has sense been reduced to 350 bikes in San Francisco). The pilot project would have placed 360 bikes in SoMa while Phase 2 would place 538 bikes in SoMa. Using a methodology based on trips generated per bike observed in four cities *(19)* and modal diversions of those trips observed in six cities *(20),* ~40 VMT in the 2040 PM peak are expected to be saved as a result of the pilot and ~60 VMT are expected to be saved from Phase 2. This translates to <0.5% VMT reduction from bikeshare alone. However, one would expect bikeshare to be an integral part of an overall coordinated TDM strategy in SoMa and its value may extend far beyond its independent VMT reduction contribution.

Transit: Several transit-related strategies considered showed no notable change in VMT on SoMa streets. Two scenarios were analyzed using the SF-CHAMP model: 1) a second underground rail tube under the San Francisco Bay for the regional heavy-rail system BART that would run from the East Bay, through SoMa under Mission Street and continue under the Geary corridor to the Richmond; 2) a "capacity unconstrained" scenario, where there would be enough room on local San Francisco buses to accommodate everyone who desired to ride transit (SF-CHAMP was recently upgraded to represent transit crowding *(21)*, and essentially this "knob" was turned off in this scenario).

In both scenarios, change in PM peak period VMT on SoMa streets was flat. This is not to say that improved transit is not imperative to the functioning of the Core, but rather than on its own, will not result in a notable reduction in SoMa VMT. This finding highlights likely latent demand for driving in this part of the city. Road space given up by those who shift to improved transit service will be replaced by new drivers "filling in" newly available capacity.

Potentially Effective Strategies Not Analyzed

"Fix the Grid": This strategy represents an idea to "fix the grid" by reconnecting streets that do not currently connect well. SoMa/Mission Bay is ground zero for several street grids that interface in awkward ways where they meet including between Downtown and SoMa, between Downtown and Market/Octavia, between SoMa and Mission Bay, and between Mission Bay and Potrero Hill/the Mission District. Several opportunities to make these upgrades have been identified. Although analysis was not undertaken, the team expects such a strategy could contribute modest positive benefits towards SoMa congestion reduction by removing bottlenecks in the network.

Auto Trip Cap: Recently, San Francisco planners have discussed the idea of a private vehicle "trip cap" as a potential next-generation TDM strategy. The idea of such a strategy would be to set an allowance for a maximum number of auto trips that allow the network to continue to function, while charging a fee to trip generators who exceed their trip allowance, similar to a cap-and-trade scheme. While this strategy was not analyzed and would require more detailed specification, it may represent a similar magnitude of potential trip shifts as parking supply restrictions or congestion pricing strategies.

Convert Freeway Lanes and Ramps from General Purpose to Transit/Carpool Because SoMa is home to a series of on- and off-ramps to three major highways of I-80, US 101, and I-280, traffic associated with motorists trying to access those ramps is a notable contributor to PM peak congestion on SoMa streets as shown in Figure 4. A strategy that would close or re-purpose some ramps or travel lanes for use only by transit- or carpool-only may both increase the competitiveness of non-SOV modes, and improve the throughput of those facilities that may be degraded by closely spaced interchanges (0.5-0.7 miles apart through SoMa). Several potential options to operationalize this strategy were developed, but the team did not believe the VMT reduction benefits could appropriately be analyzed within the resources and analysis tools available for the current Study (future work is expected to analyze this strategy in a broader planning context).

DISCUSSION OF RESULTS AND POLICY IMPLICATIONS

The team struggled with how to interpret the result that the level of reduction in demand for auto travel would be challenging to achieve, concluding that in areas of above a certain threshold of high land use intensity, *demand* for auto travel at levels higher than available *supply* will always be present and can only be managed through strong demand management strategies that increase price or restrict vehicle access. In order to maintain mobility and economic vitality concurrently, demand management strategies must be paired with improvements in safety, capacity, and performance of other modes of transportation. Given that reality, there are two challenges and policy implications to discuss: 1) what the city can do to ensure effectiveness of other modes in a congested future; 2) how to evolve from typical forecasting/analysis approaches to long-range transportation planning while still having a rational basis for proposing transportation interventions.

Increasing the effectiveness of non-auto modes of transport in a congested future.

In the San Francisco policy context of a city that has made Transit First an official policy, pure auto congestion is not considered a problem in and of itself if it does not interfere with the ability to accommodate mobility for other modes of transportation, as well as if it allows for the city to maintain its economic competitiveness. But, on-the-ground conditions today are such that during peak commute periods auto congestion *does* interfere with other modes. While some of this interference can be addressed by strategies not yet in place such as greater protection for transit and cycling facilities, the team concluded that in a destination like the Core, that is highly attractive due to the concentration of residential, employment, and visitor uses, increasing intensification would require a transition to more active management of transportation conditions such as deploying resources in real-time based on on-the ground conditions and active enforcement of "don't block the box" (i.e. enforcement/ticketing of cars that remain in an intersection on a red light). Such an approach is already utilized effectively in special cases such as during major sports or cultural events. For example, a recent confluence of major events resulted in one million people converging on San Francisco (the so-called "event-maggedon" of America's Cup/Fleet Week, the Castro Street Fair, the Italian Heritage Parade, Giants and 49ers games, the Hardly Strictly Bluegrass Festival and the Double Ten Parade) on the weekend of October 6, 2012 *(22)*.

However, the team also posited maintaining transit speed and reliability would be increasingly challenging to do so at-grade as congestion and overall trip-making grows. While upgrading streets to provide protected transit facilities is important, challenges such as the need to accommodate access to curb space for goods movement loading and disabled persons and the need to allow private vehicles, pedestrians and cyclists to cross transit lanes, all create negative speed and reliability impacts. As a result, transit may only be truly effective as grade-separated after a certain intensity of trip-making. San Francisco already has underground transit including the regional BART heavy rail system and portions of the Muni Metro system that serves some parts of the city. In addition, the newly planned Central Subway under SoMa, Union Square, and Chinatown, and eventually the planned extension of the Caltrain regional commuter system to Downtown as a part of the California High-Speed Rail project will also contribute to addressing this need. Yet, other parts of San Francisco do not currently have fast or reliable access to any below grade opportunity and some below grade facilities are not providing the level of speed or reliability needed to attract or maintain riders. Of course, this problem is particularly challenging to address given the lack of funding for major capital investments relative to past decades. How to respond to these needs are one focus of the SFTP.

Evolving from typical forecasting/analysis approaches to long-range transportation planning

Historical and to some extent state of the practice approaches to travel forecasting and transportation project evaluation have led to problem-solution framing where an input of more people and more jobs indicate an output of demand for auto trip-making that can only be solved by adding roadway capacity. San Francisco has for some time used a more nuanced approach guided by the city's Transit First policy and prioritized improvements to transit, walking, cycling, and reduction in auto lanes. San Francisco's travel demand model, SF-CHAMP, has been created and upgraded to be sensitive to a broader array of multi-modal interventions. But, the finding about the excess of vehicle demand relative to supply indicates a condition that is not physically possible. While there is widespread recognition that the "solutions" of past--increasing vehicle capacity—are wrong, the now well-recognized candidate solutions related to demand management and multi-modal improvements, are not found to do enough to address the problem when applying empirical evidence about their effectiveness from other cities to San Francisco conditions (of course more stringent representation of strategies could be quantifiably demonstrated to be more effective such as a much higher congestion toll or extreme restriction of parking supply, but were not elected to be studied here).

As the team concluded this particular effort, there was a recognition that the analytic work needed to plan to meet transportation needs in San Francisco's core must evolve to utilize different problem-solution framings. Recent ideas about how else to frame long range planning analysis are to focus on quantifying the expected increase in trip-making from new growth, then planning to accommodate those trips based on policy-driven modal split, and planning for the characteristics (performance, safety, capacity) of transit, cycling, and walking networks that are known to be important factors in travel behavior decision-making in favor of those modes. Approaches such as these are sure to be tested in emerging transport planning work in San Francisco.

LIMITATIONS

There are several limitations to the paper's technical analysis (all of which support the second discussion point regarding evolving from typical forecasting/analysis approaches):

- The paper suggests a particular level of auto traffic reduction needed to avoid perpetual gridlock. This level is based on a methodology of inputting auto traffic demand forecast by a travel demand model into microsimulation software. What is implied by the microsimluation finding is that the travel demand model is forecasting more demand than can be accommodated. Ultimately, the 26% VMT reduction should be interpreted to reflect that there would be that much demand for peak hour auto travel even in congested conditions, but in reality some of those trips would change their time of day, route, mode, or not make the trip at all. Given that SF-CHAMP also represents transit crowding, the level of transit demand would likely also not be able to be accommodated with the existing transit supply.
- The strategies specified could have been specified to be a stronger representation: for example, a congestion pricing policy with a higher priced toll would be expected to increase the VMT reduction of that strategy; similarly a higher number of bikes in a bikeshare program could also be more effective. However, the study aimed to represent strategies based on the current or proposed definitions.
- The strategies do not take into account unprecedented cultural shifts. For example, younger generations are not driving as much as past generations, and bicycling has become rapidly more popular. These trends may indicate a greater impact of some strategies than what is quantified here.
- The relative effectiveness of strategies analyzed via the model versus via off-model may not be perfectly comparable and may overestimate the benefit of off-model strategies. Modeled strategies show the induced demand of new vehicle trips "filling in" freed up capacity, while off-model strategies do not.

CONCLUSIONS

This paper finds that in areas of high land use intensity, demand for auto travel at levels higher than available supply will always be present and can only be managed through strong demand management strategies that increase price or restrict vehicle access. In order to maintain mobility, such strategies must be paired with improvements in safety, capacity, and performance of other modes of transportation. In the near-term, San Francisco can reduce traffic congestion's impacts on other modes of transport through more regular active management of the transport network and continuing to re-purpose auto lanes for walking, cycling, and transit space. In the longer term, the city will continue to strategically consider additional below-grade/subway additions and upgrades to the local and regional transit network. Finally, future long-range transport analysis should explore new analytical frameworks for long-range transport planning that may be more apt to solve tomorrow's transport challenges.

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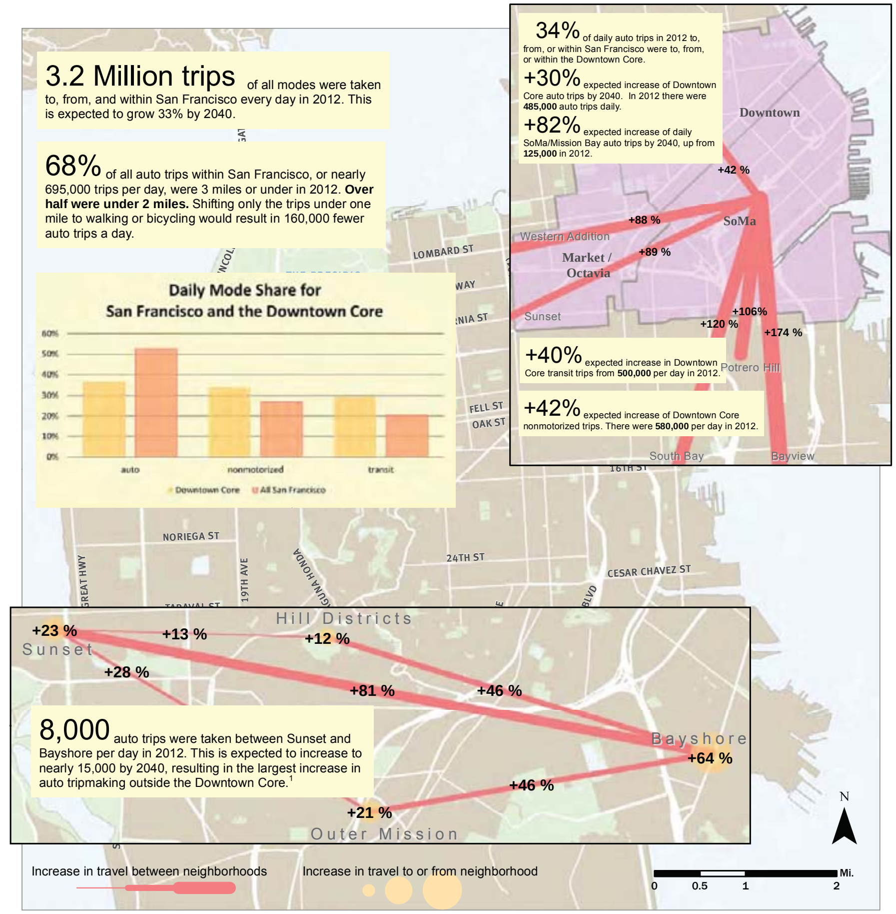
EXHIBIT 7

Appendix K

SF TRAVEL AT A GLANCE



San Francisco at a Glance: Daily Tripmaking to, from, and within San Francisco Now and 2040

Three key travel trends that shaped the SFTP

Of the 3.2 million trips to, from, or within San Francisco every day, 53% are taken by private automobile. Growth is expected to put exceptional stress on the surface transportation network in coming years, particularly in the Downtown/SoMa Core, the US 101 Corridor, and the Eastern Neigborhoods. Over two-thirds of trips entirely within San Francisco are under three miles in length, and represent an opportunity to shift to non-motorized modes walking and bicycling.

[1]Refers to travel between neighborhoods.

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY
1455 Market Street, 22nd Floor, San Francisco, CA 94103
TEL 415.522.4800 FAX 415.522.4829
EMAIL info@sfcta.org WEB www.sfcta.org

Sources: Citywide trip and mode statistics come from the 2010 California Household Travel Survey. Neighborhood level trip and mode share, and projections for 2040 are from SF-CHAMP.

EXHIBIT 8

moveSmartSF
SAN FRANCISCO
TRANSPORTATION PLAN
2040

San Francisco Transportation Plan Update

SPUR Annie Alley Forum

May 21, 2013

www.sfcta.org/MoveSmartSF
SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

Purpose of the San Francisco Transportation Plan

SAN FRANCISCO TRANSPORTATION PLAN 2040

What is it?

- San Francisco's transportation investment program for all modes, operators to year 2040
- Supporting policies and strategic initiatives
- Funding and implementation strategy

How will it be used?

- Informs **local plans** and investments (Transportation Element Update, SFMTA and CCSF capital plans)
- Guides SF's input to **regional planning** efforts (BART Strategic Plan, 2017 RTP)
  - *Advocating together for San Francisco's fair share*
- Positions SF for future funding opportunities and policy discussions at **state, national** level

New transportation goals and city development objectives

SAN FRANCISCO TRANSPORTATION PLAN 2040

2013 Regional Transportation Plan: new projects

- Blended High Speed Rail/Caltrain Electrification/Transbay/Downtown extension
- BART Metro, Transit Effectiveness Project, SF Pricing Program

SB375, SF Climate Action Strategy

- SF goal: reduce GHGs to 80% below 1990 levels by 2050
- Regional Transportation Plan Update includes a Sustainable Communities Strategy

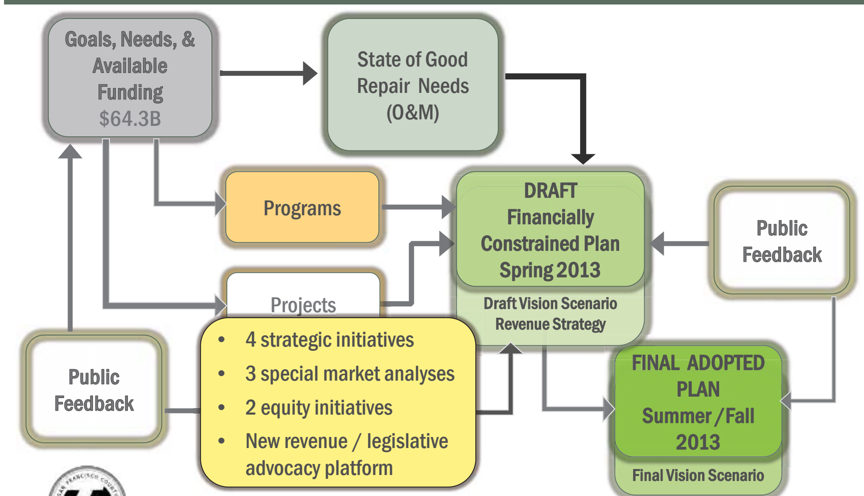
Bicycle and Pedestrian Safety Directives

- BoS: 20% Bicycle Mode Share by 2020
- Mayor's Directive: 50% reduction in pedestrian injuries by 2020

Demand Management to Support Approved Plans

- Bayview Waterfront, Treasure Island, Park Merced Plans
- SFMTA Parking and Shuttle Management policies

Developing the SFTP



SFTP needs assessment framework

Transportation System Performance

- Total trip-making
- Mode share
- Avg Occupancy (PMT/VMT)
- Transit: Auto Travel Time Ratio

Economic Competitiveness

- Congested Streets, Commute times
- Peak: Off-peak Drive Travel Time
- Goods movement needs and visitor access

Healthy Environment

- Vehicle miles traveled
- Greenhouse gas emissions
- Active Transportation (walking & biking) Trips

Livability

- Travel safety
- Transfers/Transit trip
- Non-auto trip shares
- School trip needs

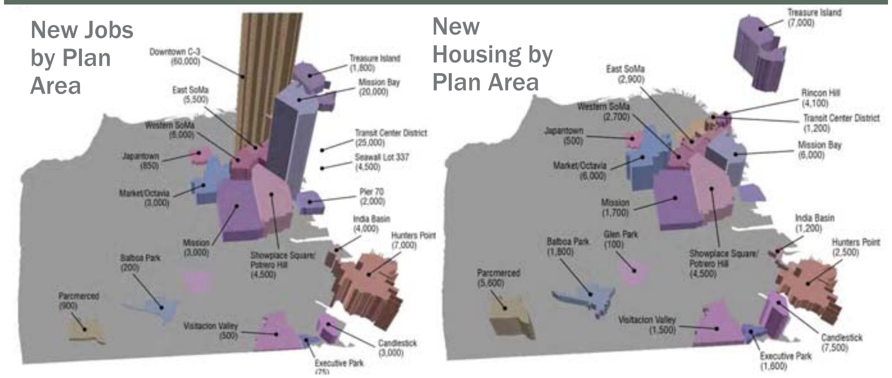
State of Good Repair

- Crowded Transit Lines
- Pavement Condition Index
- Transit Reliability
- Structural Sufficiency

Equity
Public Input

Our growth and transportation challenge

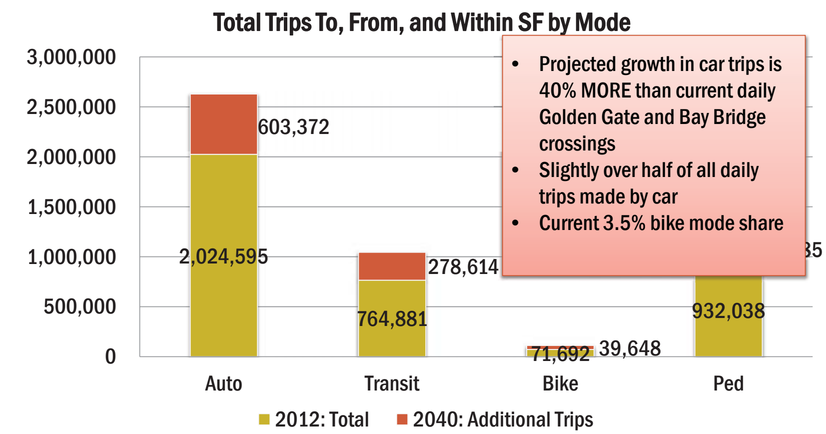
Planned growth through 2040



- 101,000 new households
- 191,000 new workers
- 603,000 more daily car trips (more than the combined daily volume of Bay Bridge and Golden Gate Bridge crossings)

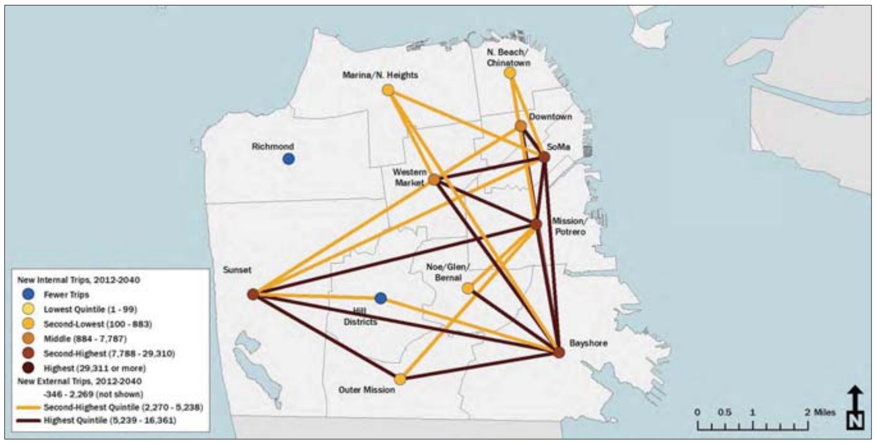
> 5 Million trips to/from/within SF by 2040

33% more trips than today



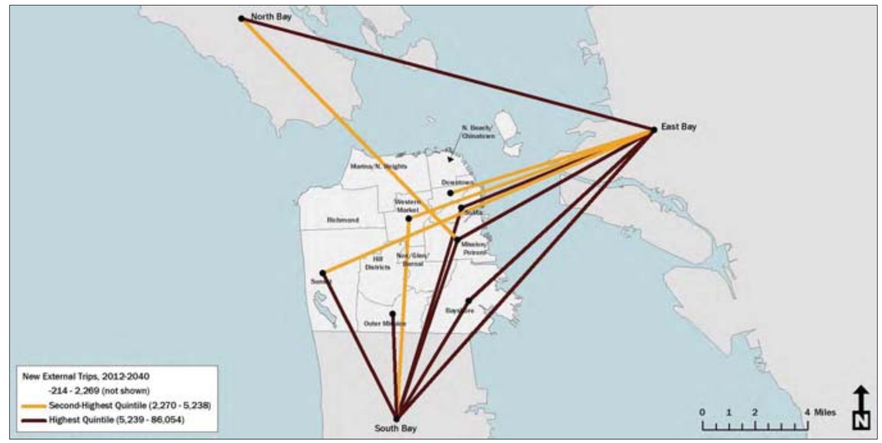
Source: SF-CHAMP 4.3

Change in local auto trips: 2012-40



Source: SF-CHAMP 4.3

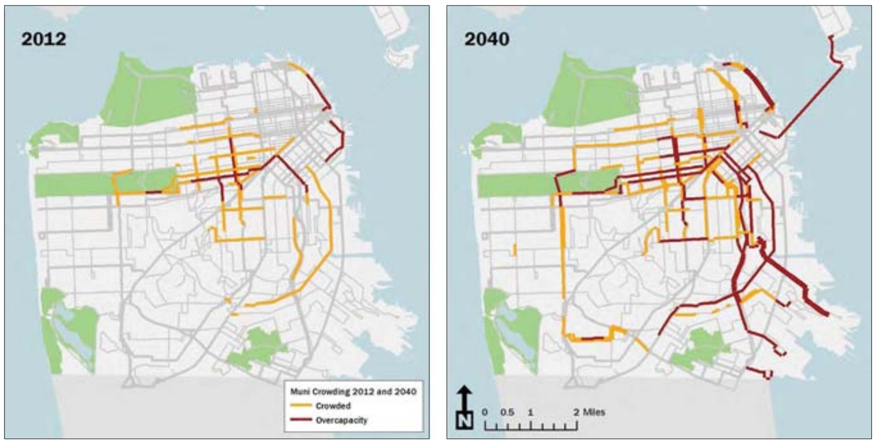
Change in regional auto trips: 2012-40



Source: SF-CHAMP 4.3

Muni crowding
Morning peak hour, 2012 and 2040

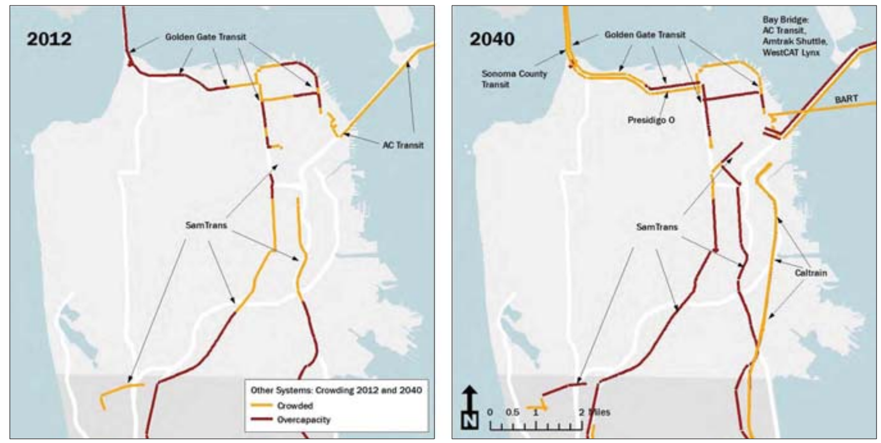
moveSmartSF SAN FRANCISCO TRANSPORTATION PLAN 2040



Source: SF-CHAMP 4.3

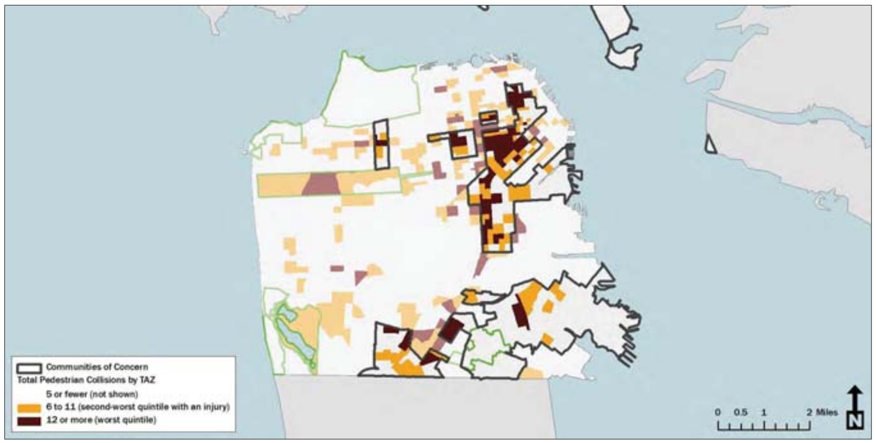
Crowding on regional transit systems | Morning peak hour, 2012 and 2040

moveSmartSF SAN FRANCISCO TRANSPORTATION PLAN 2040



Source: SF-CHAMP 4.3

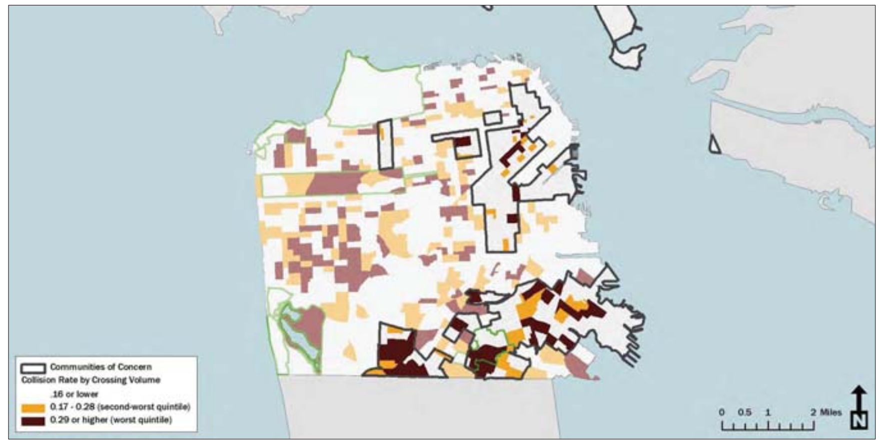
Pedestrian Injuries: Total number of injuries



Sources:
Tract Populations: American Community Survey, 2009
Ped Collisions (2007-11): Statewide Integrated Traffic Reporting System (SWITRS)

Pedestrian Injury Rate

SAN FRANCISCO TRANSPORTATION PLAN 2040

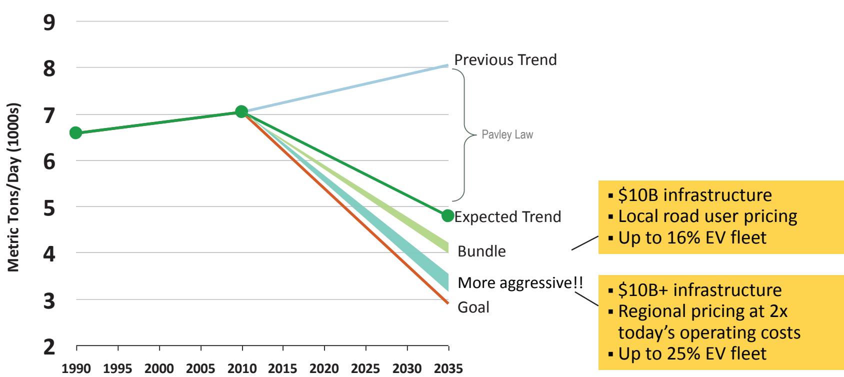


Sources:
Predicted Crossing Volume: San Francisco Pedestrian Volume Model (2011)
Ped Collisions (2007-11): Statewide Integrated Traffic Reporting System (SWITRS)

Example: Healthy Environment Scenario
can only approach goal w/aggressive policy change

San Francisco GHG Emissions Trend vs. Goal

(on-road mobile, weekday)



Source: SF CHAMP 4.1 Draft SCS, SFCTA, 2011

Response to calls for projects: public input

SAN FRANCISCO TRANSPORTATION PLAN 2040

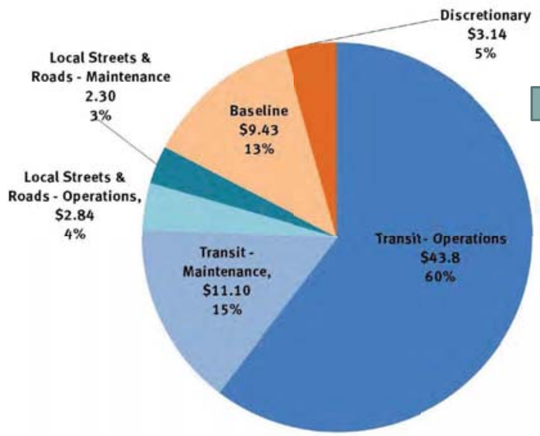
300 submittals from both agencies and the public

- Support for "Fix It First"
- Support for projects to improve transit reliability and provide dedicated right-of-way
- Demand for traffic calming, pedestrian safety and enhancement, and bicycle improvements
- Demand for more frequent transit service (to alleviate crowding)

Draft SFTP Financially Constrained Investment Scenario

SAN FRANCISCO TRANSPORTATION PLAN 2040

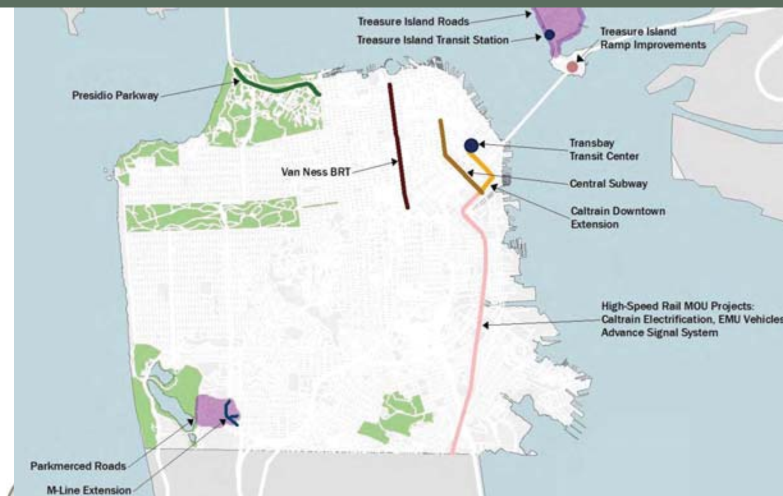
Expected Transportation Revenue for San Francisco, 2012 through 2040, Billions YOE



Total: $72.6Billion

SFTP Baseline Projects

SAN FRANCISCO TRANSPORTATION PLAN 2040



Prioritizing discretionary revenue

SAN FRANCISCO TRANSPORTATION PLAN 2040

How should we prioritize $3.14 billion in uncommitted funds?

State of Good Repair / Operations & Maintenance (O&M)

- Improve transit reliability
- Pavement quality, state and local structures

Transportation enhancements and programs

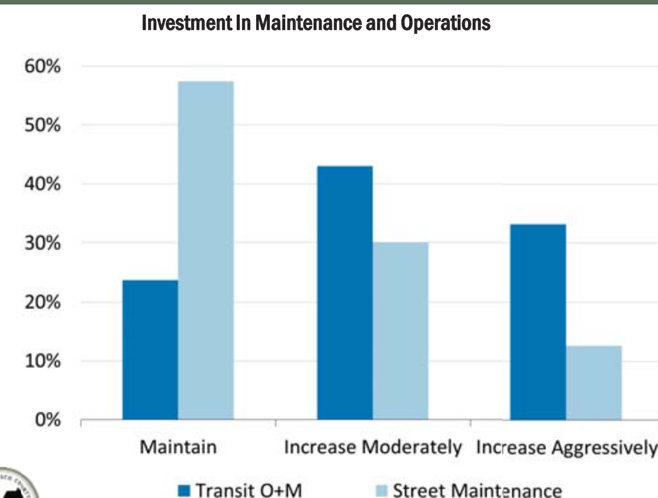
- Pedestrian safety, traffic calming
- Bicycle facilities, Rapid Transit network

Expansion projects

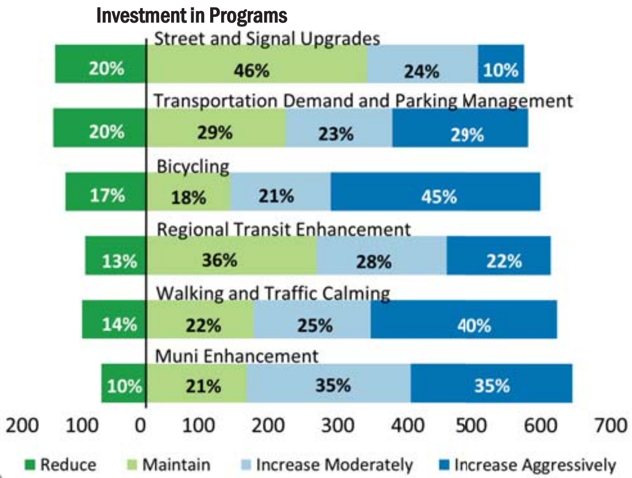
- Relieve crowding; long range strategic rail investments
- Develop freeway management strategies (US101, HWY280)

Desire for increase in transit O&M

SAN FRANCISCO TRANSPORTATION PLAN 2040

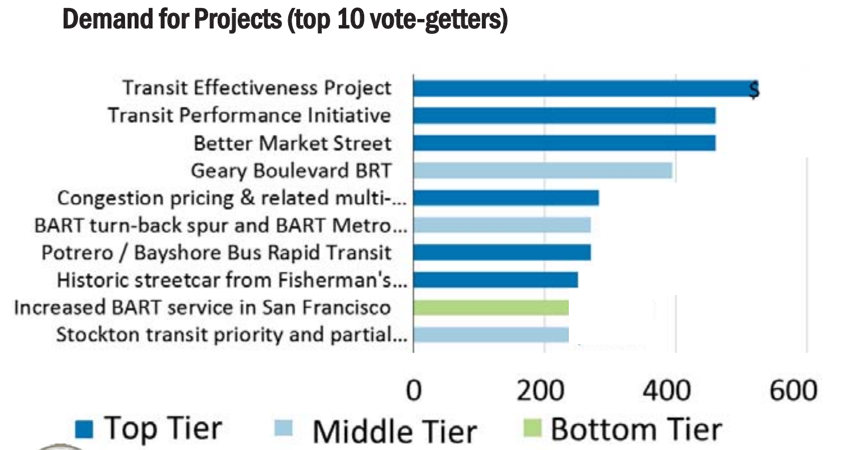


Desire for more investment in walking, cycling, + Muni enhancements



Support for high-performing transit efficiency projects

SAN FRANCISCO TRANSPORTATION PLAN 2040



Project performance evaluation

SAN FRANCISCO TRANSPORTATION PLAN 2040

Nearly 50 projects and programs were evaluated for cost effective contribution to plan goals

BENEFIT SCORE

/

ANNUALIZED COST

CAPITAL COST / PROJECT LIFE + ONE YEAR OF OPERATING COST = ANNUALIZED COST

=

BENEFIT-COST SCORE
BENEFIT SCORE DIVIDED BY ANNUALIZED COST

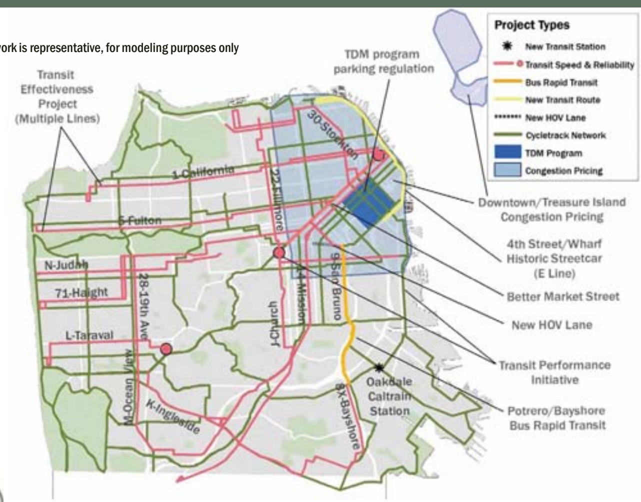
Benefit-cost proxy index – Top tier

SAN FRANCISCO TRANSPORTATION PLAN 2040

Projects with Highest Benefit-Cost Proxy Scores (Listed alphabetically)	Total Cost (cap + op, $YOE)
Better Market Street	$258
Bicycle Program	$252
Congestion Pricing – Cordon and Treasure Island	$119
Historic Streetcar Expansion – E Turnaround	$149
HOV Lane on Central Freeway	$15
New Caltrain Station at Oakdale Avenue	$62
Potrero / Bayshore BRT	$128
Transit Effectiveness Project	$178
Transit Performance Initiative	$400+
Travel Demand Management Program	$73M
Total Cost of Top Tier of Projects	$1,561

Top tier projects

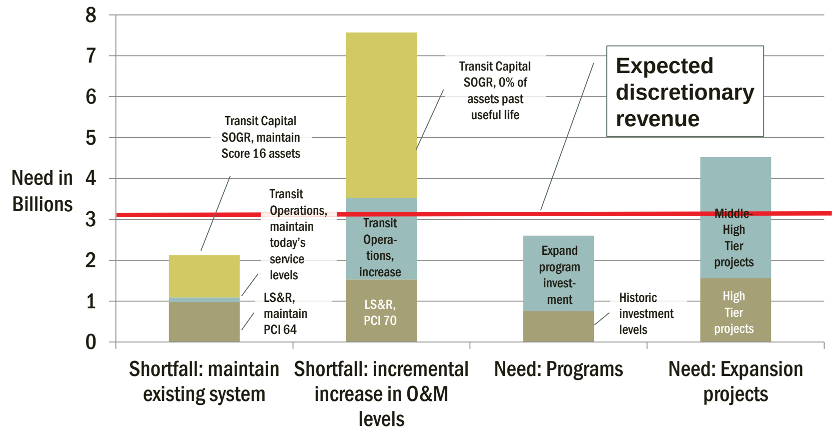
Notes
- Cycletrack network is representative, for modeling purposes only



SF priorities are top RTP performers

	Project	Quantitative B/C ratio	Qualitative (out of 10)
1	BART Metro Program	>60	8.5
2	Treasure Island Congestion Pricing	59	4.0
3	Congestion Pricing Cordon Pilot	45	6.0
4	AC Transit Grant-MacArthur BRT	18	5.5
5	Freeway Performance Initiative	16	4.0
6	ITS Improvements in San Mateo County	16	4.0
7	ITS Improvements in San Clara County	16	4.0
8	Irvington BART Station	12	5.5
9	SFMTA Transit Effectiveness Project	11	7.5
10	Caltrain Electrification + 6 train/hour service	5	7.5
11	BART to San Jose, Phase 2	5	7.0
12	Van Ness Avenue BRT	6	6.5
13	Better Market Street	6	6.0

Needs far exceed expected revenue



Knitting it all together



Investment Scenario Options

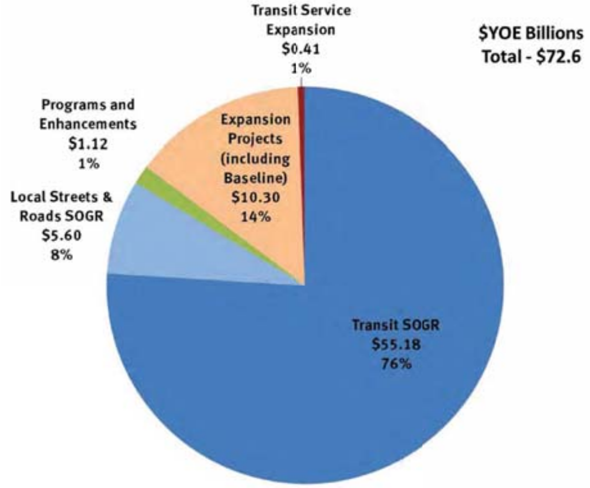
- Complementary choices among investment types (e.g. replacement vehicles, rapid transit network development can increase effective level of transit service)

But also:

- Tradeoffs between and within investment types (e.g. Operations, Maintenance, Programs, Expansion), modes, geographic areas and

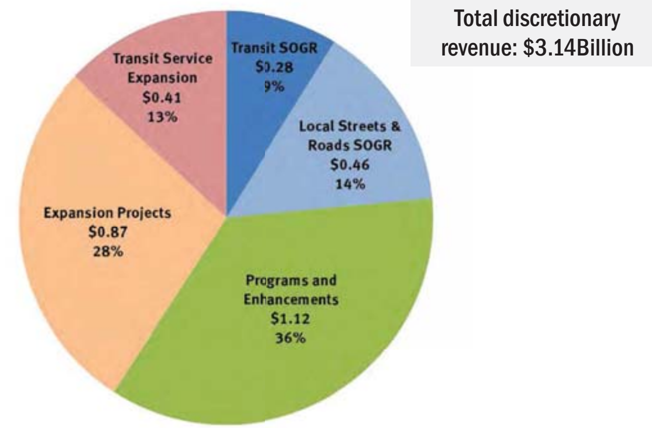
Plan development should consider multiple factors: Need, Performance, Cost-Effectiveness, Public Input , Policy/Plan status, Equity

Draft SFTP Financially Constrained Investment Scenario



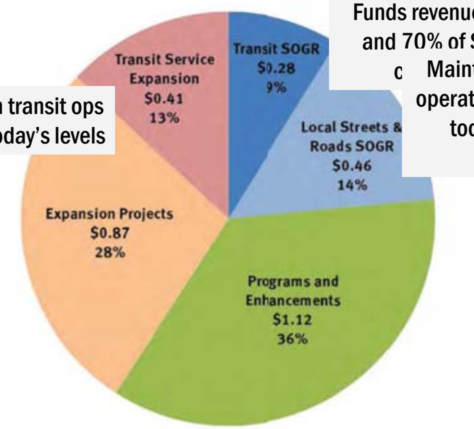
Draft SFTP Financially Constrained Investment Scenario

Discretionary Revenue Investment by Type, YOE Billions



Transit service expansion and SOGR

Discretionary Revenue Investment by Type, YOE Billions



1% increase in transit ops funding over today's levels

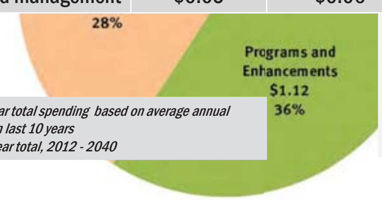
Funds revenue vehicles and 70% of Score 16 c

Maintains current road operations levels, but not today's pavement condition

Programs and enhancements

Discretionary Revenue Investment by Type, YOE Billions

Program	Historic funding level*	Proposed funding level**	% Increase over historic
Complete streets, signals and signs	$0.14	$0.20	43%
Walking and traffic calming	$0.19	$0.28	47%
Bicycling	$0.05	$0.15	200%
Demand management	$0.05	$0.06	20%

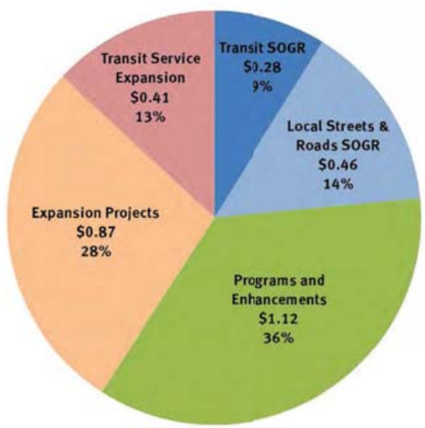


** Estimated 28 year total spending based on average annual funding levels from last 10 years*
*** Proposed 28 year total, 2012 - 2040*

Increased funding for local streets, walking and traffic calming, bicycling, and demand management

Draft SFTP Financially Constrained Investment Scenario

Discretionary Revenue Investment by Type, YOE Billions



Expansion projects inclusion criteria

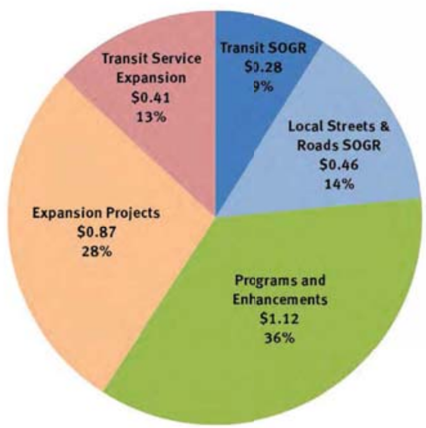
- All projects from "High" cost-effectiveness tier receive funding
- Additional projects from Middle-High Tier included based on:
  - Ability to address equity issues
  - Approval in Prop K Expenditure Plan or City Development Agreement
  - Support for Priority Development Area (PDA) growth

High Tier Projects
Better Market Street
Congestion Pricing
Caltrain Oakdale Station
E-line extension to Caltrain
Freeway Performance Initiative (FPI)
Potrero / Bayshore BRT
Transit Effectiveness Project
Transit Performance Initiative (TPI)
Middle-High Tier Projects
Bayshore intermodal station
Express buses - Hunter's & Candlestick Points
Geary Boulevard BRT
Geneva TPS / BRT
M-line west side alignment

Questions for feedback

- Level of investment by type – are we on the right track?
- How to prioritize within SOGR and Programs?
- How to incorporate equity findings into the investment strategy?

Discretionary Revenue Investment by Type, YOE Billions



Strategic policy initiatives

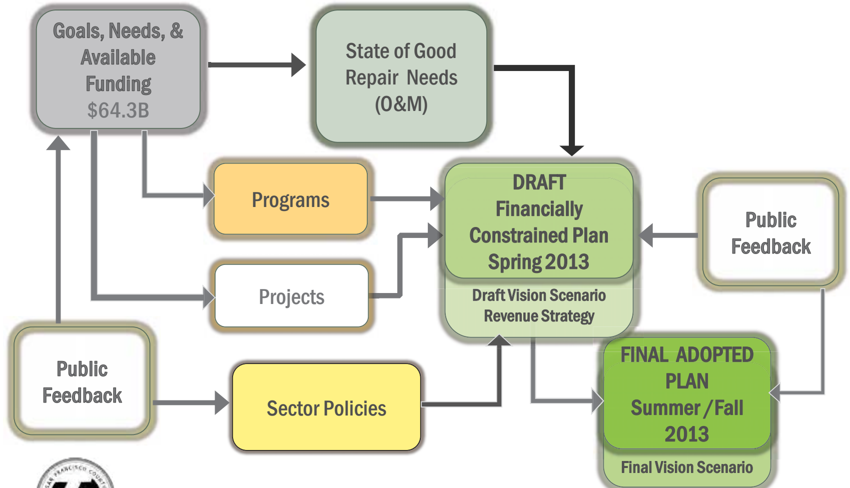
❶ **Complete Streets:** Clarify policies, create a cost-effective complete streets approach

❷ **Next-generation TDM:** Broaden, deepen TDM efforts including new ways to leverage Employer/Community-initiated efforts

❸ **Local-to-regional connection:** Re-imagine freeway, transit interfaces with region

❹ **Project delivery / performance effectiveness:** Improve project and program delivery, leverage private investment

Developing the SFTP



SFTP adoption timeline

Fall 2012 and earlier
- Revenue Estimate
- Investment Needs/Shortfall Analysis
- Public Outreach, Budget Game
- 3 Sub-market analyses

Winter 2012/13
- Project Performance Assessment
- Core Network Circulation Study
- 4 Strategic Initiatives Development

Spring 2013
- Draft SFTP Preferred and Vision Scenarios
- 2 Equity initiatives analysis
- New Revenue Strategy / legislative advocacy platform
- Authority Board Workshop on SFTP, May 30th

Summer 2013
- Public Outreach
- Revised SFTP Preferred and Vision Scenarios
- Final SFTP + Plan Adoption in September/Oct, 2013

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July 24, 2015

Ms Tiffany Bohee
OCII Executive Director
c/o Mr. Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
warriors@sfgov.org

Re: **Hydrology, Water Quality and Biological Impacts** - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

Dear Ms Bohee and Mr. Bollinger:

This office represents the Mission Bay Alliance ("Alliance"), an organization dedicated to preserving the environment in the Mission Bay area of San Francisco, regarding the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("Warriors Arena Project" or "Project"). The Mission Bay Alliance objects to approval of this Project and certification of this EIR for the reasons stated in this letter.

This letter incorporates by reference, as comments on the DSEIR, all of the comments on the DSEIR contained in the July 21, 2015, letter report authored by Matt Hageman (attached as Exhibit 1) and the July 21, 2015, letter report authored by Erik Ringelberg and Kurt Balasek (attached as Exhibit 2).

I. The DSEIR Is Not Sufficient as an Informational Document with Respect to the Project's Wastewater Treatment Infrastructure Impacts.

The DSEIR concedes the Project's cumulative wastewater flow , in combination with other approved projects, will exceed the Mariposa Pump Station's capacity, and therefore, the Project will have a significant and unavoidable impact because it "would require or result in the construction of new wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects." (DSEIR, p. 5.7-13 - 5.7-20 [Impact C-UT-2].) But the DSEIR's disclosure of the nature and severity of the potentially significant impacts of building these new wastewater treatment facilities falls far short of CEQA's requirements.

The DSEIR generally describes the type of new wastewater treatment facilities that might be built, stating:

> the SFPUC anticipates that improvements might include actions such as complete pump station replacement, enlarging or realigning the existing sewer main on Mariposa Street between 3rd Street and the Mariposa Pump Station; upgrading and adding dry weather pumps with potential temporary wet weather pump modifications; upgrading or replacing the dry-weather sump in the pump station; constructing new connections to the transport and storage box structure and rehabilitating the structure; and improving the hydraulic capacity of the downstream gravity sewers, if needed. If a new dry weather pump station is required, it could potentially be constructed within approximately a quarter mile radius of the existing Mariposa Pump Station.

(DSEIR, p. 5.7-14.)

The DSEIR then identifies a number of potentially significant impacts of constructing new wastewater treatment facilities necessitated by the Project, stating:

> These construction activities would be expected to result in temporary increases in truck and construction employee traffic, noise, and air pollutant and greenhouse gas emissions. In addition, depending on the site-specific design and location, the pump station improvements could result in physical effects on cultural resources, biological resources, water quality, and hazardous materials.

(DSEIR, p. 5.7-14.)

The DSEIR then vaguely suggests that these impacts could be mitigated to less than significant levels by adopting "typical" mitigation measures, stating:

> Most, if not all, of these potential impacts can generally be mitigated to a less-than-significant level with typical mitigation measures, similar to those identified in the Initial Study and the SEIR for this project. Long-term operational impacts would likely be less than significant because operation of the pump stations would be similar to existing operations of these facilities.

(DSEIR, p. 5.7-14.)

These vague descriptions fail to discharge the City's legal obligations under CEQA to fully

describe the Project, including its "reasonably foreseeable consequence" of necessitating the construction of additional wastewater treatment facilities, and to include an "analysis of the environmental effects" of this future action and the mitigation measures that may reduce those impacts. (See e.g., *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 396 (*Laurel Heights I*) ["an EIR must include a analysis of the environmental effects of future expansion or other action if: (1) it is a reasonably foreseeable consequence of the initial project; and (2) the future expansion or action will be significant in that it will likely change the scope or nature of the initial project or its environmental effects].)

As shown in both the DSEIR's analysis of mitigation measures and the Mission Bay Alliance's comments on many types of impacts that construction of additional wastewater treatment facilities will cause (e.g., air quality, noise, traffic), the "mitigation measures ... identified in the Initial Study and the SEIR for this project" do not ensure that "impacts can generally be mitigated to a less-than-significant level."

Finally, the DSEIR states:

> In the event that additional future wastewater flows would exceed the pump station capacities before the needed wastewater system improvements could be completed, it is assumed that the SFPUC would make internal operational or piping changes to accommodate the additional flows in the interim in order to remain in compliance with RWQCB permit requirements. The interim system modifications would be subject to the approval of the RWQCB under the terms of the Bayside NPDES permit. Approval by the RWQCB would ensure that water quality of the Bay would be protected during the interim period. Any interim system modifications are assumed to be operational or internal to the existing pump stations and therefore would not result in any physical environmental effects.

This remarkable passage suggests that the City is prepared to approve and allow construction of this Project without ensuring the construction of additional, adequate, sewage treatment capacity required by the Project. This is the opposite of responsible planning. Moreover, the City is apparently poised to take this action based on several unsupported assumptions. First, the DSEIR assumes, without discussion or evidentiary support, that interim modifications will not have a significant effect on the environment.

Second, the DSEIR assumes the Project's wastewater impacts on the Bay will only be "interim" until the SFPUC builds or expands permanent new wastewater treatment facilities; and that in this supposedly "interim" period, the Regional Water Quality Control Board will mitigate any "interim" impacts to less than significant. But there is no evidence to support the assumption the Project's wastewater can be treated to avoid significant adverse effects on Bay water quality before the SFPUC builds or expands permanent wastewater treatment facilities. Nor is there evidence that

Regional Water Quality Control Board regulation during any purported "interim" period would avoid significant adverse effects on Bay water quality. Nor is there any evidence as to how long this purportedly "interim" period will last, or how many other projects that will cumulatively exceed the Mariposa Pump Station's capacity will commence operations during this purportedly "interim" period.

Indeed, this DSEIR's approach represents a total abdication of the City's legal responsibility under CEQA to identify the Project's significant effects, to identify mitigation measures that would substantially reduce those effects, and to adopt all feasible mitigation measures that would substantially reduce those effects. To put it colloquially, punting the problem to the SFPUC or Regional Water Quality Control Board does not pass muster under CEQA.

II. The DSEIR Is Not Sufficient as an Informational Document with Respect to the Project's Contaminated Stormwater Impacts on San Francisco Bay Water Quality or Biological Resources.

In the chapter on the Project's Water Quality impacts, the DSEIR evaluates the impact of Combined Sewage Discharges (CSDs or CSOs) to the Bay that exceed treatment capacity of the Mariposa Pump Station due to the combination of increased storm water flows combined with sewage wastewater flows. The DSEIR uses two thresholds of significance based on the City's NPDES permit, stating:

> ● Wet weather flows to combined sewer system: The impact analysis examines whether project related increases in wastewater flows would contribute to combined sewer discharges during wet weather. The impact is considered less than significant if the increased flows would not increase the frequency of combined sewer discharges above the long-term average specified in the NPDES permit for the SEWPCP, the North Point Wet Weather Facility, and Bayside wet-weather facilities.
>
> ● Effluent discharges from SEWPCP: For the analysis of impacts related to changes in the quality of effluent discharges from the SEWPCP, the analysis considers whether discharges of wastewater to the combined sewer system would cause effluent quality to exceed the discharge limitations of the NPDES permit for the SEWPCP. If not, the impact is considered less than significant.

(DSEIR, p. 5.9-30.)

Thus, for purposes of complying with CEQA's requirement that it identify the Project's significant impacts, the DSEIR makes two unsupported assumptions: (1) that City compliance with its NPDES permits will avoid significant impacts, and (2) that the City will in fact comply with its NPDES permits. The DSEIR must support these assumptions with evidence.

In addition, the first threshold quoted above only looks at "frequency of combined sewer discharges above the long-term average" and ignores increases in quantity and duration of overflows. (See DSEIR, pp. 5.9-34 to 5.9-36.) The DSEIR notes:

> The model analyzed the effects of discharging the average flows from the proposed project in combination with the existing average flows in the drainage area. Under this scenario, the frequency of CSDs would not increase, but the volume of the CSDs would increase from 5.34 to 5.63 million gallons and the duration would increase from 17.2 to 17.3 hours.

(DSEIR, 5.9-35.) The DSEIR finds this impact less than significant because it defines "significance" solely in terms of the *number* of CSD events and compliance with the City's NPDES permit, regardless of the *quantity* of sewage discharged, stating:

> Because average and peak wastewater flows from the project site would not increase the frequency of CSD events from the Mariposa sub-basin and would be consistent with the requirements of the NPDES permit, project level water quality impacts related to contributions to an increase in CSD frequency would be *less than significant.*

(DSEIR, 5.9-35, 36.) The DSEIR makes the same finding for the Project's cumulative impact based on the same evidence and the same rationale. (DSEIR, 5.9-35, 36.)

This is a legal error because the DSEIR cannot merely reference a project's compliance with another agency's regulations. Lead agencies must conduct their own fact-based analysis of project impacts, regardless of whether the project complies with other regulatory standards.[1]

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[1] *See*, e.g., *Californians for Alternatives to Toxics v. Department of Food & Agriculture* (2005) 136 Cal.App.4th 1, 16 (lead agencies must review the site-specific impacts of pesticide applications under their jurisdiction, because "DPR's [Department of Pesticide Regulation] registration does not and cannot account for specific uses of pesticides..., such as the specific chemicals used, their amounts and frequency of use, specific sensitive areas targeted for application, and the like"); *Citizens for Non-Toxic Pest Control v. Department of Food & Agriculture (*1986) 187 Cal.App.3d 1575, 1587-1588 (state agency applying pesticides cannot rely on pesticide registration status to avoid further environmental review under CEQA); *Oro Fino Gold Mining Corporation v. County of El Dorado* (1990) 225 Cal.App.3d 872, 881-882 (rejects contention that project noise level would be insignificant simply by being consistent with general plan standards for the zone in question). *See also City of Antioch v. City Council of the City of Pittsburg* (1986) 187 Cal.App.3d 1325, 1331-1332 (EIR required for construction of road and sewer lines even though these were shown on city's general plan); *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 712-718

The 1998 Mission Bay FSEIR sets the stage for this legal error in its finding that CSO impacts on the Bay are less than significant, stating:

> The same conclusions for the proposed project apply to the cumulative effects of Bayside projects, in that the cumulative increase in pollutant mass load from these projects would have a less-than-significant effect on water quality. As shown in Table V.K.8, the project would represent less than 3% of the increased total pollutant load from the Bayside. The cumulative loads for pollutants would generally increase by 4-6%. Thus, the project would cause approximately half of this cumulative increase for the Bayside. To put this in context, City discharges are a very small portion of the region-wide discharges to the Bay. Compared to municipal dischargers in the Bay Area, the load contribution of the Southeast Plant represents about 12 % of all other municipal dischargers, and the Mission Bay project would represent less than 3 % of that 12% (or 0.36% of all municipal wastewater discharged to the Bay). In addition, besides municipal wastewater, other sources of pollutant loading to San Francisco Bay include riverine inputs, nonurban runoff, urban runoff, point sources, dredging/sediment disposal, spills, and atmospheric deposition. Of these sources, point sources, including municipal dischargers and other permitted industrial dischargers, represent about 1-6 % of the total load input to the Bay-Delta estuary. Regarding stormwater discharges, San Francisco Bayside stormwater flows are about 1.8% of the total regional urban storm flow to the Bay. Considering the contribution of the project and of the cumulative Bayside projects in the context of all the other pollutant inputs to the Bay, the cumulative pollutant loading from Bayside projects would be extremely small.

(1998 MB FSEIR, p. V.K.52.)

This logic reflects the "de minimis" and "ratio" rationales rejected in *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 120 ("*CBE*") ["[T]he relevant question"... is not how the effect of the project at issue compares to the preexisting cumulative effect, but whether "any additional amount" of effect should be considered significant in the context of the existing cumulative effect. [footnote omitted] In the end, the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant. [footnote omitted]"], and *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 720-21 ["They contend in assessing significance the EIR focuses upon the ratio between the project's impacts and the overall problem, contrary to the intent

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(agency erred by "wrongly assum[ing] that, simply because the smokestack emissions would comply with applicable regulations from other agencies regulating air quality, the overall project would not cause significant effects to air quality.").

of CEQA.... We find the analysis used in the EIR and urged by GWF avoids analyzing the severity of the problem and allows the approval of projects which, when taken in isolation, appear insignificant, but when viewed together, appear startling. Under GWF's 'ratio' theory, the greater the overall problem, the less significance a project has in a cumulative impacts analysis. We conclude the standard for a cumulative impacts analysis is defined by the use of the term 'collectively significant' in Guidelines section 15355 and the analysis must assess the collective or combined effect of energy development"].) *Communities* and Kings *County* teach that the significance of a cumulative impact depends on the environmental setting in which it occurs, especially the severity of existing environmental harm.

Therefore, accepting the Hydroconsult numbers at face value, the starting point for assessing whether adding 2.9 million gallons per year[2] of incompletely treated CSD pollution to the existing condition of San Francisco Bay is significant is the existing condition of San Francisco Bay.[3] The DSEIR says very little on the topic. The 1998 Mission Bay FSEIR provides some information, but the DSEIR does not discuss how much of the 1998 Mission Bay FSEIR's information may be outdated as a result of the passage of seventeen years, and is, therefore, unknown.

The 1998 Mission Bay FSEIR characterizes "municipal wastewater" as follows:

> Municipal wastewater is a relatively strong waste stream containing high concentrations of organic matter that will decompose (measured as biochemical oxygen demand because the decomposition requires oxygen), inorganic particulates (measured as total suspended solids), nutrients (measured as total nitrogen and phosphorus), and pathogenic microorganisms. It also contains oil and grease and small quantities of toxic metals, pesticides, solvents, and plasticizers (additives in plastics that maintain softness and pliability). Conventional secondary treatment, as employed by San Francisco at its Southeast Water Pollution Control Plant, greatly reduces the concentrations of most substances in municipal wastewater. On the other hand, dissolved metals and organic substances that are resistant to breakdown by bacteria, may pass through the plant relatively unaltered. This waste stream, after

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[2] 5.63 – 5.34 = 0.29 x 10 = 2.9.

[3] "If the rainstorm is a large one, and the capacity of the storage/transport box sewers is exceeded, treated combined sewer overflows (CSOs) occur at outfalls along the City's shoreline. When combined sewage is temporarily stored in transport/storage structures, floating materials are removed from the water surface and some solids settle to the bottom of the structures. The accumulated solids are then flushed to the treatment plant after the storm has subsided. The treatment that occurs within the structures is approximately equivalent to primary treatment." (1998 MB FSEIR, p. V.K.8-9.)

treatment, is referred to as municipal wastewater effluent in this SEIR.

(1998 MB FSEIR, p. V.K.4.)

The 1998 Mission Bay FSEIR characterizes "urban stormwater " as follows:

> Urban stormwater is a large-volume wastewater stream. Pollutants contained in urban runoff include street litter, sediment (mostly inorganic particulates, measured as total suspended solids), oil and grease, oxygen-demanding substances, pathogenic microorganisms, toxic metals, and pesticides. The concentrations of oxygen-demanding substances, nutrients, and pathogenic microorganisms are much lower than in untreated municipal wastewater. CSOs exhibit a blend of the untreated characteristics of municipal wastewater and urban stormwater runoff.

(1998 MB FSEIR, p. V.K.4.)

The 1998 Mission Bay FSEIR characterizes the "impairment of Central San Francisco Bay" as follows:

> The State Water Resources Control Board (SWRCB) has listed central San Francisco Bay as impaired on the basis of field surveys of the water column, sediments, sediment toxicity, bivalve bioaccumulation, and water toxicity. The determination relates to mercury, copper, selenium, diazinon, and polychlorinated biphenyls (PCBs).
> • Mercury. The main source of mercury in the Bay is erosion and drainage from abandoned gold and mercury mines. Other sources include natural sources, atmospheric deposition, and various industrial and municipal sources.
> • Copper. Copper enters the Bay through municipal sources, stormwater runoff (primarily through automobile brake pad dust), and other nonpoint sources (such as soils and abandoned mines). These are the three main sources, and they contribute roughly equivalent amounts.
> • Selenium. Selenium enters the Bay through industrial point sources (e.g., oil refineries), agriculture, and natural sources. Control programs are in place to address selenium discharges from oil refineries
> • Diazinon. Diazinon is a pesticide that enters the Bay as runoff from agriculture and, to a lesser extent, residential land uses. Diazinon is a primary component of insecticides. Homeowner pesticide use peaks in late spring and early summer.
> • PCBs. Although PCBs are no longer manufactured in the U.S., PCBs previously released to the environment enter the Bay through stormwater runoff and transport through the food chain. PCB levels in fish have resulted in health advisories for fish consumption.

(1998 MB FSEIR, p. V.K.8-9.)

The above information shows the existing environmental harm (or "preexisting cumulative effect" in the words of *Communities, supra*) is severe, and this Project will make it worse. Therefore, the DSEIR's finding that the Project's cumulative CSD impacts on the Bay are less-than-significant is erroneous as a matter of law. It is based on two legal errors: (1) the exclusion of CSD *quantity* from its threshold of significance, which reflects the "de minimis" and "ratio" rationales rejected in *Communities, supra* and *Kings County, supra*; and (2) the DSEIR's reliance on another agency's regulatory standards (i.e., the NPDES permit) to determine significance under CEQA.

As discussed in the attached reports by Matt Hageman and Erik Ringelberg, the Project's CEQA documents (i.e., the 1998 Mission Bay FSEIR, 2014 NOP/IS, and 2015 DSEIR), fail to analyze or develop mitigation measures to reduce the Project's likely contribution of a suite of toxic chemicals, including PCBs, to San Francisco Bay in amounts deleterious to the Bay's biota.

Further, it is impossible to place the discussion of this entire issue (at DSEIR pages 5.9-34 to 5.9-36) in a meaningful context, because the DSEIR does not inform the reader if the discussion assumes construction or expansion of permanent wastewater treatment facilities by the SFPUC.

Also, the DSEIR says: "the [Hydroconsult] model estimated the annual average frequency, volume, and duration of CSDs that would occur once the Mariposa wet- and dry-weather pump stations reach the combined capacity of 11.2 mgd under existing and project conditions. The model estimates that under existing conditions, CSDs from the Mariposa sub-basin occur approximately 10 times per year with an average volume of 5.34 million gallons and duration of 17.2 hours." (DSEIR, p. 5.9-35.) This text implies that the "Hydroconsult" model includes wet-weather flows and wet-weather CSDs. But the only Hydrocunsult memo cited and included in Appendix HYD states:

> Three scenarios were analyzed: base case, project, and cumulative. The base case scenario includes existing conditions plus developments and improvements expected to be substantially complete previous to occupancy of the GSW arena. The project scenario adds the DWF from the arena only and the cumulative scenario adds the project DWF plus DWF from reasonably foreseeable projects in the basin. In all three scenarios, the wet weather flow (stormwater runoff) is assumed to not contribute to the CSS; rather is treated and pumped directly to the Bay. All DWF from the proposed GSW arena is assumed to flow to the Mariposa pump station (MPS), therefore Mariposa is the only basin analyzed.

(DSEIR, Appendix HYD, p.1.) The statement "wet weather flow (stormwater runoff) is assumed to not contribute to the CSS; rather is treated and pumped directly to the Bay" makes sense if it refers only to stormwater from the Mission Bay Redevelopment Area, because all of that stormwater will be separated from wastewater flows when the separate stormwater system for Mission Bay is completed in 2015. (See DSEIR, p. 5.7-4.)[4] But the DSEIR also states that storm water from areas outside Mission Bay will continue to combine with wastewater flows to the Mariposa Pump Station and will contribute to wet weather CSDs. (DSEIR, p. 5.7-7.)[5] If this is correct, then the Hydroconsult dry-weather analysis is beside the point.

Also, the numbers for Mariposa Pump Station capacity and wastewater or stormwater flows are confusing. For example, DSEIR page 5.9-35 says the Mariposa wet- and dry-weather pump stations have a "combined capacity of 11.2 mgd." DSEIR page 5.7-7 also refers to "the combined capacity of the Mariposa pump station and transport/storage structure (11.2 mgd)."[6] But DSEIR page 5.9-34 says: "The potential effect would be greatest in the reconfigured Mariposa sub-basin, which has a *wet weather capacity of 12 mgd* (italics added)." Which is correct?

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[4]"The separate stormwater system for the Mission Bay South Plan area is currently being implemented by the master developer and includes four drainage zones within the geographic boundaries of the reconfigured Central sub-basin that have already been constructed and one drainage zone within the geographic boundaries of the reconfigured Mariposa sub-basin which is currently under construction. Stormwater in each of the drainage zones flows by gravity to one of five stormwater pump stations in the locations shown on **Figure 5.7-2**, including Pump Station SDPS-5 near the east end of 16th Street. When construction of the fifth drainage basin is completed (anticipated in 2015, prior to construction and operation of the proposed project), all stormwater runoff from Mission Bay South will be conveyed through the separate stormwater system and discharged to the Bay and China Basin Channel (Mission Creek)." (DSEIR, p. 5.7-4 (pdf151).)

[5]"The 240-acre reconfigured Mariposa sub-basin of the combined sewer system is divided into two tributary areas that direct flow to the Mariposa Pump Station. Tributary B includes Potrero Hill to the south of Mariposa Street and is outside of the Mission Bay Plan area; this tributary area directs both rainwater and wastewater to the pump station. Tributary A includes areas to the north of Mariposa Street that are located within the Plan area; in this area, stormwater flows are directed to the separate stormwater system constructed for the Mission Bay South development, and only wastewater flows are directed to the Mariposa Pump Station." (DSEIR, p. 5.7-7.)

[6]"In the event that wet weather flows in the Mariposa subbasin exceed the combined capacity of the Mariposa pump station and transport/storage structure (11.2 mgd), the excess flows are discharged to the Bay as a combined sewer discharge after receiving flow-through treatment in the transport and storage structure."

III. The DSEIR Is Not Sufficient as an Informational Document with Respect to Project Impacts on Biological Resources, Including Wetlands and Wildlife.

A. The City's decision to exclude the Project's impacts on biological resources from the DSEIR is erroneous.

The City's decision to exclude the Project's impacts on biological resources from the DSEIR (see DSEIR, p. 5.1-1) is erroneous as a matter of law. Both the NOP/IS and the DSEIR announce that their analyses are "tiered" to the 1998 Mission Bay FSEIR pursuant to CEQA Guideline 15168(c). (IS, p. 23-24; DSEIR, pp. 1-1, 5.1-2, 3.) Both the NOP/IS and the DSEIR also announce that the standards used to exclude resource topics from the DSEIR are the standards used to determine if a subsequent EIR is required under CEQA section 21166 and Guideline section 15162. (See NOP/IS, pp. 23-25; DSEIR, p. 5.1-3.)

Based on these predicates, the City decided to prepare a focused EIR, and to conduct no environmental review with respect to the following resources: Biological Resources, Aesthetics, Land Use Cultural Resources, Paleontological Resources, Geology and Soils, Recreation, Hazardous Materials, and Population and Housing. As discussed in more detail in the July 27, 2015, letter from the Mission Bay Alliance's legal counsel regarding "tiering," the City's assumption that it may prepare an EIR for this Project that tiers to the 1998 Mission Bay FSEIR is legally incorrect. As discussed in several comment letters submitted on behalf of the Mission Bay Alliance, and below regarding the Project's impacts on biological resources, the evidence relating to these excluded resource topics meets both the "fair argument" standard, as well as the CEQA section 21166 standards. Therefore, the City must prepare and recirculate for public review a Revised Draft EIR addressing all of the Project's environmental impacts.

B. There is substantial evidence supporting a fair argument the Project will have a significant adverse effect on biological resources.

While the NOP/IS give short shrift to on-site biological resources, there is substantial evidence, in the NOP/IS and the attached reports from Matt Hageman and Erik Ringelberg, supporting a fair argument the Project may have significant effects on (1) migratory birds; (2) off-site special status species downstream of the Project, including steelhead (Oncorhynchus mykiss); and (3) the on-site wetland and its ecology and associated wildlife.

With respect to migratory birds, the NOP/IS admits that the 1998 Mission Bay FSEIR did not assess the redevelopment Plan's effects on migratory birds. (NOP/IS, p. 81.) In addition, the NOP/IS concedes the Project may have significant impacts on migratory birds because it recommends the adoption of mitigation measures to substantially reduce these impacts, stating: "With implementation Mitigation Measures M-BI-4a, Preconstruction Surveys for Nesting Birds, and M-BI-4b, Bird Safe Building Practices, the project would not result in any new or substantially more severe significant impacts on resident or migratory bird species than those identified in the FSEIR." (NOP/IS, p. 81.)

This approach violates CEQA in a number of ways. First, as discussed above, the Project is a separate project from the 1998 Redevelopment Plan, or at a minimum, is not within the scope of the 1998 Mission Bay FSEIR. This fact precludes the City from "tiering" to the 1998 FSEIR for any resource, including impacts on biological resources such as migratory birds.[7] Second, trying to mitigate significant impacts before assessing their nature and extent puts the cart before the horse.[8] Third, as discussed above, the NOP/IS's concession that the Project may have significant impacts on migratory birds is substantial evidence supporting a fair argument the Project will have a significant adverse effect on migratory birds; therefore, the City is required to include an assessment of these impacts in the DSEIR.[9] Fourth, even if the City's assumption that CEQA section 21166 applies is correct, the addition of a 750,000 square foot sports arena and an additional 160 foot office tower to the Mission Bay Redevelopment Plan are substantial changes in the Redevelopment Plan that give rise to new potentially significant effects on birds that must be analyzed in the subsequent EIR.

With respect to impacts on special status species, the NOP/IS states:

> At the time of preparation of the Mission Bay FSEIR, the project site contained several buildings and facilities and was noted as lacking any notable vegetative habitat, with no state listed threatened, endangered or rare plants, or rare, threatened or endangered animal species known to occur in the upland portion of the Mission Bay plan area, including the project site. Subsequent to that time, the project site has been subject to building removal, grading, excavation, and construction of paved surface parking lots, fencing and utilities on portions of the site. Other than the creation of the depression as a result of remediation actions, no other changes in the site since the preparation of the FSEIR have altered the characteristics of the site in relation to biological habitat. These changes in conditions on the project site have

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[7] *Sierra Nevada Conservation, supra.*

[8] CEQA does not permit an agency to simply adopt mitigation measures in lieu of fully assessing a project's potentially significant environmental impacts because mere acknowledgment that an impact would be significant is inadequate; the EIR must include a detailed analysis of "how adverse" the impact would be. (*Lotus v. Department of Transportation* (2014) 223 Cal.App.4th 645, 655-56; *Galante Vineyards v. Monterey Peninsula Water Management Dist.* (1997) 60 Cal.App.4th 1109, 1123; *Santiago County Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831.)

[9] *Protect the Historic Amador Waterways*, *supra*.

> not altered the fact that the site provides no suitable habitat for any sensitive or special status species due to the sparse and ruderal nature of onsite vegetation, as well as the site's location in a densely urbanized environment, as confirmed through the reconnaissance survey and database review of special status species occurrences within the vicinity of the project site. In addition, there have been no substantial changes with respect to the circumstances under which the project would be undertaken, nor has any new information become available that demonstrates new or more severe impacts associated with the proposed project.

(NOP/IS, pp. 78-79.)

But as Mr Ringelberg points out:

> the potential project impacts to the closest federally designated critical habitat is steelhead Oncorhynchus mykiss are ignored. This habitat runs directly adjacent to the project area. In addition, San Francisco manzanita (Arctostaphytos franciscana) critical habitat is present approximately 2.6 miles to the west and should also have been identified and analyzed. The federal critical habitat analysis is missing, and the provided analysis itself is defective. The potential project's impact(s) to these listed species and their critical habitat are therefore unexamined. The project's dust, stormwater, surface flooding, and groundwater place those species at risk from hazardous chemicals.

(Exhibit 2, p. 11.)

As both Mr. Hageman and Mr. Ringelberg point out, none of the Project's CEQA documents assess the effects of toxic chemical runoff on Bay biota, including steelhead. Where, as here, the lead agency fails to study an area of possible environmental impact, a fair argument may be based on the limited facts in the record because deficiencies in the record may enlarge the scope of fair argument by lending a logical plausibility to a wider range of inferences." (*Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 311.)

Further, there is substantial evidence in the reports from Matt Hageman and Erik Ringelberg supporting a fair argument the Project may have significant effects on steelhead from toxic runoff. Again, even if CEQA section 21166 applies, CEQA requires including this issue in the subsequent EIR. The Phase 11 reports showing the site is contaminated with a suite of toxic compounds is significant new information showing the potential for new significant effects not previously identified.[10]

With respect to potential impacts on the on-site wetland, the NOP/IS indicates the DSEIR will not assess impacts on the wetland even though the 1998 FSEIR did not, and could not have, analyzed the wetland since it was apparently created sometime after 2005. (See Exhibit 2, Figure 1 and accompanying text.)

Typically if there is a potential wetland resource, there would be a formal delineation prior to release of the DEIR so the resource can be analyzed, and appropriate mitigation developed. Here, the NOP/IS claims it may not be jurisdictional (p. 80), and at the same time attempts to suggest mitigation (p. 81) in case it is. But the mitigation suggested is not enforceable, in violation of CEQA. Further, as discussed above, trying to mitigate impacts before assessing their significance puts the cart before the horse. (*Lotus v. Department of Transportation*, *supra*.)[11]

In addition, the NOP/IS' evidentiary basis for dismissing the wetland from the DSEIR is flimsy, stating:

> Because the excavation depressions on the site are small, isolated features resulting from recently completed hazardous materials remediation activities and are surrounded by paved areas and urban development, these features do not provide the important biological habitat functions and values that are typically associated with federally protected wetlands.

(NOP/IS, pp. 78-79.) But as Mr. Ringelberg points out:

> Conversely, and in rebuttal to their prior assertion that there are readily substitutable habitats nearby, small wetland features can have exceptional ecological value, in particular if they are one of the few remaining features in an urban setting.

(Exhibit 2, p. 6.)

Further, there is substantial evidence in the report from Erik Ringelberg supporting a fair argument the Project may have a significant effect by destroying the on-site wetland. Again, even

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[10]See Letter to Marty Glick re: Phase 2 Subsurface Investigation Approval, Golden State Warriors Arena, Blocks 29-32, San Francisco, CA 94158; Phase II Environmental Site Assessment, Golden State Warriors Arena, Blocks 29-32, Mission Bay, San Francisco, California.

[11]Also, the NOP/IS fails to even mention the state wetland policy (WRAPP) under Porter Cologne (fn. 49).

if CEQA section 21166 applies, CEQA requires including this issue in the subsequent EIR because the presence of the wetland is a change in circumstances since certification of the 1998 FSEIR that gives rise to the potential for new significant effects not previously identified.

IV. The DSEIR Is Not Sufficient as an Informational Document with Respect to the Project's Flooding Risk.

Chapter 5.9 of the DSEIR does not examine the potential for Project induced increases in storm water runoff to "contribute considerably" to cumulative risk of flooding. (See DSEIR p. 5.9-9 to 5.9-18.) Chapter 5.7 does not do so either. Instead, it analyzes whether the Project will require construction of new or additional storm drainage capacity. (See DSEIR, pp. 5.7-18, 19 [Impact C-UT-3].) But the question whether the Project will require construction of new facilities is different than the question whether it will cause the impact such new facilities are intended to avoid. (See e.g., Chapters 5.7 and 5.9 regarding CSD impacts, and the discussion of same in section 1 above.)

The DSEIR's analysis of cumulative stormwater (C-UT-3) states that the impact is less than significant because the capacity of the new, separated stormwater system is adequate. (DSEIR, p. 5.7-18.) This section of the DSEIR cites to "BKF, Mission Bay Blocks 29-32 - Stormwater Memorandum, January 6, 2015." (DSEIR, p. 5.7-18, note 20.) This Stormwater Memorandum, in turn, states:

> G. Major Storm Events
> The storm drain system and pump station are designed to handle runoff from a 5-year storm event. During larger events such as a 100-year storm event, runoff is conveyed through the streets to a controlled overflow to the Bay. The overland flow analysis was studied in the "Revised Summary Drainage Study for the South of Channel Watershed for Mission Bay Project", dated December 1, 2000. Based on December 2000 study, overland flow from drainage basin, where the Project is located (i.e., "Drainage Basin B"), currently enters the Bay via an existing overflow near Mission Bay Boulevard North (North Overflow). Overland flow in Project perimeter streets, except 16th Street, is conveyed to this North Overflow. Overland flow in 16th Street is conveyed to overflow located to the south of Project near park P24. Refer to attached Figure D for the location of the overland flow release.
> The Project will be sufficiently flood proofed to prevent 100-year overland flow in perimeter streets from entering below grade structures or inundating utilities and equipment. Flood proofing will include using protective measures to prevent storm runoff from inundating and/or damaging equipment such as furnaces, boilers, air conditioning compressors, air ducts, electrical system components, electrical wiring, dry conduits, electrical and gas meters, utility rooms, septic tanks, control panels, HVAC systems and fuel systems."

(BKF, Mission Bay Blocks 29-32 - Stormwater Memorandum, January 6, 2015, p. 6.)

There are two missing pieces of this analysis. First, the memorandum tells us "The Project will be sufficiently flood proofed to prevent 100-year overland flow in perimeter streets from entering below grade structures or inundating utilities and equipment." This may be good news for the Project itself, but it tells the reader nothing about the extent to which this Project will contribute to increased flood risk to surrounding properties. The DSEIR does not examine the potential for Project induced increases in storm water runoff to "contribute considerably" to cumulative risk of flooding around the Project. (See DSEIR p. 5.9-9 to 5.9-18.) Second, the DSEIR does not describe the "flood proofing" measures that it says will avoid inundating below grade structures of the Project.

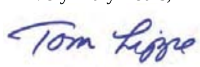
V. The DSEIR Is Not Sufficient as an Informational Document with Respect to Inundation Impacts of the Project.

The DSEIR concedes the Project will be vulnerable to inundation and flooding as a result of a combination of climate change induced sea level rise and storm surge. (DSEIR, pp. 5.9-10-16.) The DSEIR also describes several government initiatives to plan for and protect against such inundation. (DSEIR, p. 5.9-17-18.)

This discussion makes it clear the Mission Bay area, and the Project site in particular, will need to be protected from inundation in the foreseeable future. Therefore, the construction of protective measures is a reasonably foreseeable consequence of Project approval, and the construction of protective measures will change the nature and extent of the Project's environmental impacts. Therefore, the DSEIR must describe these measures and their environmental effects. (Laurel Heights I, supra.)

Thank you for your attention to this matter.

Very Truly Yours,



Thomas N. Lippe

List of Exhibits

Exhibits 1 and 2 are referenced in this letter.
Exhibits 3 through 8 are referenced in Exhibit 1 to this letter.
Exhibits 9 through 13 are referenced in Exhibit 2 to this letter.

1. July 21, 2015, letter report authored by Matt Hageman.

2. July 21, 2015, letter report authored by Erik Ringelberg and Kurt Balasek.

3. San Francisco Bay Regional Water Quality Control Board September 2013 report; San Francisco Bay PCBs TMDL - Implementation at Cleanup Sites; cited at footnote 1, found on page 2; footnote 3, found on page 4; and footnote 10, found on page 5 of Exhibit 1 above.

4. San Francisco Stormwater Design Guidelines, prepared by City of San Francisco, San Francisco Public Utilities Commission and Port of San Francisco, November 2009; footnote 2, found on page 3 of Exhibit 1 above.

5. US EPA Polychlorinated Biphenyls (PCBs) - PCBs in Caulk in Older Buildings, February 21, 2014; footnote 4, found on page 4 of Exhibit 1 above.

6. San Francisco Estuary Partnership, Taking Action for Clean Water, PCBs in Caulk Project, July 22, 2015; footnote 5, found on page 4 of Exhibit 1 above.

7. US EPA Mid-Atlantic Toxic Substances - Polychlorinated Biphenyls (PCBs), PCB Transformers, April 28, 2015; footnote 6, found on page 4 of Exhibit 1 above.

8. US EPA Polychlorinated Biphenyls (PCBs) - Contractors: Handling PCBs in Caulk During Renovation, February 21, 2014; footnote 11, found on page 6 of Exhibit 1 above.

9. California Native Plant Society - CNPS Botanical Survey Guidelines, December 9, 1983, Revised June 2, 2001; footnote 2, found on page 4 of Exhibit 2 above.

10. General Rare Plant Survey Guidelines by Ellen A. Cypher, California State University, Stanislaus, Endangered Species Recovery Program, July 2002; footnote 3, found on page 4 of Exhibit 2 above.

11. State of California, California Natural Resources Agency, Department of Fish and Game - Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities, November 24, 2009; footnote 4, found on page 4 of Exhibit 2 above.

12. State of California, Department of Fish and Game - Forest and Woodlands Alliances and Stands, September 2010; footnote 10, found on page 7 of Exhibit 2 above.

13. US EPA Toxic and Priority Pollutants, May 2, 2014; footnote 11, found on page 8 of Exhibit 2 above.

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EXHIBIT 1

Technical Consultation, Data Analysis and Litigation Support for the Environment

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July 21, 2015

Thomas N. Lippe
The Law Offices of Thomas N. Lippe
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Comments on the Event Center and Mixed-Use Development Project at Mission Bay Blocks 29-32

Dear Mr. Lippe:

We have reviewed the June 5, 2015 Draft Subsequent Environmental Impact Report (DSEIR) for the Event Center and Mixed-Use Development Project ("Project") at Mission Bay Blocks 29-32. GSW Arena LLC (GSW), an affiliate of Golden State Warriors, LLC, which owns and operates the Golden State Warriors National Basketball Association (NBA) team, proposes to construct a multi-purpose event center and a variety of mixed uses, including office, retail, open space and structured parking on an approximately 11-acre site on Blocks 29-32 within the Mission Bay South Redevelopment Plan Area of San Francisco. The proposed event center would host the Golden State Warriors basketball team during the NBA season, and provide a year round venue for a variety of other uses, including concerts, family shows, other sporting events, cultural events, conferences, and conventions.

We have found significant shortcomings in the DSEIR in identifying impacts on Hydrology and Water Quality. A revised DSEIR should be prepared to address these inadequacies and to incorporate mitigation to reduce impacts which otherwise would degrade the water quality of San Francisco Bay.

Hydrology and Water Quality

The DSEIR acknowledges that the San Francisco Bay is impaired under Section 303(d) of the Clean Water Act for chlordane, DDT, dieldrin, dioxins, furan compounds, mercury, polychlorinated biphenyls (PCBs), invasive species, and trash (p. 5.9-22). Of these, PCBs are of the greatest concern for Project water quality impacts. A total maximum daily load (TMDL), limiting PCB discharges, has been issued by the San Francisco Bay Regional Water Quality Control Board (RWQCB) for PCBs in San Francisco Bay and it is proving very difficult and very costly for Bay Area cities, who are responsible for limiting PCB discharges,

to meet. According to the RWQCB, Bay Area municipalities will spend millions of dollars to achieve the ten-fold reduction in PCBs required by the TMDL.[1]

The DSEIR utterly fails to evaluate how Project construction may result in discharge of PCBs to San Francisco Bay, leading to further impairment. Failure to conduct this analysis flies in the face of the TMDL mandate which requires reduction of PCB discharge to the Bay and ignores guidance issued by the San Francisco Bay Regional Water Quality Control Board (RWQCB) on reducing PCB discharges at sites that require cleanup and where buildings that likely contain PCBs in construction materials will be torn down.

The Project poses significant threats to water quality of San Francisco Bay from the release of PCBs upon construction from two sources: (1) contamination in soil at sites that will undergo cleanup; and (2) PCBs used in former building materials at the Project site.

Contaminated Sites Pose Potential PCB Impacts

The DSEIR fails to acknowledge the PCB-contamination threat posed from numerous sites that will require cleanup prior to Project construction. The Initial Study (IS), in summarizing information in the Mission Bay SEIR, stated that land uses at Blocks 29-32 included crude oil storage, offices, railroad tracks, trucking-related activities, maintenance and repair facilities, junk yard, stock corral, a gravel plant, bus company facility, equipment rental, storage yard, auto body shop, and a warehouse (p. 108). No evaluation of these sites for PCB-containing equipment was included in the DSEIR and no analysis of any spills that would have originated from such equipment was conducted.

The RWQCB has identified PCBs originating from sites undergoing cleanup on the margins of San Francisco Bay are a major threat to water achieving the TMDL, stating:

> Stormwater runoff from sites containing residual PCBs in soils after state and federal ordered cleanups contribute to PCB sediment concentrations in the Bay and such contributions must be essentially eliminated in order to achieve the TMDL target. For cleanup sites, the TMDL calls for implementing "on-land source control measures, to ensure that on-land sources of PCBs do not further contaminate in-Bay sediments."

The IS acknowledges the potential threats that contaminants pose during Project development, stating:

> The Mission Bay FSEIR discussed various types of construction activities, including excavation, grading, trenching, soil movement/transport, pile installation, building demolition and removal of underground storage tanks that would potentially expose workers and the public to contaminated soils, dust, soil gases and other hazards. The Mission Bay FSEIR also noted the potential for construction dust-related effects on the aquatic and terrestrial environment.

However, the Mission Bay FSEIR pre-dates the issuance of the RWQCB TMDL for PCBs in San Francisco Bay and mitigation in the Mission Bay FSEIR make no provisions for ensuring that PCBs are not mobilized and transported to the Bay during Project construction. As stated by the RWQCB:

[1]San Francisco Bay Regional Water Quality Control Board, September 2013, San Francisco Bay PCBs TMDL Implementation at Cleanup Sites: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/SF%20Bay%20PCBs%20TMDL%20-%20Considerations%20for%20Cleanup%20Sites%20September%205%202013.pdf, p. 1

> Of particular concern, and often overlooked, is the fact that PCBs in surface soil can be mobilized by stormwater runoff and flow to the Bay.

The RWQCB's concerns are justified by the failure of the DSEIR in identifying how Project construction might contribute to the PCB impairment of San Francisco Bay. The DSEIR, in ignoring this issue, provides no PCB-specific mitigation to prevent the flow of PCBs to the Bay upon construction. Mitigation identified in the Mission Bay FSEIR specified only minimum parameters to be included in a Risk Management Plan for the addressing contaminated soils and groundwater prior to and during construction of individual development projects.

PCBs, when spilled and released to soil, stick strongly to the soil particles that is entrained with stormwater when mobilized during rain events and which leads to PCB deposition in the Bay. The DSEIR offers no mitigation to address this likelihood, and only provides tepid assurance that stormwater will be managed consistent with "San Francisco Stormwater Design Guidelines" (p. 5.9-25). The cited San Francisco Stormwater Design Guidelines makes no special provisions for PCB contamination other than to say:

> Control of PCBs and mercury will be implemented through design measures that limit the mobilization of these pollutants in contaminated soils.[2]

The San Francisco Stormwater Design Guidelines make no further statements about what the PCB design measures would entail and how specifically PCB discharge in stormwater will be limited. The San Francisco Stormwater Design Guidelines are mute on the urgency that faces San Francisco in preventing PCB discharges, in stark contrast to the language use by the RWQCB in issuing the following edict in eliminating all PCB discharges from cleanup sites:

> … it is important that cleanup sites do not contribute any PCBs to surface water runoff. Remedial actions should be conducted so as to eliminate all means of conveyance of PCBs from cleanup sites, including sediment runoff, vehicular drag out, and airborne dust.

Because the issue of PCBs is not specifically addressed, the DSEIR offers an inadequate basis for making the following statement on stormwater contamination:

> Implementation of BMPs and other stormwater control measures required by the updated Phase II General MS4 NPDES Permit; Article 4.2 of the San Francisco Public Works Code, Section 147; and the City's Stormwater Design Guidelines would ensure that the project does not contribute to an increase in discharge of stormwater pollutants to the Bay in discharges from the separate stormwater system. Therefore, impacts related to degradation of water quality and providing an additional source of stormwater pollutants are less than significant in relation to direct stormwater discharges.

Without mitigation and specific measures to address PCB contamination in the Project area, the impacts from Project construction on the already impaired San Francisco Bay may be significant. The DSEIR should acknowledge the PCB contamination potential and offer concrete mitigation to address the

[2] San Francisco Stormwater Design Guideline, September 2009
http://www.sfwater.org/Modules/ShowDocument.aspx?documentID=2779, p. 14

stormwater transport of PCB-contaminated soils to the Bay. Concrete steps to incorporate, as mitigation in a revised DSEIR and prior to Project construction, include:

- A thorough parcel-by-parcel review of the potential use of PCB-containing equipment;
- Site inspections of each parcel which used electrical equipment and sampling of soil where PCB-containing equipment is identified; and
- Cleanup of PCB-impacted soil at concentrations that exceed 25 ug/kg, consistent with RWQCB guidance.[3]

PCBs in Originating from former land uses at the Project Site have not been Adequately Evaluated

Polychlorinated biphenyls (PCB) contamination originating from materials used in building construction is receiving intense scrutiny from regulatory agencies. The U.S. EPA has acknowledged that demolition of 1950s- to 1970s-era buildings, or cleanup of those sites, may disturb PCB-containing materials used in caulking and as a plasticizer in paints and other coatings.[4] In fact, a recent report has found that PCBs are prevalent in the caulk in Bay Area buildings constructed from 1950 to 1980. PCBs were detected in 88% of the caulk samples tested; 40% of the samples contained greater than 50 ppm PCBs and 20% contained greater than 10,000 ppm PCBs.[5] PCBs were used in electrical transformers manufactured between 1929 and 1977 and are a well-recognized source of soil contamination when fluid is leaked.[6]

According to the US EPA[7]:

> PCBs do not break down in our environment and can have severe health effects on humans. PCBs in the air eventually return to our land and water by settling or from runoff in snow and rain. In our water, PCBs build up in fish and can reach levels hundreds of thousands of times higher than the levels in water. Fish consumption advisories are in effect for PCBs in all five of the Great Lakes. PCBs are the leading chemical risk from fish consumption.

Because PCBs do not break down, PCBs may be present at the Project site from former land uses which include:[8]

- Bulk fuel storage and distribution (approximately 1902 to 1966).
- Railroad operations (approximately 1904 to 1939).
- A machine shop (approximately 1904 to 1927).
- A boiler house (approximately 1904 to 1927).
- Steel mill (approximately 1906 to 1928).
- Well casing manufacturer (1907 to 1975).

[3] San Francisco Bay Regional Water Quality Control Board, September 2013, San Francisco Bay PCBs TMDL Implementation at Cleanup Sites:
http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/SF%20Bay%20PCBs%20TMDL%20-%20Considerations%20for%20Cleanup%20Sites%20September%205%202013.pdf, p. 2
[4] US EPA, PCBs in Caulk in Older Buildings: http://www.epa.gov/pcbsincaulk/
[5] San Francisco Estuary Project, PCBs in Caulk Project: http://www.sfestuary.org/taking-action-for-clean-water-pcbs-in-caulk-project/
[6] US EPA, Polychlorinated Biphenyls (PCBs) http://www.epa.gov/reg3wcmd/ts_pcbs.htm
[7] Ibid.
[8] Letter from the San Francisco Department of Public Health to Golden State Warriors Arena, June 8, 2015, p. 2

- Warehousing, shipping, and receiving operations for a variety of products including agricultural chemicals, lumber, food, automobiles, metals, etc. (approximately 1910 to 2006).
- A fruit cannery (approximately 1935 to 1961).
- Junk yards, vehicle parking, and vehicle maintenance facilities (approximately 1950 to 2004).
- Ready-mix concrete facilities (approximately 1972 to 2010).

Of these uses, the 1950s-1980 land uses, which include well casing manufacturing, warehousing, a cannery, junk yards, and concrete manufacturing, could have been operated out of building that were constructed with PCB-containing materials and which were supplied with power by PCB-containing transformers. If PCB-containing building materials, such as caulking or paint, were weathered and disposed in soils adjacent to the former buildings, the could remain at concentrations that would serve as a source for contamination of San Francisco Bay, upon erosion by wind or stormwater.

In fact, a limited study conducted in January 2015 did detect PCBs in soil at the Project site. In this study, which took soil samples from only seven locations at the 10.9-acre site, PCBs were detected at 0.016 mg/kg or 16 ug/kg in one sample of the seven locations.[9] Although this is less than the 25 ug/kg RWQCB cleanup requirement, it is 16 times greater than the target PCB sediment concentration of 1 ug/kg in San Francisco Bay.[10] Given that the Project site is located less than 500 feet from the Bay, construction activities that disturb soil pose a significant potential for documented PCBs at the Project site to be transported to the Bay.

I have found no analysis of PCBs used in the building materials of the previously existing structures at the site in the DSEIR or in the Mission Bay FSEIR or how PCBs, documented in soil at the Project site, may be mobilized by construction or by cleanup of contaminated sites, and transported to the Bay. The RWQCB has offered guidance on how to test for materials that may contain PCBs and how to evaluate sites undergoing cleanup on the Bay margin, guidance which was not mentioned in the DSEIR.

The failure to thoroughly analyze the presence of PCBs in the Project area and how Project construction activities would potentially mobilize the PCBs, leading to further impairment of San Francisco Bay, is a significant oversight which ignores a regulatory mandate for construction projects on the Bay margin to evaluate PCBs. A DSEIR should be prepared to include the results of a full evaluation of the potential of former Project site buildings to contain PCBs. A soil sampling study should be targeted to areas where PCBs may have been released or spilled. To ensure the adequacy of the PCB investigation, the study should be conducted under the oversight of the San Francisco Bay Regional Water Quality Control Board which should be engaged, specifically on the issue of potential PCB contamination to originate from Project construction.

The revised DSEIR should identify mitigation that would be necessary to protect PCB-containing materials from being mobilized though stormwater transport and aerial deposition to San Francisco Bay. The revised DSEIR should also include measures to protect construction workers and the health of adjacent residents who may be exposed to PCB-containing dust during demolition or renovation

[9] Letter from the San Francisco Department of Public Health to Golden State Warriors Arena, June 8, 2015, p. 9
[10] San Francisco Bay Regional Water Quality Control Board, September 2013, San Francisco Bay PCBs TMDL Implementation at Cleanup Sites: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/SF%20Bay%20PCBs%20TMDL%20-%20Considerations%20for%20Cleanup%20Sites%20September%205%202013.pdf, p. 1

activities. The DSEIR should also identify proper disposal practices that are compliant with 40 CFR § 761.62 of the Toxic Substances Control Act. Under this provision, PCB bulk product waste must be disposed in a permitted solid waste landfill or through regulatory approval of risk-based process.[11]

Other Contaminants Pose Risks to the Bay

Recent sampling[12] at the Project site has detected soil contaminants, in addition to the PCB contamination noted above, that include:

[11] US EPA, Contractors: Handling PCBs in Caulk During Renovation: http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/caulkcontractors.htm
[12] Letter from the San Francisco Department of Public Health to Golden State Warriors Arena, June 8, 2015, pp. 8-10

- 1.2.4-Trimethylbenzene
- Acetone
- Carbon disulfide
- Ethylbenzene
- 2-Butanone
- Xylenes
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(k.)fluoranthene
- Chrysene
- Dibenz(a,h)anthracene
- Fluoranthene
- Fluorene
- Indeno(l,2,3-c,d)pyrene
- Naphthalene
- Phenanthrene
- Pyrene
- Antimony
- Barium
- Beryllium
- Cadmium
- Cobalt
- Copper
- Mercury
- Molybdenum
- Silver
- Vanadium
- Zinc

Of these compounds, mercury is identified in the DSEIR as an impairment in San Francisco Bay under Section 303(d) of the Clean Water Act (p. 5.9-22). Mercury, along with the other contaminants listed above, may sorb tightly to soil and be mobilized and transported to the Bay when eroded by stormwater, further degrading water quality.

No specific provisions to manage these contaminants to prevent discharge to the Bay are included in the DSEIR. The DSEIR provides only vague assurance that stormwater will be managed consistent with "San Francisco Stormwater Design Guidelines" which do mention mercury (along with PCBs, as noted above) but offer no specific mitigation to manage these contaminants (p. 5.9-25).

A revised DSEIR should be prepared to identify specific stormwater best management practices (BMPs) to prevent the discharge of contaminated sediment during rain events. The BMPs should be tailored to the each of the contaminants documented in soil at the Project site to prevent discharge and should include consideration of the use of sorbent or flocculent materials, retention basins, berms, silt fences, and bales.

Sincerely,

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Geologic and Hydrogeologic Characterization
Industrial Stormwater Compliance
Investigation and Remediation Strategies
Litigation Support and Testifying Expert
CEQA Review

Education:

M.S. Degree, Geology, California State University Los Angeles, Los Angeles, CA, 1984.
B.A. Degree, Geology, Humboldt State University, Arcata, CA, 1982.

Professional Certifications:

California Professional Geologist
California Certified Hydrogeologist
Qualified SWPPP Developer and Practitioner

Professional Experience:

Matt has 25 years of experience in environmental policy, assessment and remediation. He spent nine years with the U.S. EPA in the RCRA and Superfund programs and served as EPA's Senior Science Policy Advisor in the Western Regional Office where he identified emerging threats to groundwater from perchlorate and MTBE. While with EPA, Matt also served as a Senior Hydrogeologist in the oversight of the assessment of seven major military facilities undergoing base closure. He led numerous enforcement actions under provisions of the Resource Conservation and Recovery Act (RCRA) while also working with permit holders to improve hydrogeologic characterization and water quality monitoring.

Matt has worked closely with U.S. EPA legal counsel and the technical staff of several states in the application and enforcement of RCRA, Safe Drinking Water Act and Clean Water Act regulations. Matt has trained the technical staff in the States of California, Hawaii, Nevada, Arizona and the Territory of Guam in the conduct of investigations, groundwater fundamentals, and sampling techniques.

Positions Matt has held include:

- Founding Partner, Soil/Water/Air Protection Enterprise (SWAPE) (2003 – present);
- Geology Instructor, Golden West College, 2010 – 2104;
- Senior Environmental Analyst, Komex H2O Science, Inc. (2000 -- 2003);

- Executive Director, Orange Coast Watch (2001 – 2004);
- Senior Science Policy Advisor and Hydrogeologist, U.S. Environmental Protection Agency (1989–1998);
- Hydrogeologist, National Park Service, Water Resources Division (1998 – 2000);
- Adjunct Faculty Member, San Francisco State University, Department of Geosciences (1993 – 1998);
- Instructor, College of Marin, Department of Science (1990 – 1995);
- Geologist, U.S. Forest Service (1986 – 1998); and
- Geologist, Dames & Moore (1984 – 1986).

Senior Regulatory and Litigation Support Analyst:

With SWAPE, Matt's responsibilities have included:

- Lead analyst and testifying expert in the review of over 100 environmental impact reports since 2003 under CEQA that identify significant issues with regard to hazardous waste, water resources, water quality, air quality, Valley Fever, greenhouse gas emissions, and geologic hazards. Make recommendations for additional mitigation measures to lead agencies at the local and county level to include additional characterization of health risks and implementation of protective measures to reduce worker exposure to hazards from toxins and Valley Fever.
- Stormwater analysis, sampling and best management practice evaluation at industrial facilities.
- Manager of a project to provide technical assistance to a community adjacent to a former Naval shipyard under a grant from the U.S. EPA.
- Technical assistance and litigation support for vapor intrusion concerns.
- Lead analyst and testifying expert in the review of environmental issues in license applications for large solar power plants before the California Energy Commission.
- Manager of a project to evaluate numerous formerly used military sites in the western U.S.
- Manager of a comprehensive evaluation of potential sources of perchlorate contamination in Southern California drinking water wells.
- Manager and designated expert for litigation support under provisions of Proposition 65 in the review of releases of gasoline to sources drinking water at major refineries and hundreds of gas stations throughout California.
- Expert witness on two cases involving MTBE litigation.
- Expert witness and litigation support on the impact of air toxins and hazards at a school.
- Expert witness in litigation at a former plywood plant.

With Komex H2O Science Inc., Matt's duties included the following:

- Senior author of a report on the extent of perchlorate contamination that was used in testimony by the former U.S. EPA Administrator and General Counsel.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of MTBE use, research, and regulation.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of perchlorate use, research, and regulation.
- Senior researcher in a study that estimates nationwide costs for MTBE remediation and drinking water treatment, results of which were published in newspapers nationwide and in testimony against provisions of an energy bill that would limit liability for oil companies.
- Research to support litigation to restore drinking water supplies that have been contaminated by MTBE in California and New York.

- Expert witness testimony in a case of oil production-related contamination in Mississippi.
- Lead author for a multi-volume remedial investigation report for an operating school in Los Angeles that met strict regulatory requirements and rigorous deadlines.

- Development of strategic approaches for cleanup of contaminated sites in consultation with clients and regulators.

Executive Director:
As Executive Director with Orange Coast Watch, Matt led efforts to restore water quality at Orange County beaches from multiple sources of contamination including urban runoff and the discharge of wastewater. In reporting to a Board of Directors that included representatives from leading Orange County universities and businesses, Matt prepared issue papers in the areas of treatment and disinfection of wastewater and control of the discharge of grease to sewer systems. Matt actively participated in the development of countywide water quality permits for the control of urban runoff and permits for the discharge of wastewater. Matt worked with other nonprofits to protect and restore water quality, including Surfrider, Natural Resources Defense Council and Orange County CoastKeeper as well as with business institutions including the Orange County Business Council.

Hydrogeology:
As a Senior Hydrogeologist with the U.S. Environmental Protection Agency, Matt led investigations to characterize and cleanup closing military bases, including Mare Island Naval Shipyard, Hunters Point Naval Shipyard, Treasure Island Naval Station, Alameda Naval Station, Moffett Field, Mather Army Airfield, and Sacramento Army Depot. Specific activities were as follows:

- Led efforts to model groundwater flow and contaminant transport, ensured adequacy of monitoring networks, and assessed cleanup alternatives for contaminated sediment, soil, and groundwater.
- Initiated a regional program for evaluation of groundwater sampling practices and laboratory analysis at military bases.
- Identified emerging issues, wrote technical guidance, and assisted in policy and regulation development through work on four national U.S. EPA workgroups, including the Superfund Groundwater Technical Forum and the Federal Facilities Forum.

At the request of the State of Hawaii, Matt developed a methodology to determine the vulnerability of groundwater to contamination on the islands of Maui and Oahu. He used analytical models and a GIS to show zones of vulnerability, and the results were adopted and published by the State of Hawaii and County of Maui.

As a hydrogeologist with the EPA Groundwater Protection Section, Matt worked with provisions of the Safe Drinking Water Act and NEPA to prevent drinking water contamination. Specific activities included the following:

- Received an EPA Bronze Medal for his contribution to the development of national guidance for the protection of drinking water.
- Managed the Sole Source Aquifer Program and protected the drinking water of two communities through designation under the Safe Drinking Water Act. He prepared geologic reports, conducted public hearings, and responded to public comments from residents who were very concerned about the impact of designation.

- Reviewed a number of Environmental Impact Statements for planned major developments, including large hazardous and solid waste disposal facilities, mine reclamation, and water transfer.

Matt served as a hydrogeologist with the RCRA Hazardous Waste program. Duties were as follows:

- Supervised the hydrogeologic investigation of hazardous waste sites to determine compliance with Subtitle C requirements.
- Reviewed and wrote "part B" permits for the disposal of hazardous waste.
- Conducted RCRA Corrective Action investigations of waste sites and led inspections that formed the basis for significant enforcement actions that were developed in close coordination with U.S. EPA legal counsel.
- Wrote contract specifications and supervised contractor's investigations of waste sites.

With the National Park Service, Matt directed service-wide investigations of contaminant sources to prevent degradation of water quality, including the following tasks:

- Applied pertinent laws and regulations including CERCLA, RCRA, NEPA, NRDA, and the Clean Water Act to control military, mining, and landfill contaminants.
- Conducted watershed-scale investigations of contaminants at parks, including Yellowstone and Olympic National Park.
- Identified high-levels of perchlorate in soil adjacent to a national park in New Mexico and advised park superintendent on appropriate response actions under CERCLA.
- Served as a Park Service representative on the Interagency Perchlorate Steering Committee, a national workgroup.
- Developed a program to conduct environmental compliance audits of all National Parks while serving on a national workgroup.
- Co-authored two papers on the potential for water contamination from the operation of personal watercraft and snowmobiles, these papers serving as the basis for the development of nation-wide policy on the use of these vehicles in National Parks.
- Contributed to the Federal Multi-Agency Source Water Agreement under the Clean Water Action Plan.

Policy:
Served senior management as the Senior Science Policy Advisor with the U.S. Environmental Protection Agency, Region 9. Activities included the following:

- Advised the Regional Administrator and senior management on emerging issues such as the potential for the gasoline additive MTBE and ammonium perchlorate to contaminate drinking water supplies.
- Shaped EPA's national response to these threats by serving on workgroups and by contributing to guidance, including the Office of Research and Development publication, Oxygenates in Water: Critical Information and Research Needs.
- Improved the technical training of EPA's scientific and engineering staff.
- Earned an EPA Bronze Medal for representing the region's 300 scientists and engineers in negotiations with the Administrator and senior management to better integrate scientific principles into the policy-making process.
- Established national protocol for the peer review of scientific documents.

Geology:

With the U.S. Forest Service, Matt led investigations to determine hillslope stability of areas proposed for timber harvest in the central Oregon Coast Range. Specific activities were as follows:

- Mapped geology in the field, and used aerial photographic interpretation and mathematical models to determine slope stability.
- Coordinated his research with community members who were concerned with natural resource protection.
- Characterized the geology of an aquifer that serves as the sole source of drinking water for the city of Medford, Oregon.

As a consultant with Dames and Moore, Matt led geologic investigations of two contaminated sites (later listed on the Superfund NPL) in the Portland, Oregon, area and a large hazardous waste site in eastern Oregon. Duties included the following:

- Supervised year-long effort for soil and groundwater sampling.
- Conducted aquifer tests.
- Investigated active faults beneath sites proposed for hazardous waste disposal.

Teaching:

From 1990 to 1998, Matt taught at least one course per semester at the community college and university levels:

- At San Francisco State University, held an adjunct faculty position and taught courses in environmental geology, oceanography (lab and lecture), hydrogeology, and groundwater contamination.
- Served as a committee member for graduate and undergraduate students.
- Taught courses in environmental geology and oceanography at the College of Marin.

Matt taught physical geology (lecture and lab and introductory geology at Golden West College in Huntington Beach, California from 2010 to 2014.

Invited Testimony, Reports, Papers and Presentations:

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Presentation to the Public Environmental Law Conference, Eugene, Oregon.

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Invited presentation to U.S. EPA Region 9, San Francisco, California.

Hagemann, M.F., 2005. Use of Electronic Databases in Environmental Regulation, Policy Making and Public Participation. Brownfields 2005, Denver, Coloradao.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Nevada and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Las Vegas, NV (served on conference organizing committee).

Hagemann, M.F., 2004. Invited testimony to a California Senate committee hearing on air toxins at schools in Southern California, Los Angeles.

Brown, A., Farrow, J., Gray, A. and **Hagemann, M.**, 2004. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to the Ground Water and Environmental Law Conference, National Groundwater Association.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Arizona and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Phoenix, AZ (served on conference organizing committee).

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in the Southwestern U.S. Invited presentation to a special committee meeting of the National Academy of Sciences, Irvine, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a tribal EPA meeting, Pechanga, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal repesentatives, Parker, AZ.

Hagemann, M.F., 2003. Impact of Perchlorate on the Colorado River and Associated Drinking Water Supplies. Invited presentation to the Inter-Tribal Meeting, Torres Martinez Tribe.

Hagemann, M.F., 2003. The Emergence of Perchlorate as a Widespread Drinking Water Contaminant. Invited presentation to the U.S. EPA Region 9.

Hagemann, M.F., 2003. A Deductive Approach to the Assessment of Perchlorate Contamination. Invited presentation to the California Assembly Natural Resources Committee.

Hagemann, M.F., 2003. Perchlorate: A Cold War Legacy in Drinking Water. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. From Tank to Tap: A Chronology of MTBE in Groundwater. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. A Chronology of MTBE in Groundwater and an Estimate of Costs to Address Impacts to Groundwater. Presentation to the annual meeting of the Society of Environmental Journalists.

Hagemann, M.F., 2002. An Estimate of the Cost to Address MTBE Contamination in Groundwater (and Who Will Pay). Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to a meeting of the U.S. EPA and State Underground Storage Tank Program managers.

Hagemann, M.F., 2001. From Tank to Tap: A Chronology of MTBE in Groundwater. Unpublished report.

Hagemann, M.F., 2001. Estimated Cleanup Cost for MTBE in Groundwater Used as Drinking Water. Unpublished report.

Hagemann, M.F., 2001. Estimated Costs to Address MTBE Releases from Leaking Underground Storage Tanks. Unpublished report.

Hagemann, M.F., and VanMouwerik, M., 1999. Potential Water Quality Concerns Related to Snowmobile Usage. Water Resources Division, National Park Service, Technical Report.

VanMouwerik, M. and **Hagemann, M.F**. 1999, Water Quality Concerns Related to Personal Watercraft Usage. Water Resources Division, National Park Service, Technical Report.

Hagemann, M.F., 1999, Is Dilution the Solution to Pollution in National Parks? The George Wright Society Biannual Meeting, Asheville, North Carolina.

Hagemann, M.F., 1997, The Potential for MTBE to Contaminate Groundwater. U.S. EPA Superfund Groundwater Technical Forum Annual Meeting, Las Vegas, Nevada.

Hagemann, M.F., and Gill, M., 1996, Impediments to Intrinsic Remediation, Moffett Field Naval Air Station, Conference on Intrinsic Remediation of Chlorinated Hydrocarbons, Salt Lake City.

Hagemann, M.F., Fukunaga, G.L., 1996, The Vulnerability of Groundwater to Anthropogenic Contaminants on the Island of Maui, Hawaii. Hawaii Water Works Association Annual Meeting, Maui, October 1996.

Hagemann, M. F., Fukanaga, G. L., 1996, Ranking Groundwater Vulnerability in Central Oahu, Hawaii. Proceedings, Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association Publication VIP-61.

Hagemann, M.F., 1994. Groundwater Characterization and Cleanup at Closing Military Bases in California. Proceedings, California Groundwater Resources Association Meeting.

Hagemann, M.F. and Sabol, M.A., 1993. Role of the U.S. EPA in the High Plains States Groundwater Recharge Demonstration Program. Proceedings, Sixth Biennial Symposium on the Artificial Recharge of Groundwater.

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Other Experience:

Selected as subject matter expert for the California Professional Geologist licensing examination, 2009-2011.

EXHIBIT 2

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July 21, 2015 BSK Project Number E0906601S

Soluri Meserve
1010 F St, Ste. 100
Sacramento, CA 95814

Subject: **DRAFT Biological Resources Review**
Mission Bay Subsequent Environmental Impact Report
San Francisco, California

Dear Mr. Soluri:

Per your request, BSK Associates (BSK) reviewed publicly available documents associated with the Draft Subsequent Environmental Impact Report (SEIR) on the Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32. BSK assessed these documents for potential project impacts on biological resources (following the California Environmental Quality Act [CEQA] Appendix G). The Draft SEIR (DSEIR), the associated 2014 Notice of Preparation-Initial Study (NOP-IS), and the prior Mission Bay Final Subsequent Environmental Impact Report (1998 FSEIR [FSEIR]) were compared to each other, as well as to State of California and federal Geographic Information System (GIS) databases, scientific and technical resources prepared by others, as well as current and historic aerial photographs.

SUMMARY

In our opinion, the SEIR, in several key areas related to biological resources, failed to adequately characterize the nature and the extent of the site's resources; failed to identify the full range of potential significant impacts from the proposed project on those resources; failed to examine those impacts at a sufficient level of detail to understand the project impacts; and, failed to provide adequate mitigation for those resources, both during construction and cumulatively. Specifically, key species and sensitive habitat(s) were left out of the discussion, and mitigation measures were missing, or inadequate, to reduce the impacts of the project on those species below the threshold of significance; and finally, significant changes have occurred at the site affecting both the applicable policies and the relevant resource use since the original analysis.

ECOLOGICAL CONDITIONS REVIEW

The project area has two boundaries, the larger "Mission Bay Redevelopment Plan Area Boundary," (Plan Area) which is described in the 1998 FSEIR and the current "site" boundary (site), which includes Blocks 29-32 within that larger planning boundary (Figure 1). Both boundaries will be used for the purposes of discussion as they relate to the corresponding environmental analysis documents and the project's potential impacts on biological resources. A current aerial photo is provided for detailed site context (Figure 2).

The Plan Area's near surface soils are the result of mixed fills and have been identified by the Natural Resource Conservation Service as: 134, Urban land-Orthents, reclaimed complex, 0 to 2 percent slopes (Figure 3). The soils are the result of historic filling of the Mission Bay with debris, earthquake waste spoils, and other material to reclaim the site from the San Francisco Bay (ESA 2014; Pg. 1). This soils information is consistent with other analyses, developed by others, discussed later.

The U.S. Fish & Wildlife Service, National Wetlands Inventory (NWI) identified several features adjacent to the Plan Area, but none within the site (Figure 4). The relative elevation of these features both within (and nearby) the project boundary appear to correlate with the local shallow water table (ESA 2014; LTR 2015; Pg. 13-14 and Figures A-2 and A-3).

The site itself appears to be a largely ruderal area that has been subject to various anthropogenic disturbances, within an urban setting, containing two large surface parking areas. The site currently contains an open water feature, actively used by wildlife, and a narrow swale to the east (Figure 5). The site's current conditions are detailed in the following site observations.

SITE OBSERVATIONS

The Blocks 29-32 footprint consists of two large paved areas (Southwest parking lot approximately 79,910 sq.ft./1.83 ac. and Northeast parking lot approximately 91,776 sq.ft./2.11 ac.)[1] currently being used as paid parking lots; an area of soil stockpiles (31,066 sq.ft./0.71 ac) on the eastern edge of the property (Terry A. Francois Boulevard); and an adjoining large open field, open water (22,115 sq.ft./0.51 ac) and wetland swale complex, (904 sq.ft./0.02 ac.) (closest to the Southwest parking lot) shown on Figure 2. A series of photographs were taken of the site and the adjoining areas (Attached Photo Plates).

At the time of observation, the open water area encompassed the majority of the water feature, with a patchy, but substantial fringe of palustrine emergent (predominately alkali bulrush [*Bolboschoenus maritimus*]) and riparian plants (willows [*Salix sp.*]). The emergent plants and shrubs were concentrated on the two narrower ends of the water feature. The narrower channel and the seasonal wetlands

[1]2015 Google Earth

apparent from the aerial photographs (Figures 2a-i) were not clearly visible from the site perimeter fence(es).

Numerous native birds were observed within, and in some cases flying to and from the water body. Several Canada geese (*Branta canadensis*) were seen, including what appear to be adult plumage juveniles; three killdeer (*Charadrius vociferous*), including two juveniles; a female mallard and a juvenile (*Anas platyrhynchos*); several crows (*Corvus brachyrhynchos*); two non-native Eurasian collared-doves (*Streptopelia decaocto*); and numerous non-native rock doves/pigeon (*Columba livia*). The site has significant use for nesting and foraging by these bird species.

2015 DSEIR

The DSEIR uses an incomplete description of the environmental setting in its impact assessment.

The DSEIR incompletely characterizes the site's biological resources in the project site description and existing uses. The sole description of the site as it related to its biological resources in the DSEIR is as follows:

"Immediately east of, and adjacent to, Parking Lot B is a depressed area (measuring approximately 320 feet by 280 feet) created by an excavation and backfill associated with a prior environmental cleanup of that portion of the site. A surface swale extends west within this portion of the site to allow for drainage of surface water into the depression." (Pg. 3-10)

This description fails to mention any of the site biological resources, such as plants or animal or habitats, or the fact that there is a large permanent pond and wetland features in the middle of the site. There is no mention of wildlife use and the existing habitat(s) on the site in the DSEIR. The site's biological resources, including waters, wetlands, wildlife habitat and species are then not discussed at all in the DSEIR (except for the Appendix containing the NOP-IS).

The DSEIR failed to protect species and identify the appropriate list of sensitive natural communities, as well as Critical Habitat designations

1. The potential for Western pond turtles and California red-legged frog is stated as "low" since by their estimation, "No suitable habitat present." However, the perennial pond feature (and for the frog a constructed water feature in particular) is not ideal, but it is certainly suitable habitat. In particular, the analysis (and inferred conclusion) is faulty since low potential does not mean "no" potential, and therefor reasonable steps should be taken to establish or reject the presence of the species and as needed, mitigation. These simple mitigation measures are commonly applied to similar activities

throughout California, and include rare plant surveys, and targeted (focused) species surveys.[2, 3, 4] The rare plant surveys must be timed to the appropriate season, and the focused surveys for the right life stage of the target species. In our experience both in preparing EIRs, and supporting similar construction projects, that in virtually every case, where natural(ized) features exists that can potentially support species of concern, there is an additional mitigation measure that provides a preconstruction survey (or surveys); and if species of concern are likely to occupy the site, the preparation and implementation of a Worker Environmental Awareness Plan (WEAP). The DSEIR solely has a pre-construction breeding bird survey.

2. The potential use (given the habitat values present and prior observations by others) of the site for at least foraging habitat is identified for Peregrine falcon[5], Red-tailed hawk, American kestrel[6], Great blue heron[7], American goldfinch[8] but its loss is not mitigated for (NOP-IS Appendix A. Table 2 A-8). Note: Two species that do not appear to meet the section 3503.5 Eggs, Nests, and Nestlings Protected under the California Department of Fish and Game Code provisions are identified as such in the text.

3. There is significant new information related to the federal designation of Critical Habitat for the listed anadromous fish, the steelhead (*Oncorhynchus [Salmo] mykiss*)[9]. The DSEIR failed to identify that the project has the potential to impact the defined Critical Habitat for the steelhead. This designation was completed in 2005 and was not described in the 1998 Mission Bay FSEIR. Neither the potential of the project activities to impact the steelhead (*See*: Other Biological Resource Issue Areas), or the designation of the status of this plan area was identified in the DSEIR.

The Project's impacts adequately are not fully disclosed in the DSEIR

1. The project fails to identify, assess, and mitigate for the proposed project impacts on the biological resources associated with the site water bodies.

2. The DSEIR analysis restates that there are no new or significant changes to biological resources and appears to rely entirely on the NOP-IS (Pg. 1-9; Pg. 5.1-1; Pg. 1-58/59). Despite these statements, there is in fact a significant new impact identified in the DSEIR from the project to birds identified in the text on Pg. 3-28, "The project sponsor proposes to incorporate bird-safe design measures that would reduce

[2] http://www.cnps.org/cnps/rareplants/pdf/cnps_survey_guidelines.pdf
[3] http://www.fws.gov/sacramento/es/Survey-Protocols-Guidelines/Documents/rare_plant_protocol.pdf
[4] https://www.dfg.ca.gov/biogeodata/cnddb/pdfs/Protocols_for_Surveying_and_Evaluating_Impacts.pdf
[5] Identified as "present" in 1998 FSEIR Table K.2
[6] Identified as "present" in 1998 FSEIR Table K.2
[7] Identified as "present" in 1998 FSEIR Table K.2
[8] Identified as "present" in 1998 FSEIR Table K.2
[9] Federal Register / Vol. 70, No. 170 / Friday, September 2, 2005 / Rules and Regulations

the potential effects of the proposed buildings, signage and lighting on birds." And, that impact requires and was provided a new mitigation measure: The project sponsor shall design and implement the project consistent with the San Francisco *Standards for Bird-Safe Buildings* and Planning Code Section 139, as approved by OCII. OCII shall consult with the Planning Department and the Zoning Administrator concerning project consistency with Planning Code Section 139." (Pg. 1-59)

Nowhere in the DSEIR is there an analysis of which bird species would be subject to these strike impacts, what time of year, or which types of impacts they were subject to. There was no discussion of the determination of thresholds for the bird injury and/or death associated with the project, and no explanation about how or why the mitigation proposed would be sufficient to reduce those injury and/or deaths below a specified threshold.

The Project's impacts are not appropriately mitigated in the DSEIR

The DSEIR analysis, at a minimum, should have been fully developed to reflect the 2015 federal Wetland Policy modifications, the observations of its own wetland experts, and the numerous state and federal wetland policies and regulations that apply to this site. It is our opinion that the DSEIR fails to mitigate for impacts to waters and wetlands at the site; as well as the potential impacts to biological resources within and around the site through contact with hazardous waste. Effective mitigation measures are available to reduce the impacts below significance. These comments are more fully explained under the NOP-IS analysis below.

2014 NOP-IS

The 2014 NOP-IS Applies the Prior Impact Analysis to the Modified Current Setting

1. The NOP-IS (Pg. 76) re-characterizes the 1998 FSEIR in order to minimize the type, extent and value of current ecological features of the site. The analysis conflates the prior CEQA analysis with the current ecological conditions, without fully assessing the significant changes that currently exist under and the impacts of the project on the biological resources. The analysis further parses the "upland" species and habitat from the aquatic species and habitat, without identifying and relating the project impacts associated with each of those contexts. For example, the proposed project has both direct (loss of habitat) and indirect environmental impacts (potential contamination) to both terrestrial and aquatic resources, within and adjacent to the site (dust, groundwater and stormwater), but these impacts are not fully identified (impacts identified only to nesting and flying birds). The project must be evaluated with an associated impact analysis that defines the specific project impacts on the site's (and Plan Area) biological resources.

2. There are substantially new ecological conditions at the site that differ from the description provided in the FSEIR, the project analysis under the NOP-IS newly identifies water bodies as wetland features, but fails to provide analysis of the project impacts on those features, define their regulatory status, and

identify suitable mitigation according to its regulatory status (NOP-IS, Pg.78; ESA 2014; WRA 2014). For example, if the features are only determined to be regulated by the State there is typically one set of mitigation measures similar to those identified in the IS-NOP, if they are both state and federal, additional measures may be required, however those measures are dependent on a series of tests, and since the project may be subject to CWA 404(b)(1) provisions, significant additional analysis and mitigation may be required.

Instead, the analysis claims that the habitat is: "…limited due to the sparse and ruderal nature of onsite vegetation, as well as the site's location in a densely urbanized environment. While several bird species were observed foraging and hunting onsite, these species are common to San Francisco and would continue to be supported by vegetation communities and water features found in the project vicinity." By its own admission the analysis states that these features would be permanently lost, but that impact doesn't matter because there is some other place for the species to go. It fails to fully define what the biological impacts are, and then identify where (to which nearby features) these species would go.

Further the analysis states: "Because the excavation depressions on the site are small, isolated features resulting from recently completed hazardous materials remediation activities and are surrounded by paved areas and urban development, these features do not provide the important biological habitat functions and values that are typically associated with federally protected wetlands." Conversely, and in rebuttal to their prior assertion that there are readily substitutable habitats nearby, small wetland features can have exceptional ecological value, in particular if they are one of the few remaining features in an urban setting.

This biological resource information in the NOP-IS was only analyzed in a cursory manner, simply recapitulating the site observations, without fully identifying and evaluating the CEQA-required biological resource impacts from the project. Without a full technical understanding of which resources are impacted, mitigation cannot, and indeed was not, adequately developed- as these measures depend on the nature and extent of the resources impacted. The standards of significance are not identified, and fail to show the application of thresholds to the project impacts for wetlands and other special ecological habitats.

For example, on Pg. 78 of the analysis, the NOP-IS identifies use of the site's open water and wetland by a variety of native plants and animals:

"Site reconnaissance revealed the deepest part of the excavation within this area contains standing water with a mixture of ruderal vegetation described above, and wetland plants, including alkali bulrush (*Bolboschoenus maritimus*), brass buttons (*Cotula coronopifolia*), fat-hen (*Atriplex prostrata*), and saltgrass (*Distichlis spicata*), present around its perimeter. The standing water supports common wildlife as evidenced by a snowy egret (*Egretta thula*) hunting at the water's edge and a black phoebe (*Sayornis nigricans*) sallying insects from a vegetative perch."

Despite these observations, the analysis fails to accurately characterize the site habitats, and reconcile the appropriate list of species regulatory concern (Table 1, Attachment 1). The habitats observed by BSK (2014) and ESA (2014) at the site appear to include: open water, shallow water with emergent vegetation (alkali wetland), mud flats, riparian fringe (locally called scrub), ruderal grassland, seasonal wetlands, and open/disturbed shrubland. California identifies one of these habitat types as sensitive: *Bulboschoenus maritimus* (Salt marsh bulrush marshes) Alliance, status S3[10] (S3 = Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state.)

For illustration of the biological resources analysis defects, as they related to waters and wetlands, the following section provides a site waters and wetland feature history and summary analysis of how the provided data and analysis are insufficient or incorrect.

WATERS AND WETLAND FEATURE HISTORY

The term "wetlands" from a Clean Water Act (CWA) 404 perspective generally means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands typically include swamps, marshes, bogs, and similar areas. These are typically identified using a three-part test, examining the presence of water, wetland (hydric) soil, and wetland dependent (hydrophytic) vegetation, following specific guidance(s). The federal CWA section 404(b)(1) Guidelines list both wetlands and mud flats as types of "special aquatic sites."

A wetland under California's regulations contains the following features, an area that is covered by shallow water or where the surface soil is saturated, either year-round or during periods of the year; where that water coverage has caused a lack of oxygen in the surface soil; and, has either no vegetation or plants of a type that have adapted to shallow water or saturated soil. Some examples are fresh water marshes, bogs, riparian areas, vernal pools, coastal mud flats and salt marshes. In this case, there are both a permanent water body and a seasonal feature (possibly a small complex) with wetland characteristics by the admission of the experts who prepared the environmental documentation for the project. These characteristics meet the definitions contained in the various regulations, including 14 CCR 13577(b), Cal. Pub. Res. Code § 30121. The open water feature and its wetland (hydrophytic) vegetation were verified in the field, and through the use of aerial photos, showing their presence over time, both by season and by year.

The site is within the footprint of the historic Mission Bay, which has been filled in over time (ESA 2014; Pg. 1). The original Bay muds are still found below the site, as evidenced by the site soil borings (LTR 2015; Pg. 13 and Figures A-2 and A-3). The excavation intercepted local shallow groundwater and is

[10] https://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/natcomlist.pdf

evidently maintained by that natural source (LTR 2015; Pg. 14). The site also has seasonal wetland features which appear to be dominated by stormwater. It is not clear that these seasonal features would not be maintained for far longer in the spring, but they have been captured through an excavated trench apparently intended to drain them to the open water body (ESA 2014; Pg. 2). The site "remedial" activities thus captured the local water table and allowed for the expression of open water and wetland features (ESA 2014; Pg. 2). The ESA analysis goes on to specifically identify that the: "…deeper excavation and surrounding shallow depressions within the proposed project site are features that exhibit hydrology and vegetation characteristics of wetlands. Hydric soil is presumed present due to the year-round inundation and presence of obligate wetland plants." (ESA 2014; Pg. 3)

Federal Jurisdiction-Wetlands created by human actions fall under discrete classes under Federal jurisdiction. Most typically these are agricultural features that are caused by the movement of water from one location to another, such as a dam providing water to a canal constructed in uplands. In this case however, the site was originally a tidal mudflat or estuary wetland which has since reverted back to a wetland (ESA 2014). In addition, even if it was not originally a water or wetland, it currently meets those adjacency, and direct hydrologic connectivity requirements under the Final Clean Water Rule (2015; 33 CFR Part 328 and 40 CFR Parts 110, 112, 116, 117, 122, 230, 232, 300, 302, and 401); and, even manmade wetlands and water bodies have restrictions on discharges under 33 CFR 323.4(b).

There are Federal exemptions for specific construction associated activities. These exemptions (33 CFR 323.4 - Discharges not requiring permits) are invalidated, however: "If any discharge of dredged or fill material resulting from the activities listed in paragraphs (a) (1) through (6) of this section contains any toxic pollutant listed under section 307 of the CWA such discharge shall be subject to any applicable toxic effluent standard or prohibition, and shall require a section 404 permit." (33 CFR 323.4(b)).

The site's water and soils include several chemicals identified under CWA section 307 as toxic pollutants (BBL 2006; LTR 2015).[11] Those chemicals include the following 12 Priority Pollutants found in the Phase II (LTR 2015; Table 4 and Table 5):

1. Benzene
2. Naphthalene
3. Cyanide
4. Antimony
5. Arsenic
6. Chromium
7. Copper
8. Lead
9. Mercury
10. Nickel

[11] http://water.epa.gov/scitech/methods/cwa/pollutants-background.cfm

11. Selenium
12. Zinc

Therefore, the site is *not exempted* under 33 CFR 323.4 because it contains 12 of the chemicals identified as priority pollutants under section 307.

The proponents' consultant, WRA, in a separate analysis, claims exemption from the CWA under yet a different test (without identifying that any exemption is *invalidated* by the section 307 test described above (WRA 2014; Pg. 2)). WRA states that: "1986 (51 Fed. Reg. 41206) (e) Water-filled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the United States."

The site owner's continuing failure to backfill the excavation and its abandonment for the past decade, despite being under Order No. R2-2005-0028 and its RRMP, constitutes abandonment and its clear reversion to the definition of waters, wetlands and/or other special aquatic site. WRA's explanation, contrary to demonstrating how the site may be exempted as an incidental construction feature, documents how that feature has been abandoned. Therefore the exemption also does not apply on that basis.

Indeed, there is no merit to the further argument made by WRA (Pg. 4) that: "As described in the RWQCB Order No. R2-2005-0028, the Project Area was to be excavated and backfilled in preparation for future development as part of the overall Mission Bay redevelopment plan." The site was not backfilled. It should be noted by WRA's argument there could never be a case for reversion under the CWA, because any naturalized feature would simply 'be ready' for some postulated future backfilling. The provided analysis fails to show: 1. How the feature has not reverted and 2. How the exemption override under 33 CFR 323.4 does not apply due to the presence of section 307 toxic chemicals. Regardless, WRA is silent on the open water and wetland features in context of the State water and wetland policy and applicable regulations.

California Jurisdiction-California does not have the same exemptions in its waters and wetland framework as exist under the CWA. California derives its authority from different sources (Porter-Cologne Water Quality Control Act and various other Acts) for its policies, and includes all man-made features under its jurisdiction. Therefore the site's water features, regardless of origin, appear to be regulated and protected waters and wetlands of the State.

The NOP-IS acknowledges that the project would result in the fill of a wetland (and without identifying it Pg. 76, its associated fringe riparian zone), however, the proponent has not yet (and does not propose to) characterized the wetlands to determine their jurisdictional status (Pg. 78). The failure to prepare the jurisdictional determination prior to public comment eliminates full public disclosure and the ability to assess the potential reasonableness and efficacy of mitigation measures. Moreover, the specified failure to establish specific (offsite) mitigation may violate CEQA's mandate to impose all feasible mitigation measures, and may fail to meet both Porter Cologne and the Clean Water Act permitting requirements for filling wetlands and waters.

SITE ABANDONMENT AND NEW EXPOSURES

The Site's Failure to Fill the Excavation Has Led to Wetland Formation and New and Unanalyzed Exposures

The site petroleum-related remedial activities exposed the local water table and allowed for the expression of wetland characteristics and the site which have become naturalized over time (ESA 2014; Pg. 2). These activities have resulted in the creation of stockpiles of material adjacent or near to these wetland features that in some cases: "…contains contaminants that exceed hazardous waste threshold concentrations and will require special handling and disposal," (LTR 2015; Pg. 1). These activities took place over several years culminating in a Phase II remedial action that left the excavated area open and abandoned in 2005 (LTR 2015; Pg. 6). The Revised Risk Management Plan (RRMP, BBS; Pg. 2-3 and 2-3) infers that the excavation was backfilled, however, it was not.

The RRMP further identifies that: "1. Because North Terminal, Parcel X4, OAS and 16th Street East OUs are currently under development, interim risk management measures (IRMMs) designed for undeveloped parcels are not relevant to the protection of human health on those OUs. If development ceases or areas are created with uncovered native soils, IRMMs may again be necessary." (BBS 2006; Table 1) The development of the site still has not occurred, and there is no evidence that the IRMMs have been applied.

The site's open water and wetland features are thus a direct result of the abandonment of a site cleanup allowed to revert back to a 'natural state' for approximately a decade. Not only did natural features evolve in response to this abandonment, but the very abandonment created conditions that may have exposed wildlife to a variety of hazardous chemicals through their use of that habitat (LTR 2015).

The Project Impact Evaluation Modifies the Appendix G Question in a Manner that Eliminates Critical Analysis

The project Impact Evaluation BI-1 fails to follow the language of Appendix G by removing the second half of the question, and reduces the subject matter and detail of its impact analysis accordingly (Pg. 77). The current (2015) Appendix G states:

IV. BIOLOGICAL RESOURCES -- Would the project:

> a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans,

> policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Instead the NOP-IS states:

> "Impact BI ‐ 2: The proposed project would not have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations. (No Impact)"

The result of this text deletion is that the potential for the project to impact U.S. Fish and Wildlife Service designated critical habitat is not analyzed. Therefore, the potential project impacts to the closest federally designated critical habitat is steelhead *Oncorhynchus mykiss* are ignored. This habitat runs directly adjacent to the project area. In addition, San Francisco manzanita (*Arctostaphytos franciscana*) critical habitat is present approximately 2.6 miles to the west and should also have been identified and analyzed. The federal critical habitat analysis is missing, and the provided analysis itself is defective. The potential project's impact(s) to these listed species and their critical habitat are therefore unexamined. The project's dust, stormwater, surface flooding, and groundwater place those species at risk from hazardous chemicals. This issue is discussed in detail in Other Biological Resource Issue Areas.

OTHER BIOLOGICAL RESOURCE ISSUES

The DSEIR is silent on the potential project impacts on offsite fish and wildlife issues associated with stormwater and other discharges from the site to the surrounding area, Mission Creek Channel, and the San Francisco Bay. The DSEIR Appendix MIT Mission Bay FSEIR Mitigation Measures: Applicability to Proposed Project K. Hydrology and Water Quality section (MIT-27 through -29) states that the project would fall under different mitigation measures under different programs (such as the General Stormwater Permit) and that the detailed mitigation requirements from the 1998 FSEIR would not be used. The site's hazardous material history show that the proposed project construction activities pose risks to the environment and its biological resources through the release of hazardous chemical to surface waters, through wind redeposition, stormwater drainage, or unabated stormwater sheet flow above a 5-year design rain event (BBL 2006, LTR 2005). The RMP has not protected these resources because it was not intended to covers these features, followed superseded analytical methods, and even if it was applicable and current, has had implementation failures. Some of these issues are identified in greater detail in a separate document, SWPPP Memorandum BSK Associates, 2015.

There is a direct route from the site to the surrounding area, including the Bay, from dust and stormwater. Stormwater can take several routes off the site, and may enter a sediment trapping system, or not, and flows over a 5-year event run unabated into neighboring properties and the Bay. Currently, there are what appear to be multiple failures to implement and maintain effective Best Management Practices (BMPs) for dust and stormwater. The DSEIR fails to identify these risks and conditions, and fails to identify the potential environmental impacts from the substantially changed new environmental conditions as a result of the site remedial activities. The DSEIR further identifies that there were detailed mitigation measures for these potential impacts as they related to stormwater (but not biological resources) in the FSEIR, but that they deleted the hazardous material protective elements and simplified the sediment management. The site stormwater operations have management issues that need reconciliation, but the evidence shows a likelihood of these contaminants reaching surface waters, despite the prior BMPs and this must be fully analyzed and the mitigation measures modified correspondingly to reflect those significant new conditions in order to protect biological resources, designated critical habitat and listed fish and wildlife.

CUMULATIVE IMPACTS

In our opinion, the project's impacts on listed species, waters and wetlands, and their loss, were not analyzed in sufficient detail or context to be able to understand what the likely cumulative impacts would be on those and other biological resources. It seems probable that there would be cumulatively considerable impacts from the project given the limited availability of those habitats, and that there are mitigation measures available for those impacts. However, the IS-NOP analysis discusses some broadly applicable mitigation measures for wetlands, then fails to identify or apply any of those mitigation measures in Table 1-2 (NOP/IS Pg. 1-58) Appendix MIT (Pg. MIT-30). There are only two mitigation measures described as applicable to biological resources at the site in the DSEIR, breeding bird use protection and bird strike impacts.

The DSEIR's cumulative impact analysis lacks the degree of detail that the 1988 DEIR completed and fails to apply that analysis to the current waters and wetlands, and contradicts the current DSEIR's findings:

"Wetland habitats in the San Francisco Bay Region continue to be eliminated and altered. Wetlands provide a continuity of habitat between the open waters of the Bay and upland areas. Wetlands increase the wildlife diversity by providing additional habitats, and by providing many of the animals' life history requirements (e.g., feeding, mating, and nesting) in one area." (1988 FEIR Pg. VI.M.12)

According to the project analysis: "The proposed project could potentially result in adverse effects on various bird species through disruption of nests, collisions with buildings, or disorientation from night lighting. These impacts, in combination with other projects along the San Francisco waterfront, could potentially result in cumulative impacts to birds." (NOP/IS Pg. 84) There is no assessment of how many birds or which species would be impacted and how the mitigation would achieve that reduction below the unstated threshold. The document then fails to identify how the mitigation measures would result in a less than significant finding over the cumulative impact analysis area. There is also no supporting analysis for these bird impacts in the 1988 FEIR or 1998 FSEIR.

1998 FSEIR

HABITAT ANALYSIS

No Prior Interior Wetland Presence and Analysis

The 1998 FSEIR states: "This section focuses on the aquatic and wetland habitats of China Basin Channel. Terrestrial habitats in the remainder of the Project Area do not support any significant biological resources, as discussed in the Initial Study (see Appendix A)." At the time of that analysis, there were no documented interior water and wetland features at the site, and therefore the project impacts on waters and wetlands were not analyzed (Pg. II.30). It also is important to note that the mitigation used for the China Basin Channel may, and in some cases may not, be applicable to the project impacts on the current interior wetlands, and thus require significantly new and more detailed analysis for both the impact to these features, and the impacts on their associated species.

HAZARDOUS CHEMICALS

Hazardous Chemical effects on Biota

The FSEIR identified that for the purposes of analyzing wastewater impacts from the project, that "Near-Shore Effects-Treated combined sewer overflows currently occur at Bayside discharge facilities, including facilities at China Basin Channel, at the end of Mariposa Street, and in Islais Creek. The proposed project would marginally increase treated combined sewer overflows and direct stormwater discharges to near-shore waters of the Bay, including China Basin Channel and Islais Creek. Near-shore discharges are not subject to the same rapid mixing and dilution as the deep-water discharges from the Southeast Plant." (Pg. II.27) This effect is generally correct and holds for both wastewater, and typically to an even greater degree, most particulate or soluble chemicals that would come off the site through the groundwater, aerial re-deposition or stormwater/surface transport.

However, in the immediately following section, Effects of Stormwater Discharges, it states that "Under the project, the volume of stormwater directly discharged to near-shore waters of the Bay from the Project Area would increase about 2%. The concentrations of pollutants in the stormwater discharge would change, because the project would intensify land use in the Project Area. Neither the increase in stormwater flow, nor the change in pollutant concentrations would constitute a significant effect on aquatic biota." (Pg. II.28) The recent findings of Class 1 and Class 2 hazardous waste is not taken into account for these analyses and comprise significant new information that requires analysis in the 2015 SEIR because of the different and significantly greater biological impacts of these hazardous materials (LTR 2015).

The FSEIR identifies an analysis of potential adverse ecological effect associated with the current conditions at the site in 1998 (Pg. I.54). It states: "As noted by ENVIRON, no criteria have been developed for the assessment of risk to ecological receptors in the aquatic environment based on comparisons to groundwater chemical concentrations. However, ambient water quality criteria for the protection of marine (saltwater) organisms are used as a conservative means of evaluating the potential risk to surface water organisms." (Pg. I.57) However, since 1998, the San Francisco Regional Water quality Control Board has developed these very criteria as described below.

The 1998 analysis relied on Preliminary Remediation Goals (PRGs) for its analysis, however the San Francisco Regional Water Quality Board (SFRWQB) states in its current guidance document that: "The U.S. EPA Regional Screening Levels or RSLs (formerly PRGs; U.S. EPA, 2013d) address human health concerns associated with direct exposure to chemicals in soil, but do not address ecological concerns. Exposure routes and receptors not addressed by the RSLs, but included in the ESLs [Environmental Screening Levels] are listed below: …groundwater screening levels for the protection of aquatic…habitats/surface water quality…soil screening levels for urban area ecological concerns; (SFRWQB 2013; Pg. 1-3). These exposure routes which apply and are specific to the site are identified in the current Environmental Screening Levels (ESLs). This is new and substantial information that affects the potential environmental impacts to biological resources which was not used in the DSEIR.

Further, the ESLs (the PRGs for that matter) are not legal limits, but they are intended to inform decision-making. However, they may not be protective enough in particular for "…sediment or sensitive ecological habitats (such as wetlands or endangered-species habitats). The need for a detailed human health or ecological risk assessment should be evaluated on a site-by-site basis for areas where significant concerns may exist (SFRWQB 2013; Pg. ES-1 and 2).

The prior FEIR analysis identifies that in their opinion there were no significant species or habitats at the site, and therefore the analysis was specifically intended not to be protective of terrestrial habitat or interior wetlands, and therefore does not apply to the current conditions: "As previously described, chemicals present in the soils could potentially impact the health of the ecological environment if terrestrial or nesting avian species come into direct contact with soils which contain elevated levels of chemicals, or if the chemicals in exposed soil were to be released into China Basin Channel or San Francisco Bay through surface water runoff. Additionally, chemicals present in the soil and groundwater could potentially impact the aquatic environment if the chemicals leach from the soil into the groundwater and subsequently migrate to China Basin Channel or San Francisco Bay. As discussed in the Mission Bay Final Environmental Impact Report (FEIR), the current and future conditions within the Project Area do not provide a habitat capable of supporting a significant terrestrial or nesting avian wildlife community. Accordingly, potential exposures that terrestrial species could have with soils would not represent a significant effect on the terrestrial wildlife community." FEIR 1998; Pg. I.54) The current conditions are significantly different and specifically excluded from the prior 1998 analysis and the current ESL methods do apply to these conditions.

The 1998 "risk analysis" applies the PRG criteria for impacts on biological resources in the Bay as a result of offsite groundwater movement only. It also uses average values and only for selected contaminants.

This is an artificial narrowing of chemicals that can have biological impacts, and likely a major reduction of the risk by not using the maximum observed concentration and the biologically relevant risk drivers. For example, species are exposed to actual concentrations, not site averages. By using the observed peak concentrations, it establishes the appropriate worst case scenario and sets the upper limits for the purposes of developing mitigation.

However, groundwater is but one of several potential routes by which contaminants can leave the site. Wind can blow contaminated dust and stormwater (containing both fine sediment and dissolved contaminants) can also run off the site. The RMP and RRMP also do not apply and cannot be relied upon because they specifically rely on the previous risk analysis, which does not look at terrestrial or interior wetlands.

Additional Mechanisms of Impacts to Biological Resources

Some of the mechanisms for biological impacts from the project's contribution to contaminants are through bio-accumulation, as well as the unanalyzed bio-concentration: "These contaminants could be directly lethal to smaller organisms, and could accumulate in the food chain and become successively more concentrated in a process known as bio-accumulation. Through bio-accumulation, the toxic concentrations could reach levels in which they are lethal to larger organisms, such as birds or marine mammals. Turbidity and toxicity from re-suspended sediments could also interfere with beneficial uses of the channel, such as spawning of Pacific herring." (1998 FSEIR Pg. II.31) The FSEIR analysis describes just one of the potential mechanisms for biological impacts from the project-associated hazardous chemicals, then identifies that it is significant and mitigatable, but then simply ignores that potential mechanism for other species that would potentially come in contact with the same material. The analysis should instead examine the various chemical of concern, their individual and joint biological impacts (chemicals can have additive (or counteracting) or multiplicative effects) and their routes of exposure (wind, groundwater or stormwater) and asses the risk drivers for each species (or trophic surrogate).

There are newly identified Class 1 and 2 hazardous waste materials at the site, the newly identified use of the site by diverse biota, the designated Critical Habitat, and similar release pathways off of the site. These changed conditions require analysis of both onsite impacts and offsite impacts. The lines of reasoning, based on high contaminant concentrations at/close to the site, poor mixing in the shallows, and bio-concentration/bio-accumulation should also be applied to the current physical conditions and the elevated contaminant concentrations.

Mitigation for Hazardous Materials

The analysis provided above in the 1998 FSEIR relied on the dilution effect of the Bay, despite its own earlier analysis that there would be significant impacts which required mitigation, but cumulatively there would be no impact (1998 FSEIR Pg. II.27). General stormwater impacts are not the same as impacts from solid phase and dissolved phase hazardous materials. Specific analysis must be developed to identify which capture or treatment systems are required for which hazardous constituent in which phase. For example, large particles traveling in the stormwater system could be trapped through a conventional filtration system, however, overflow of that system (and/or poor maintenance) by design flow above a 5-year rain event could cause that material to be flushed directly into the Bay. Very fine size and dissolved phase chemicals typically require specific treatment technologies to stop their direct movement to the Bay during mobilizing rain events. The mitigation does not appear to be sufficient to protect biota from hazardous materials identified at the site in the LTR 2015 report.

Cumulative Hazardous Issues

The same failure to identify, and therefore analyze cumulative impacts, as a result of newly identified hazardous materials also applies to cumulative impacts from these chemicals: "To put this in context, City discharges are a very small portion of the region-wide discharges to the Bay. Considering the contribution of the project and of the cumulative Bayside projects in the context of all the other pollutant inputs to the Bay, the cumulative pollutant loading from the Bayside projects would be extremely small." (1998 FSEIR Pg. II.29) The cumulative impacts of hazardous materials (not just generalized pollutants) would be specific to certain species in the Bayside proximate to the site, not generically in the context of the entirety of the Bay. It is inappropriate to consider the entirety of the Bay in the cumulative impacts specifically because of the mechanics of chemical redistribution identified in another section in the FSEIR (1998 FSEIR Pg. II.27, and see above). The analysis provided in the FSEIR does not cover the hazardous materials and fails to look at the appropriate biological context, including resident and locally foraging migrants, and must be reanalyzed in light of the new cumulative impact information. In our opinion, because of the new analysis methods and standards, and the lack of mitigation for soluble or stormwater transportable hazardous materials, the project's impacts on aquatic biological resources is cumulatively significant after mitigation. Mitigation measures are readily available for these potential impacts, but they require a careful analysis of the specific hazardous constituents and what levels of contamination are acceptable to develop.

REFERENCES

BBL Environmental Associates [BBL], 2006. Revised Risk Management Plan, Former Petroleum Terminals and Related Pipelines Located at Pier 64 and the Vicinity, City and County of San Francisco, California. (August, 2006)

ESA Associates [ESA], 2014. Habitat Value Assessment at the Mission Bay Blocks 29-32 Project Site. (11/6/14)

Langan Treadwell Rollo [LTR], 2015. Phase II Environmental Site Assessment, Golden State Warriors Arena, Blocks 29-32, Mission Bay, San Francisco, California. (June, 2015)

San Francisco Regional Water Quality Control Board [SFRWQCB], 2013. User Guide. December 2013.

US Environmental Protection Agency [EPA], 2015. Final Clean Water Rule http://www2.epa.gov/cleanwaterrule/final-clean-water-rule

WRA Consultants [WRA], 2014. Construction Related Depressions at Golden State Warriors Mission Bay Site. (10/1/14)

LIMITATIONS

Our review was limited to the Ecological-related aspects as they are identified in the project environmental documents provided or otherwise made available for review. Additional information related to the project may be available through other sources, but were not reviewed for the purposes of this analysis.

The observations, assessment and recommendations submitted in this report are based upon the data obtained from listed reports prepared by others, limited field investigation, and site observations. The report does not reflect variations which may occur beyond the assessed area. BSK's services were be performed in a manner consistent with the level of care and skill ordinarily exercised by other professionals practicing in the same locale and under similar circumstances at the time the work is performed. No warranty, either expressed or implied, is included. The findings of the field observation may have a potential for negative impact(s) on the value or suitability of the site for some purposes. BSK cannot assume liability for any such negative impact(s). Permitting requirements or permit interpretations may change over time. The findings of this report are valid as of the present. However, changes in the conditions of the site can occur with the passage of time, whether caused by natural processes or the human-induced changes on this property or adjacent properties. In addition, changes in applicable or appropriate standards or practices may occur, whether they result from legislation, governmental policy, or the broadening of knowledge.

We appreciate the opportunity to be of service to Soluri Meserve and trust that this correspondence provides you with the information necessary at this time. Please contact us with any questions regarding the review comments presented this letter.

Respectfully submitted,
BSK Associates

Erik Ringelberg
Senior Scientist
Ecological Services Group Manager

Kurt Balasek, PG, CHg, CSD
Senior Hydrogeologist

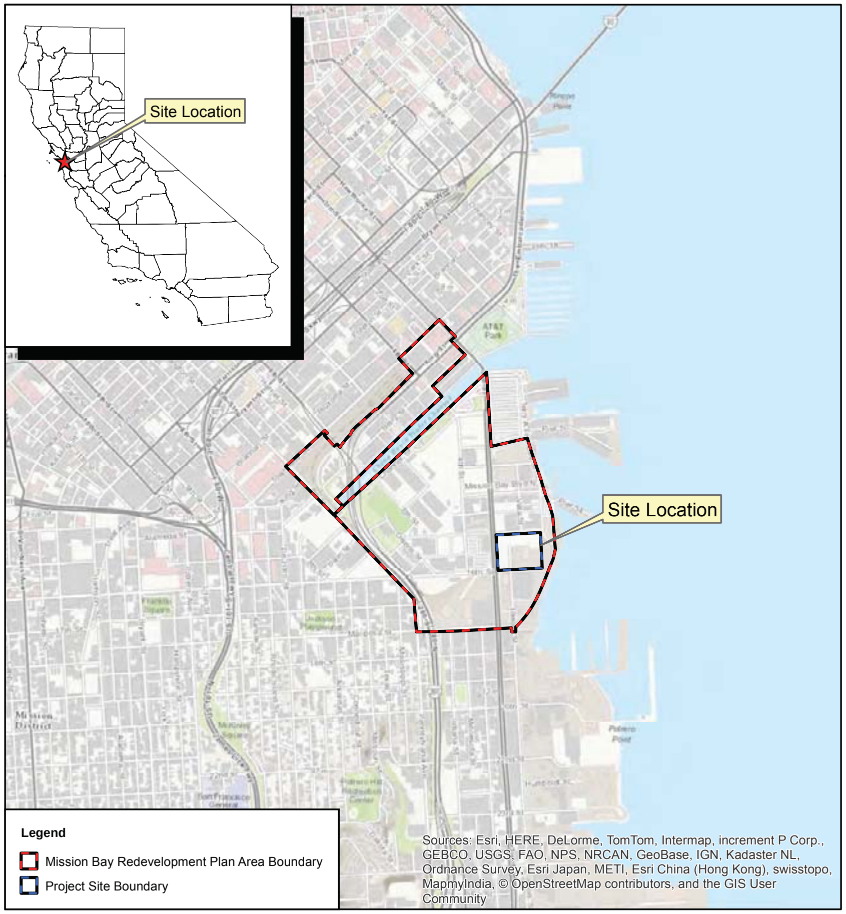

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Figure 1
Vicinity Map

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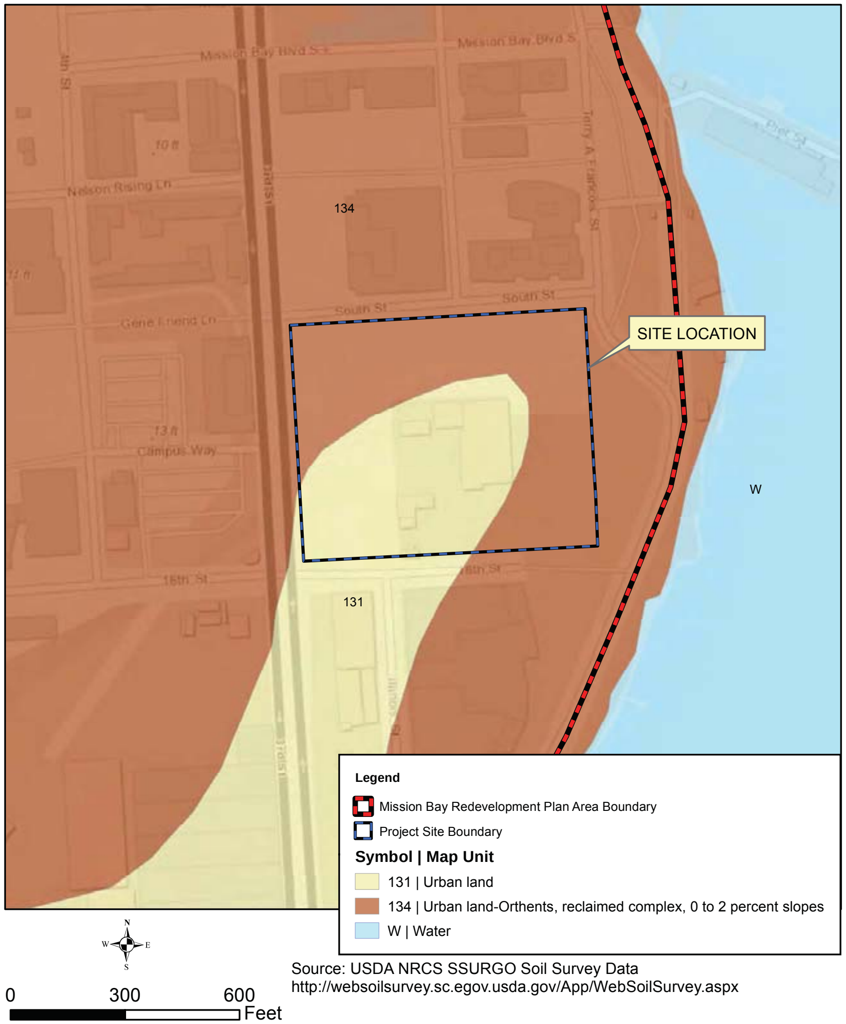
Figure 2
Current Aerial Photograph



Source: USDA NRCS SSURGO Soil Survey Data
http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

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Review - Mission Bay Subsequent Environmental Impact Report San Francisco, California	Figure 3 Project Area Soil Map

Source: U.S. Fish & Wildlife Service, National Wetlands Inventory,
http://www.fws.gov/wetlands/Data/State-Downloads.html

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Review - Mission Bay Subsequent Environmental Impact Report San Francisco, California	Figure 4 National Wetland Inventory

Review - Mission Bay Subsequent Environmental Impact Report San Francisco, California	Figure 5 Observed Wetland Features

Erik Ringelberg – Ecological Services Group Manager

Professional Background:

Mr. Ringelberg began his career as an environmental scientist in 1992. His academic background includes a B.Sc. in Microbiology from Colorado State University, a M.Sc. in Environmental Science from Lesley University in Cambridge, Massachusetts, and he is a Ph. D. candidate at the University of Montana, in Riparian and Wetland Ecology. He has directed organizations, managed departments, technical staff, contractors, and volunteers for the public and private sectors. He has coordinated development and restoration projects with state and federal oversight agencies, and developed threatened and endangered species management plans. Mr. Ringelberg directed and advised non-profit, tribal, and local government agencies on special studies, wildlife mitigation measures, habitat management and restoration for listed species.

Mr. Ringelberg has completed numerous California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) analyses and associated field studies, including protocol studies for listed avian, terrestrial, and aquatic species and their associated habitats in California, Nevada, and Montana. He has delineated over 30 miles of Streamside Management Zones, US Army Corps of Engineers - Wetlands and Ordinary High Water Marks, and California “isolated” waters. Mr. Ringelberg has also directed both large and small-scale wetland and river restorations.

Relevant Project Experience:

Field Studies

Multi-species Habitat Utilization Analysis
Glacier National Park, including spotted sandpiper (*Actitis macularius*), Barrows goldeneyes (*Bucephala islandica*), Harlequin duck (*Histrionucus histrionucus*) and common merganser (*Mergus merganser*).

Habitat Reconstruction Analysis
Reconstruction of pre-impact conditions using stratified random statistical analysis of NHP data, and site specific data from local informants, for the Yerington, Nevada area.

Avian Mitigation Measure Development
Stone Lake National Wildlife Refuge Association (CEQA/NEPA EIR/EIS in development); Yolo Basin Foundation Putah Creek Stream Restoration (CEQA EIR in development); and, numerous CEQA projects in the Central Valley of California.

Breeding Bird Surveys
Caltrans-Highway 50; and, numerous development projects in Alameda, Glenn, Madera, Sacramento, San Joaquin, Solano, Stanislaus, Tehama, and Yolo Counties.

QUALIFICATIONS

Certifications:
DFW Scientific Collections Permit SC-10511, 2015
Hazardous Analysis and Critical Control Point: Aquatic Nuisance Species, USFWS, 2003
Constructed Wetland Designer; UW, Madison, 1993
40-CFR Hazardous Waste Handling, 1992-1993

Education:
Ph.D., candidate (ABD) Riparian and Wetland Research Program, University of Montana, School of Forestry, Missoula, MT, 2003

M.Sc., Environmental Science, Lesley University, Cambridge, MA, 1991

B.Sc., Microbiology (Business concentration), Colorado State University, Fort Collins, CO, 1987

Experience:
BSK Associates 2009-Present
Wallace-Kuhl 2009-2006
PLF 2006-2003
KYNF 2003-2000

Bat Surveys
Multi-species bat surveys for development projects in Yolo County.

Burrowing owl (*Athene cunicularia hypugaea*). Protocol-level field surveys in Fresno, Solano and Yolo Counties, California.

Northern spotted owl (*Strix occidentalis caurina*). Protocol-level field surveys in Napa County for wind projects.

Swainson's hawk (*Buteo swainsoni*). Protocol-level field surveys in Solano and Yolo Counties, California.

California tiger salamander (*Ambystoma californiense*). Supported protocol-level field surveys in Calaveras County.

Red-legged frog (*Rana draytonii*). Supported rotocol-level field surveys in in Calaveras County.

Clear Lake Hitch (*Lavinia exilicauda chi*). Hatchery establishment, field collections and protocol development in Lake County.

Focused Rare Plant Surveys (various). Surveys in Calaveras, Kern, Napa, Sacramento, San Joaquin, Solano, Stanislaus, Tehama, and Yolo Counties.

Worker Environmental Awareness Protection Plans
Preparation and presentation of Worker Environmental Awareness Protection (WEAP) Plans for project which may have potential to impact Special status species and breeding birds in Kern, Solano and Yolo Counties.

Field Ecology

Putah and Cache Creek Plans, Yolo County, CA, Washoe County, and Lyon County NV - Technical Advisor on habitat analysis, restoration (and SMARA-equivalent) planning for Yolo County Resource Management Planning Area for Cache Creek, advisor for large-scale watershed restorations (and dam removal) on Putah Creek; and, restoration and management plans for the Pyramid Lake Paiute Reservation. Developed historic species lists for Cache Creek and Yerington region.

Pyramid Lake Paiute Tribe, Big Valley, Robinson, and Upper Lake Rancherias, in Washoe County NV and Clear Lake County, CA - Directed a multi-disciplinary lake and river research-management program for threatened and endangered species. Provided technical support for federal and state-listed species and those of tribal concern (Lahontan cutthroat trout, Cui-ui, Clearlake hitch, Sacramento perch, and tui chub), including managing 6 hatcheries, a water quality laboratory, and tagging programs.

Missoula County Riparian Inventory and Classification Project, Missoula County, MT - Co-funded, developed, and managed the Missoula County riparian inventory. Researched the integration of riparian and wetland vegetation, habitat, and stream classifications.

Confidential Client - Ethnographic study assessing cultural uses of plants, animal, insects and minerals.

Awards

Secretary of Defense, Environmental Award for Pyramid Lake Torpedo and Bombing Range Remediation Project, Team recipient. 2006.

George Bright Graduate Fellowship for academic achievement and exceptional service to the School of Forestry. 1994-1995.

Jesse M. Bierman Scholarship for academic achievement and potential in the life sciences. 1994.

Certifications

Hazardous Analysis and Critical Control Point: Aquatic Nuisance Species, USFWS
Constructed Wetland Designer; University of Wisconsin, Madison
40-CFR Hazardous Waste Handling

Grants

US Bureau of Reclamation, DTR. 2005

Fish and Wildlife Service, TLIP. 2012, 2011, 2010, 2009, 2005, 2004.

Natural Resources Conservation Service. 2004.

Publications, Presentations and Reports

Ringelberg, Erik. "California's Water Crisis: The Delta and Beyond." *California's Constitutional Crisis and Reclaiming the Public Good.* 2009. Heyday Books.

Ringelberg, Erik. "Stakeholder Involvement in Department of Energy Decision Making: A Stakeholder's Perspective." *American Nuclear Society*. 2002.

Invited Speaker:

"Large Scale Wetlands Mapping: New Technology and Databases" and "Mitigation and Restoration Challenges" for Lorman's: "Wetland Regulation in California" Sacramento, CA, 2014.

"Agricultural Impacts from Restoration Activities in the Delta." Watershed Education Foundation. Stockton, CA. 2014.

"Elk Slough Restoration and Flood Control Opportunities." Watershed Education Foundation. Sacramento CA. 2013.

"Lessons Learned from Stream Restorations in the Central Valley." Landscape Architecture Department. University of California, Davis. CA. 2013.

"Managing Project Environmental Risks" (co-presenter). 17th Annual Conference. American Public Works Association. Richmond, CA. 2013.

Ringelberg, Erik. "Riparian Restoration - Team Approaches." Landscape Architecture. University of California, Davis. CA. 2011. Lecture.

Ringelberg, Erik and Osha Meserve. "Habitat Conservation Planning and the Bay Delta Conservation Plan." UC Davis School of Law. University of California, Davis. CA. 2011.

Ringelberg, Erik and Dietrick McGinnis "Restoring a rare native fish, the Hitch *Lavinia exilicauda chi*: preliminary biology, ecology, and an initial adaptive management plan." Society for Ecological Restoration, Annual Conference. Mammoth, CA. 2010.

Ringelberg, Erik. "Applied Ecosystem Restoration." Wildlife, Fish and Conservation Biology, Habitat Conservation and Restoration. University of California, Davis. CA. 2009. Lecture.

Ringelberg, Erik. "Adaptive Management, principles and guidelines." Central Valley Regional Water Quality Control Board, Mercury TMDL and BPA Amendment. Stockton, CA. 2009. Lecture.

Ringelberg, Erik. "Hitch Ecology and Adaptive Management." Hinthil Environmental Resource Consortium. Middletown, CA. 2009. Lecture.

Ringelberg, Erik. "Hitch Ecology and Tagging Program." Chi Council. Lakeport, CA. 2009. Lecture.

Ringelberg, Erik. "Riparian Management, Cache and Putah Creeks." Restoring habitats Conference, Cache Creek Conservancy. Woodland, CA. 2009. Lecture.

Ringelberg, Erik. "Wetland Soils" and "Restoration, Construction, and General Principles: Lessons Learned." Ducks Unlimited Wetland Engineering Seminar. San Francisco, CA. 2008. Lecture.

Ringelberg, Erik. "Vernal Pool Establishment, a Multidisciplinary Approach." Society of Wetland Scientists. Sacramento, CA. 2007. Lecture.

Ringelberg, Erik. "Mercury Impacts on a Tribal Fisheries." Natives Impacted by Mining Conference, Reno, NV, 2005. Lecture.

Ringelberg, Erik. "Hatchery Program for Native Fish Species." Western States Water Council Conference and Desert Terminal Lakes Conference, Salt Lake City, UT 2005. Lecture.

Ringelberg, Erik. "Changing Directions in Tribal Fisheries." Lahontan Cutthroat Trout Interagency Meeting, Reno, NV 2004 and 2005. Lecture.

Ringelberg, Erik. "Riparian Ecology and Restoration" and "Riparian Ecology, Delineation, and Streamside Management Zones." University of Montana, School of Forestry, Missoula, MT, 1999. Lecture.

Ringelberg, Erik. "The Harlequin Duck, Habitat Use and Behaviors along a Rocky Mountain Stream." Joint Meeting of Montana Regional Society of American Foresters and The Wildlife Society, Missoula, MT, 1997. Lecture.

Research and educational work featured in Western Water: "Remnants of the Past: Management Challenges of Terminal Lakes,"; and, Sandstrom, Per (1996); Identification of potential linkage zones for grizzly bears in the Swan-Clearwater Valleys using GIS. M.Sc. Thesis; University of Montana; *Birder's World* article: "The Harlequin Duck"; *Wildbird* article, "Duck Tales" *Wildbird* article; untitled film depicting issues around water policy in the Sacramento-San Joaquin Delta, and, the film "The Innu vs. Inco at Voisey's Bay."

Technical Reports

Cache Creek Annual Assessment, Yolo County Board of Supervisors. 2011, 2010, 2009, and 2008.

Hitch Status in Clearlake's watershed. USFWS. 2011, 2010 and 2009.

10-year Management plan for the Lahontan cutthroat trout and the cui-ui. USFWS-PLPT. 2006

Erik Ringelberg – Ecological Services Group Manager

Inventory and Assessment of Bank Stabilization Projects on reaches of the Clark Fork River, Bitterroot River, Blackfoot River, Lolo Creek, and Nine Mile Creek in Missoula County, Montana. 2000.

Detailed Methods and Materials for the Inventory and Assessment of Bank Stabilization Projects. Missoula County 2000.

Unpublished Manuscripts

Ringelberg, Erik. "Assessment of Rosgen and Strahler Stream Classifications, Examination of the Relationships between Geomorphology and Riparian Habitat." 1999. Manuscript.

Ringelberg, Erik and Aldred-Cheek, Kristin, "Rural Community Collaborations, a Case Study in Western Montana." University of Montana. 1999. Manuscript.

Committees and Community Service

Riparian Ecologist - County of Yolo, Technical Advisory Committee. 2008-12. Woodland, CA.

Participant - Abandoned Mines Forum. 2006-present. Sacramento, CA.

Participant - Delta Tributaries Mercury Council. 2008-present. Sacramento, CA.

Commissioner - Regional Water Planning Commission. 2004-5. Reno, NV.

Member - Regional Stormwater Professional Advisory Group. 2004-5. Reno, NV.

Member - Lahontan Trout Recovery- FWS TRI Team. 2003-5. Reno, NV.

Tribal Observer - US Fish and Wildlife Service, Management Oversight Group. 2003-5. Reno, NV.

Member - Secretary of Energy Advisory Board, Alternatives to Incineration Committee, and Steering Committee for Stakeholder's Forum. 2001-2. Washington, D.C.

Participant - INEEL Long-Term Stewardship Program, St. Cloud State. 2001-2. Idaho Falls, ID.

Chair - Missoula City/County Water Quality Advisory Council. 1993-9. Missoula, NV.

Co-founder - Clark Fork Watershed Education Network. 1999-2001. Missoula, MT.

Member - Montana Watershed Council, and Montana Wetlands Council. 1994-2000. Helena, MT.

Ex-officio Board Member - Swan Ecosystem Center, 1999-2000. Beaverhead, Bighole, and Mineral County (MT) Advisory /Watershed Councils. 1998-2000.

Science Judge - Society of Wetland Scientists, Annual Student Projects. 2007. Sacramento, CA.

Science Judge - Preliminary and Final, Montana State Science Fair. 1995-9. Missoula, MT.

Science Judge - International Wildlife Film Festival. 1994-7. Missoula, MT.

Erik Ringelberg – Ecological Services Group Manager

Additional Technical Training

Special Status Amphibians and Reptiles of Northern California, University of California. 2008.

Vernal Pool Workshop, California Native Grasslands Association. 2007.

California *Anostracan* and *Notostracan* Identification Class and Practical Exam, Belk. 2006.

UCSB Vernal Pool Workshop, Society for Ecological Restoration. 2006.

Surface Mining Reclamation Act Lead Agency Training, Department of Conservation. 2006.

Planning and Promoting of Ecological Land Reuse of Remediated Sites**.** USEPA Interstate Technology and Regulatory Council, 2007.

Guidance for Characterization, Design Construction and Monitoring of Mitigation Wetlands. USEPA Interstate Technology and Regulatory Council, 2006.

Professional Organizations

California Invasive Plant Council

California Native Grasslands Association

California Society for Ecological Restoration

Society of Wetland Scientists

Native American Fish and Wildlife Society

Kurt Balasek, PG, CHG, QSD – Senior Hydrogeologist

Professional Background:

Mr. Balasek is the Sacramento Senior Hydrogeologist for BSK. He has more than 25 years of experience providing geologic, hydrogeologic and environmental consulting to western U.S. businesses and government agencies. His experience includes managing teams of scientists and engineers on projects ranging from large-scale brownfield developments, and CEQA compliance to third party consultation and groundwater studies. He has provided project management of water resource evaluations and conjunctive use studies, as well as numerous petroleum hydrocarbon-related soil and groundwater contamination investigations and remedial designs. Mr. Balasek has completed geologic hazard studies for proposed school sites in accordance with the Office of State Architect requirements and has completed detailed geologic surface mapping assignments in the foothills of the Sierra Nevada.

Mr. Balasek has spent his career working to evaluate hundreds of properties for the purposes of development, redevelopment and preservation as conservation easements. Conducting or leading these evaluations has given Mr. Balasek vast experience preparing site investigation strategies with an emphasis toward negotiating with regulatory agencies regarding future land use. Mr. Balasek has worked with redevelopment teams in numerous northern California cities and extensively under EPA community-wide assessment grants in the Cities of West Sacramento, Esparto, and Rancho Cordova. He has worked with local, State, and Federal agencies in evaluating a wide range of environmental, contaminanted and blighted sites, assessing community needs, and using tools to develop site cleanup goals. His skills of using land use covenants and maintenance tools provides for blighted property that have led to showcases community revitalization efforts. Mr. Balasek has completed numerous landfill characterization studies and provided detailed analysis to assist in consolidation and clean closure decision making.

Representative Project Experience:

City of Rancho Cordova, CA, Community Redevelopment Agency, Brownfield Assessments– Mr. Balasek provided senior management oversight on a community-wide assessment of over 460 properties in Rancho Cordova, California. Approximately 30 parcels warranting Phase I and/or Phase II Environmental Site Assessments (ESAs) were identified. To date, a Phase I and II ESA were conducted on two parcels of a planned community college campus.

Putah Creek Park North Bank Improvement Project- The North Bank Improvement Project stemmed from a federal appropriation of 2 million dollars to enhance the

Qualifications

Registrations:
Professional Geologist, California, No. 6162

Certified Hydrogeologist, California, No. 299

Education:
MS, Hydrogeology, California State University, Chico 1989

BA, Geology. University of California, Santa Barbara, 1985

Experience:
BSK Associates 2009

1991-2009, Wallace-Kuhl Director of Environmental Services

1989 – 1991 Terrestrial Tech. Senior Staff Hydrogeologist

Solano County Transportation Department's automobile bridge replacement at the City of Winters. The project funds are administered by **CalTrans** so extensive coordination with this agency regarding project description and permitting has been a substantial portion of this project. The project was developed by the City of Winters. Mr. Balasek and his team were initially tasked with obtaining the biological opinion for mitigation as it related to disturbance of Valley Elderberry shrubs. Instead of purchasing mitigation credits from a Service-approved mitigation bank, Mr. Balasek and his staff devises a unique plan to develop a small on-site mitigation area within the Winters Putah Creek Nature Park. If approved, the mitigation area will provide enough mitigation credits to offset the Solano County Bridge project, the north bank improvement project and a proposed pedestrian bridge. Money will be set aside for maintenance of the mitigation area in perpetuity but will enable the project proponents to mitigate habitat damage locally and keep local control of the money. To develop this plan, Mr. Balasek and his team developed the financial model to predict the amount of money required to establish a non-wasting endowment. This model was submitted to USFWS and is undergoing review. U.S. Representative Mike Thompson and his staff are involved in the project and are assisting with negotiations with USFWS.

Winters Putah Creek Park Revised Master Plan CEQA Support- Winters, CA- Mr. Balasek and his team prepared the Initial Study/Mitigated Negative Declaration (IS/MND) based on the revised master plan for Winters Putah Creek Park. This document was compiled in advance of implementing several projects outlined in the park master plan. The document was reviewed by the Winters City Council and adopted by the Winters planning commission without comment by the trustee agencies and with only one comment from the public. The document framed the foundation for environmental permitting for all of the following restoration-related projects.

City of West Sacramento, Housing and Community Investment Division, West Sacramento, CA– Mr. Balasek has managed several Environmental Projects for the City of West Sacramento, including: West Capitol Corridor Study, 427 "C" Street, Tower Court, Sacramento Generator, and Vlad's Toyota.

City of Winters PG&E Training Center, Winters CA– During critical property negotiations, due diligence studies revealed the historic presence of an underground fuel storage tank. Me. Balasek we retained by the City on an emergency basis to advise City Council and staff. Mr. Balasek mobilized BSK resources and conducted a comprehensive, soil, groundwater and soil vapor investigation on the site. Mr. Balasek also advised the City throughout the project and represented the City in numerous negotiations with PG&E. As a result of a well planned and executed investigation, a $70 million state-of-the-art training facility project is moving through the CEQA process and is scheduled to break ground late in 2015. This project is a huge success for the small City of Winters and will act as a catalyst for a downtown hotel project. Mr. Blazek's work in the field and at the negotiating table was a key part of the success of this project.

Stockton Worknet Center, Stockton, California– Provided project management for a contaminated site. The site characterization and remediation was funded by a State of California Brownfield Grant. The source of contamination was determined to have come from a pipeline located under railroad tracks. Removal and backfill of soil from an excavation that was 35 feet wide by 400 feet long was completed prior to construction of the new center.

River City Baseball – River Cats Stadium, West Sacramento, California- The site was located adjacent to a chemical mixing plant and as part of the owner's due diligence an environmental assessment was conducted. Contamination of volatile organics was determined and remediation followed. Based on these findings the foundation design was also adjusted to accommodate shallow groundwater. Based on Mr. Balasek's recommendation, Gorsorb™, a passive form of soil vapor testing, was used to delineate the contamination. A Risk Assessment report was provided to determine if the level of contamination exposure based on the properties intended use. All this work was completed at an accelerated pace to facilitate construction.

Colusa County, Three UST Sites, Colusa, California– Underground storage tanks at the County Sheriff's Department, Central Services, and County Jail were removed soil and water samples were tested for contamination. As project manager, Mr. Balasek managed the team who provided soil excavation and shallow groundwater monitoring for petroleum hydrocarbons. The three projects took place concurrently resulting in a cost savings to the county.

Sacramento International Airport Terminal Construction, Sacramento, California- - Mr. Balasek and his team installed monitoring wells and conducted aquifer performance tests in advance of massive dewatering efforts to facilitated construction at the new Sacramento International Airport Terminal project. Data developed from this study was used to quantify discharge volumes and evaluate water quality. The data was subsequently used as the basis for dewatering design related to a large basement structure extending approximately 17 feet below grade for the entire terminal building as well as subterranean tunnel structures. The new Sacramento Terminal opened in the fall of 2011.

Yolo Ranch Agricultural Landfill Remediation, Yolo County, California- Provided project management and oversight during landfill excavation and remediation. This project involved careful coordination with regulatory personnel from the Illegal Abandoned Landfill Group at the former California Integrated Waste Management Board to remove and/or encapsulate a wide range of ag-related waste in the Yolo ByPass. The work involved remediation and subsequent site closure of an agricultural landfill adjacent to sensitive natural habitats. This work was done as part of a property transaction and demonstrated creative problem solving that included an on-site solution which saved the client tens of thousands of dollars.

Butte County, California- Mr. Balasek and his team conducted the base-line hydrogeologic analysis of the site vicinity in support of the gravel mining permit application submitted to Butte County. Mr. Balasek's team also conducted the slope stability evaluations for the propose mine. Both technical documents were used to support an EIR commissioned by Butte County on behalf of the project proponent. In addition, Mr. Balasek's team provided consultation on pit capture and anadromous fish entrapment if high water resulted in overtopping of the pit. The work also involved analyzing resource data to identify the bottom of economically recoverable resource.

Cold Spring Rancheria, Tollhouse, California- Mr. Balasek oversaw the preparation of a comprehensive long range water development program for the Cold Springs Rancheria. This program examined available surface and groundwater resources, outlined potential problems with existing infrastructure and water rights and prioritized projects for improvement. Mr. Balasek and his staff also prepared a revised Quality

Assurance Assessment Plan (QAAP) for the Rancheria that outlined procedures for all field sampling activities. These plans were funded by the Bureau of Indian Affairs and are required planning documents in advance of project implementation funding.

Professional Organizations

American Society of Civil Engineers
Association of Environmental and Engineering Geologists
ASFE - Professional Firms Practicing in the Geosciences
Water Resource Association of Yolo County
Winters Education Foundation
City of Winters, Putah Creek Park Committee
Solano Resource Conservation District
Groundwater Resources Association of California

BSK

EXHIBIT 3

San Francisco Bay PCBs TMDL – Implementation at Cleanup Sites

PCB TOTAL MAXIMUM DAILY LOAD (TMDL)

Basin Plan section 7.2.3, San Francisco Bay Polychlorinated Biphenyls TMDL, should be considered during site investigations and cleanups throughout the Region, particularly but not exclusively at sites located on the Bay margin. Of particular concern, and often overlooked, is the fact that PCBs in surface soil can be mobilized by stormwater runoff and flow to the Bay.

Fish tissue PCB concentrations are the direct cause of impairment to the Bay, and therefore the numeric target of the TMDL is a fish tissue PCB concentration protective of human health. The TMDL's fish tissue screening level of 10 ng/g represents a ten-fold reduction in fish tissue PCB concentration. To achieve this, surface sediment PCB concentrations in San Francisco Bay must be reduced to an average of 1 ug/kg. The TMDL's wasteload allocations were developed with the goal of achieving a ten-fold decrease in PCB sources to the Bay.

Of the sources to the Bay, stormwater runoff contributes the greatest mass of PCBs. The PCB TMDL establishes a wasteload allocation for stormwater of 2 kg/yr total PCBs, which represents a ten-fold decrease over the current estimated load. In an effort to achieve this reduction, Bay Area municipalities are pilot-testing remedial actions in areas where street sediments contain PCBs in the 1 mg/kg range *before any remedial action is taken*. Municipalities will spend millions of dollars to achieve the ten-fold reduction in PCBs required by the TMDL.

ACHIEVING THE PCB ALLOCATION AT CLEANUP SITES

Stormwater runoff from sites containing residual PCBs in soils after state- and federal-ordered cleanup contributes to sediment concentrations in the Bay, and such contributions must be essentially eliminated in order to achieve the TMDL target. For cleanup sites, the TMDL calls for implementing "on-land source control measures, to ensure that on-land sources of PCBs do not further contaminate in-Bay sediments."

PCBs cleanups that occur in urban areas often have a cleanup goal based on protection of human health, and this can allow residual PCB concentrations close to or exceeding 1 mg/kg to remain in surface soils. **Regardless of the cleanup goal, it is important that cleanup sites do not contribute any PCBs to surface water runoff. Remedial actions should be conducted so as to eliminate <u>all</u> means of conveyance of PCBs from cleanup sites, including sediment runoff, vehicular drag out, and airborne dust**. Achieving this may require a durable cover of soil, hardscape, or structures to prevent surface exposure of PCBs. The goal is to have zero discharge of residual PCBs at cleanup sites.

PCBs in aquatic environments require cleanup to ecological risk-based concentrations that are generally much lower than the one mg/kg human health level. For example, a San Francisco Bay tidal marsh PCB cleanup concentration was established at 90 ug/kg PCBs to protect clapper rails.

RECOMMENDED PCB ANALYTICAL METHODS

Sampling and analyses are needed to confirm that PCB levels are low enough to achieve the TMDL targets. For cleanup sites in the San Francisco Bay area, the analytical method for PCBs in soils should be capable of detecting total PCBs ***well below*** 1 mg/kg dry weight and approaching 25 ug/kg dry weight for soil, with a high likelihood that all PCBs present in the sample are detected. The Water Board's own Surface Water Ambient Monitoring Program uses a Reporting Level of 0.2 µg/kg for most PCB congeners in sediment.

Analytical methods that we know will attain this data quality objective, and that we recommend using at all cleanup sites, include the following:

- EPA Method 8270D (semivolatiles in soils/waste) modified by EPA Method 1625. Method 1625 is the application of isotope dilution/recovery correction to GC/MS methodology. Total PCBs are determined by summing the individual congener results. Results can be reported as either, or both, congeners or aroclors. Ball-park cost for this analysis is $375/sample.[1]
- EPA Method 1668A or 1668C, which combine high-resolution GC with high-resolution mass spectrometry (HRGC/HRMS). Results are reported for all 209 congeners in µg/kg dry weight. Ball-park cost for this analysis is $800-900/sample.[1] An alternative is to use the same method, but report results for the 40 PCB congeners monitored by the SF Bay Regional Monitoring Program: PCBs 8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, l05, 110, 118, 128, 132, 138, 141, 149, l51, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, and 203. Cost for this alternative may be about 15% less than the full congener analysis.[1]
- Note that cleanups conducted under the authority of the Toxic Substances Control Act (TSCA) have their own PCB analysis requirements. Contact the U.S. Environmental Protection Agency, Region 9, TSCA staff or see http://www.epa.gov/Region9/pcbs/ for further information.

Other analytical methods (such as 8082) generally do not identify and quantify all the PCB congeners that may be present at a cleanup site, which can result in inadequate cleanups. Municipalities are finding PCBs in roads and gutters that may be traced back to "closed" cleanup sites that did not use reasonably rigorous analytical methods and/or cleanup standards.

Methods such as 8082 identify and quantify aroclors by gas chromatography (GC) with an electron capture detector (ECD). Each aroclor consists of a number of PCB congeners. The aroclor is identified by the retention times of the highest peaks in the chromatogram, and is quantified by comparing the height or area of those peaks to those of a pure aroclor standard. Between 5-8 aroclors are typically reported in an 8082 method, depending on the lab method used. Some high production aroclor mixtures, such as 1270 (almost 100% congener 209), are rarely included in the method. In addition, PCBs in the environment undergo volatilization, partitioning, chemical transformation, photo-degradation, and biodegradation over time. These changes confound the matching of an environmental sample to an aroclor pattern. **As a result, other analytical methods often do not measure the total PCBs present in an environmental sample, and we do not recommend relying on such methods at this time.**

[1] Axys Analytical, personal conversation. May 1, 2012.

CAULK SAMPLING & ANALYSIS[2]

Structures, especially non-residential buildings, constructed or renovated between 1950 and 1980 may have PCBs in caulking and other building materials. A local study found that PCBs are prevalent in the caulk in Bay Area buildings constructed during that timeframe. PCBs were detected in 88% of the caulk samples tested; 40% of the samples contained > 50 ppm PCBs and 20% contained > 10,000 ppm PCBs. Please refer to the study's project page for more information about PCBs in caulks and sealants.

The following methods are recommended for sampling and analyzing caulk and sealants suspected of containing PCBs: Remove a one inch strip (or ~10 g) of the sealant sample from the structure using a utility knife with a solvent-rinsed, stainless-steel blade. Collect one sealant sample per sealant type on each structure to fully characterize the PCB content in the structure's sealants.

PCBs can be present in the percentage range in caulk, so a high resolution method is not necessary. EPA Method 8270 (semi-volatile organic compounds by gas chromatography-mass spectrometry) is appropriate. Report analytical results as the total of 209 PCB congeners, or the shorter list of 40 congeners above may be used.

BMPs for Controlling PCBs

Best management practices (BMPs) for controlling PCBs during removal from structures can be found at http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/caulkcontractors.htm.

BMPs for controlling sediment during site grading and other construction activities are available at http://cfpub.epa.gov/npdes/stormwater/swppp.cfm.

[2] Further information on PCB-containing caulks and sealants can be found at http://www.sfestuary.org/projects/detail.php?projectID=29 and http://www.epa.gov/pcbsincaulk/.

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EXHIBIT 4

To Mission Bay Alliance Comment Letter dated July 24, 2015

Re: Hydrology, Water Quality and Biological Impacts - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

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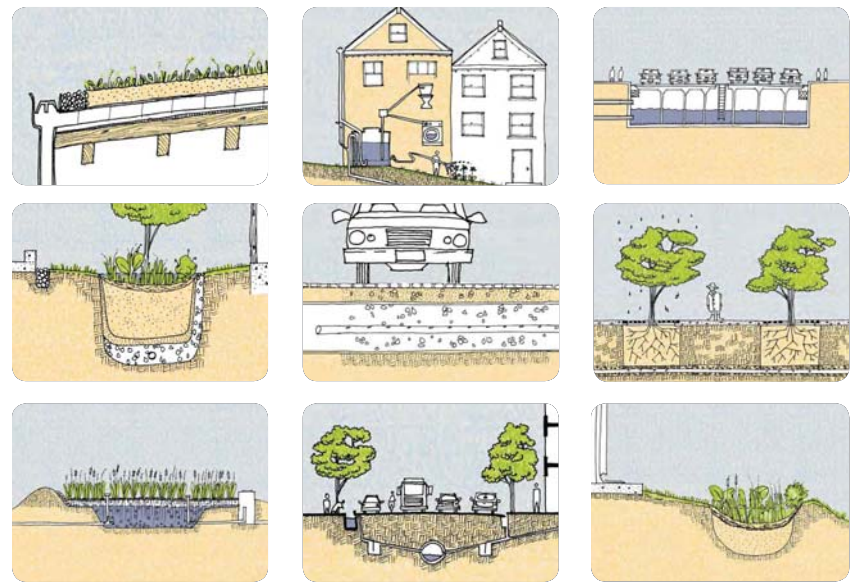
EXHIBIT 4



SAN FRANCISCO
stormwaterdesignguidelines

November 2009 Version - Updates and errata will be published as necessary

SAN FRANCISCO stormwater design guidelines

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ACKNOWLEDGEMENTS

The *San Francisco Stormwater Design Guidelines* team would like to thank the Phase I cities that have gone before us and have graciously shared their wisdom, their support, and the many valuable lessons they have learned. We are particularly grateful for the examples set by the counties of Contra Costa and Santa Clara, California and the Cities of Emeryville, California; Portland, Oregon; and Seattle, Washington.

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CONTENTS

San Francisco Stormwater Design Guidelines

Stormwater management is a critical municipal responsibility that has a direct impact on public health and safety, surface water quality, and wildlife habitat.

Like many California municipal agencies, the San Francisco Public Utilities Commission (SFPUC) and the Port of San Francisco administer Stormwater Management Programs developed in accordance with the federal Clean Water Act and a State of California National Pollution Discharge Elimination System (NPDES) Permit.

NPDES permits for stormwater specify a suite of activities that municipalities must undertake to reduce pollution in stormwater runoff. One of these is the development, implementation, and enforcement of a program to reduce pollutants in stormwater runoff from new development and redevelopment projects. This effort is commonly referred to as a *post-construction stormwater control program*.

In February 2007, Port and SFPUC staff initiated a community planning effort to develop a regulatory guidance document that fulfills state and federal requirements for post-construction stormwater runoff control. The San Francisco Stormwater Design Guidelines (*Guidelines*) represent the culmination of this effort. The *Guidelines* describe an engineering, planning, and regulatory framework for designing new infrastructure in

Linked bioretention cells are a central part of the design for the Glashaus development in Emeryville, CA.

a manner that reduces or eliminates pollutants commonly found in urban runoff. The *Guidelines* are designed to work within the context of existing San Francisco regulations and policies, and are consistent with the City's and Port's Building Code and Planning Code requirements.

The *Guidelines* are currently directed primarily to San Francisco's **separate storm sewer areas**, which include the Port of San Francisco, Hunters Point Shipyard, Mission Bay, Treasure Island, Candlestick Point, and areas that discharge to inland receiving waters such as Lake Merced. However, the thresholds presented here and the general strategies described to achieve compliance also apply to **combined sewer areas**. While the thresholds and strategies are the same for both combined and separate sewers, the performance measures are different. For information about requirements in combined sewer areas, see page 62.

Low Impact Design

In keeping with San Francisco's policy goals for promoting sustainable development, the *Guidelines* encourage the use of Low Impact Design (LID) to comply with stormwater management requirements. LID applies decentralized, site strategies to manage the quantity and quality of stormwater runoff. LID integrates stormwater into the urban environment to achieve multiple goals. It reduces stormwater pollution, restores natural hydrologic function to San Francisco's watersheds, provides wildlife habitat, and contributes to the gradual creation of a greener city. LID can be integrated into all development types, from public open spaces and recreational areas to high-density housing and industrial areas.

Master-planned or Multi-Parcel Projects

Many future projects in San Francisco will be located in large redevelopment areas and will include construction of significant horizontal infrastructure and open space in addition to subdivided parcels and individual buildings. Master-planned projects, such as Treasure Island, Hunters Point Shipyard, and the Port's Sea Wall Lot 337, can make use of larger LID strategies that provide superior treatment, wildlife habitat, recreational amenities, and other benefits that may not be possible with smaller projects. Constructed wetlands and large-scale rainwater harvesting are just a few examples of LID strategies presented in these *Guidelines* that are ideally suited to large projects.

Using the Stormwater Design Guidelines

The *Guidelines* are intended to lead developers, engineers, and architects through a planning and design process that incorporates stormwater controls into site design. The *Guidelines* provide a policy overview, describe the regulatory context for post-construction stormwater control requirements, and explain how these requirements will be incorporated into San Francisco's planning and permit review process.

The *Guidelines* introduce the stormwater performance measures that must be achieved for project approval and provide detailed instructions for developing a Stormwater Control Plan (SCP), a document which will allow city staff to assess compliance. A worked example illustrates how to complete each step in the design process, and a template for the SCP is included at the end of the document. The *Guidelines* include compliance strategies, a decision tree to assist in the selection of stormwater controls, and spreadsheets for sizing stormwater controls. The requirements outlined in the *Guidelines* are of a technical nature and most project applicants will require the assistance of a qualified civil engineer, architect, or landscape architect in order to comply.

Every applicant seeking a building permit or every project that requires compliance with California Environmental Quality Act (CEQA) process on or after **January 1, 2010** for a new or redevelopment project over 5,000 square feet must complete a SCP showing that they have incorporated appropriate stormwater controls into their project and have met the stormwater performance measures described in these *Guidelines*. SFPUC and Port permit staffs will review SCP submittals for adequacy.

Native plants in bloom in the swales at the Sunset Circle parking lot, an LID feature that protects the water quality of Lake Merced.

Introduction

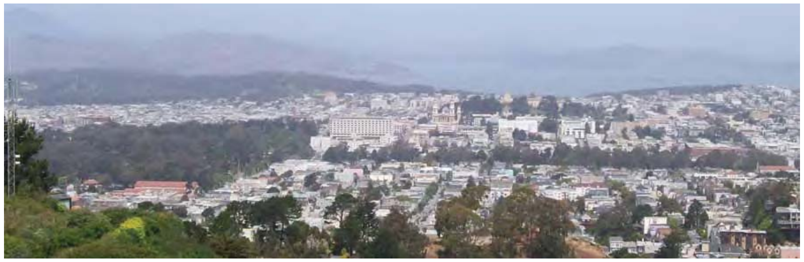
San Francisco's location adjacent to the Pacific Coast and San Francisco Bay, the largest estuary on the west coast of the United States, gives the City significant environmental, social, and economic advantages; it also confers unique responsibilities for water quality protection upon the City and its citizens.

The San Francisco Public Utilities Commission (SFPUC) and the Port of San Francisco (Port) have partnered to create the *San Francisco Stormwater Design Guidelines* (*Guidelines*) for San Francisco's developers, designers, engineers, and the general public. The *Guidelines* are designed to help project applicants implement permanent post-construction stormwater controls. Water quality regulations under the federal Clean Water Act require such controls for new and redevelopment projects in areas served by municipal separate storm sewer systems (MS4s).

While water quality protection is the fundamental driver behind stormwater management, well-designed stormwater controls offer many ancillary benefits. These *Guidelines* encourage innovative and multi-purpose design solutions for meeting stormwater requirements in San Francisco's urban setting. In addition to protecting water quality, well-designed multi-purpose solutions will contribute to attractive civic spaces, open spaces, and streetscapes. They will also protect and enhance wildlife habitat and have the potential to effectively integrate stormwater management into the redevelopment of historic sites.

By implementing the stormwater management strategies articulated in this document, each project applicant will contribute to the incremental restoration of the health of the City's watersheds, protect the Bay and Ocean, and build a greener San Francisco. Patrick Condon, Chair in Landscape and Livable Environments at the University of British Columbia, underscores the contribution that each site can make to a region: "What the cell is to the body, the site is to the region. And just as the health of the body is dependent on the health of the individual cells that make it up, so too is the ecological and economic health of the region dependent on the sites that comprise it."

The *Guidelines* function as both policy document and design tool. They explain the environmental and regulatory drivers behind stormwater management, demonstrate the concepts that inform the design of stormwater controls, describe the benefits that green stormwater infrastructure bring to San Francisco, and take project applicants through the process of creating a Stormwater Control Plan (SCP) to comply with stormwater regulations. The *Guidelines* are specific to San Francisco's environment; they reflect the city's density, climate, diversity of land uses, and varying topography.



Regulatory Context

The federal Clean Water Act (CWA) establishes the foundation for stormwater regulation across the country. State, regional, and municipal laws and policies under the CWA help to ensure that San Francisco's stormwater requirements are appropriate to the city's geography, climate, and development patterns.

The Clean Water Act

In 1972, Congress passed the Clean Water Act (CWA) to regulate the discharge of pollutants to receiving waters such as oceans, bays, rivers and lakes. Under the CWA, waste discharges from industrial and municipal sources are regulated through the National Pollutant Discharge Elimination System (NPDES) Permit Program. Approximately 90% of San Francisco is served by a **combined sewer system** (see map on page 10) that conveys both sewage and stormwater for treatment to three sewage treatment plants before being discharged to receiving water. Discharges from the treatment plants are subject to the requirements of NPDES permits.

Stormwater runoff, now recognized by the United States Environmental Protection Agency (EPA) as a leading contributor to water quality degradation in the United States, was unregulated until 1987 when section 402(p) was added to the CWA. Section 402(p) established a two-phase plan to regulate polluted stormwater runoff under NPDES. The Phase I permits, finalized in 1990, regulate **municipal separate storm sewer systems (MS4s)** serving populations of 100,000 or more. Stormwater discharges associated with certain types of industrial facilities and construction sites greater than five acres are also

Note: Map currently undergoing annual review. An updated version will be available in Janurary 2010.

San Francisco Public Utilities Commission
The Port of San Francisco
Redevelopment areas (various owners)

Figure 1. *Separate storm sewer areas and jurisdictions*

Best Management Practices

Stormwater Best Management Practices (BMPs) are measures or programs used to reduce pollution in stormwater runoff. The EPA defines a BMP as a "technique, measure or structural control that is used for a given set of conditions to manage the quantity and improve the quality of stormwater runoff in the most cost-effective manner."

regulated under Phase I. Phase II permits, finalized in 2000, regulate MS4s serving populations of 100,000 or less.

The California State Water Resources Control Board (SWRCB) serves as the implementing agency for NPDES regulations. In 2003, the SWRCB issued the *General Permit for Discharges of Stormwater from Small Municipal Storm Sewer Systems* (General Permit) to regulate small MS4s. San Francisco's MS4 areas cover approximately 10% of the City and serve fewer than 100,000 people. They are therefore subject to Phase II requirements in the General Permit.

The General Permit

To comply with NPDES Phase II regulations, the General Permit requires agencies holding the Phase II NPDES Permit (SFPUC and Port) to develop Stormwater Management Plans (SWMPs) describing the measures that will be implemented to reduce pollution in stormwater runoff in the MS4 areas.

The General Permit requires Permittees to implement four measures for post-construction stormwater management in new and redevelopment projects located in areas served by separate sewers:

1. Develop, implement, and enforce a program to address stormwater runoff from new and redevelopment projects to ensure that controls are in place to prevent or minimize water quality impacts;
2. Develop and implement stormwater management strategies, including a combination of structural and/or non-structural best management practices (BMPs) appropriate for the community;
3. Use an ordinance or other regulatory mechanism to control post-construction runoff from new and redevelopment projects to the extent allowable under the law; and,
4. Ensure the adequate long-term operation and maintenance of BMPs.

Under the General Permit, Permittees have two options for adopting the post-construction stormwater management requirements listed above. The first is to use the minimum design standards listed in Attachment 4 of the Phase II General Permit as a framework for administering post-construction control programs (http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/final_attachment4.pdf).

The second option for compliance is for Permittees to develop a functionally equivalent program that is acceptable to the San Francisco Bay Regional Water Quality Control Board (RWQCB). The Port and the SFPUC have chosen to pursue the latter option by implementing these *Guidelines*, which are largely based on the C.3 Provision of the San Francisco Bay Area Phase I stormwater permits. The C.3 requirements are similar to those in the General Permit, but require more effort on the part of the Permittee to develop a post-construction control program suitable for its climate, geography and development patterns.

Effective January 1, 2010, these *Guidelines* will apply to all projects greater than 5,000 square feet in the City of San Francisco. The *Guidelines* **do not** apply to those projects that have received 1) building permits and/or 2) discretionary approvals by the San Francisco Planning Department, the San Francisco Department of Building

Project Type	Excluded Projects
Commercial, industrial or residential development	Projects with fewer than 5,000 square feet of developed area that are not part of a larger common plan of development.
Single family residential development	Construction of one single family home that is not part of a larger common plan of development and is fewer than 5,000 square feet, with the incorporation of appropriate source control measures, and using landscaping to appropriately treat runoff from impervious surfaces.
Redevelopment and repair projects	Interior remodels and routine maintenance and repair, such as roof replacement, exterior painting, utility trenching and repair, pier apron repair and pile replacement, pavement resurfacing, repaving and structural section rehabilitation within the existing footprint.
Parking lots	Parking lots of fewer than 5,000 square feet.

Table 1. *Projects excluded from Stormwater Design Guidelines requirements*

Requirement

All project sites with an area greater than 5,000 square feet must incorporate post-construction stormwater controls that meet the performance measures set forth in these *Guidelines*, including minimizing the sources of stormwater pollutants (see Source Controls, beginning on page 75) and treating a specified flow or volume of stormwater (see Treatment BMPs, beginning on page).

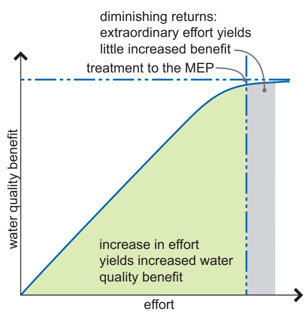


Figure 2. *As the maximum extent practicable (MEP) standard is approached, additional investment in BMPs yields reduced benefit.*

Inspection, the Port of San Francisco Planning Division, or the Port Building Department by January 1, 2010. All new project applications, incomplete project applications, and amendments received thereafter will be subject to these *Guidelines*. Table 1 lists the types of projects that are excluded from the *Guidelines*.

The RWQCB monitors San Francisco's implementation of General Permit requirements. The Port and the SFPUC must submit ongoing reports on their respective development review efforts, the number and type of projects reviewed, and the stormwater control measures included in the projects. To assess the effectiveness of stormwater control measures, the Port and SFPUC must define criteria for compliance. The RWQCB and the EPA require that stormwater control measures be designed to reduce pollution in stormwater runoff to the Maximum Extent Practicable (MEP).

The Maximum Extent Practicable Treatment Standard

MS4 permits require stormwater management strategies to "reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods."

Treatment to the maximum extent practicable (MEP) can be achieved by applying the BMPs that are most effective at treating pollutants in stormwater runoff. The SWRCB has said of the MEP standard that there "must be a serious attempt to comply, and practical solutions may not be lightly rejected." The SWRCB also states that if project applicants implement only a few of the least expensive stormwater BMPs, it is likely that the MEP standard has not been met. If, on the other hand, a project applicant implements all applicable and effective BMPs except those shown to be technically infeasible, or those whose cost would exceed any benefit to be derived, then the project applicant would have achieved treatment to the MEP. As technology and design innovation improve, stormwater BMPs become more effective. The definition of MEP continually evolves with the field to encourage innovation and improved water quality protection. Because of this, some end-of-pipe strategies such as vortex separators, which were considered to meet the MEP standard ten years ago, are no longer accepted as such. Similarly, in cases where just one BMP may have gained project approval in the past, today there are many cases where multiple BMPs will be required in order to achieve treatment to the MEP.

Pollutants of Concern

Because stormwater runs off of diverse sites, it mobilizes many kinds of pollutants. The following list summarizes the main categories of pollutants found in stormwater, their sources, and their environmental consequences.

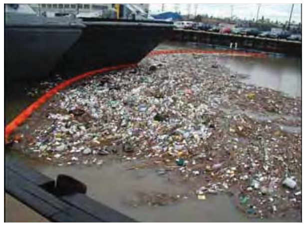
Gross pollutants mobilized by stormwater include litter, plant debris and floatable materials. Gross pollutants often harbor other pollutants such as heavy metals, pesticides, and bacteria. They also pose their own environmental impacts; they degrade wildlife habitat, water quality, the aesthetic quality of waterways, and are a strangling and choking hazard to wildlife.

Sediment is a common component of stormwater runoff that degrades aquatic habitat and can be detrimental to aquatic life by interfering with photosynthesis, respiration, growth, reproduction, and oxygen exchange. Construction sites, roadways, rooftops, and areas with loose topsoil are major sources of sediment. Sediment is a vehicle for many other pollutants such as trace metals and hydrocarbons. Over half the trace metal load carried in stormwater is associated with sediment. Because of this, sediment removal is a good indicator for reduction of a broader range of pollutants. For the purpose of developing stormwater controls, engineers and designers must consider both coarse and fine ("suspended") sediments.

Oil and grease include a wide range of organic compounds, some of which are derived from animal and vegetable products, others from petroleum products. Sources of oil and grease include leaks and breaks in mechanical systems, spills, restaurant waste, waste oil disposal, and the cleaning and maintenance of vehicles and mechanical equipment.

Nutrients like nitrogen and phosphorous are typically used as fertilizers for parks and golf courses and are often found in stormwater runoff. They can promote excessive and accelerated growth of aquatic vegetation, such as algae, resulting in low dissolved oxygen. Un-ionized ammonia, a form of nitrogen, can be toxic to fish. In San Francisco, nutrients carried in runoff are a significant concern for enclosed freshwater bodies such as Lake Merced, more so than they are for the San Francisco Bay and Pacific Ocean.

Oils and gross pollutants pose a significant threat not only to water quality but also to bay area wildlife.



Stormwater runoff transports trash to local water bodies, where it creates an aesthetic nuisance, harms wildlife, and pollutes receiving waters.

Pesticides (herbicides, fungicides, rodenticides, and insecticides) are often detected in stormwater at toxic levels, even when they have been applied in accordance with label instructions. As pesticide use has increased, so have concerns about their adverse effects on the environment and human health. Accumulation of these compounds in simple aquatic organisms, such as plankton, provides an avenue for biomagnification through the food web, potentially resulting in elevated levels of toxins in organisms that feed on them, such as fish and birds.

Organics can be found in stormwater in low concentrations. They include synthetic compounds associated with adhesives, cleaners, sealants, and solvents that are widely used and are often stored and disposed of improperly.

Bacteria can enter stormwater via sources such as animal excrement, decay of organic materials, and combined sewer discharges. High levels of bacteria in stormwater runoff can lead to beach closures and fishing advisories.

Dissolved metals including lead, zinc, cadmium, copper, chromium, and nickel are mobilized by stormwater when it runs off of surfaces such as galvanized metal, paint, automobiles, and preserved wood, whose surfaces corrode, flake, dissolve, decay, or leach. Metals are toxic to aquatic organisms, can bioaccumulate in fish and other animals, and have the potential to contaminate drinking water supplies.

PCBs and Mercury are legacy contaminants that are found in low concentrations in soils associated with historically industrialized areas. San Francisco Bay is listed by the USEPA as an "impaired water body" for these contaminants. Control of PCBs and mercury will be implemented through design measures that limit the mobilization of these pollutants in contaminated soils.

Synergy with other Regulations and Initiatives

The *Guidelines* are designed to work with San Francisco's existing and emerging regulatory programs and policies. For example, development along the San Francisco waterfront is subject to policies adopted by the Port of San Francisco and the San Francisco Bay Conservation and Development Commission (BCDC); the *Guidelines* are consistent with these policies. Federal, state, and local regulations most relevant to the *Guidelines* are shown in Table 2 at the end of this section.

There are three initiatives underway in San Francisco that directly affect stormwater management in the City and that propose policies parallel to those presented in these *Guidelines*: the *Sewer System Master Plan*, the *Better Streets Plan*, and the Green Building Ordinance. These mutually-supportive efforts are consistent with the stormwater management goals and requirements put forward here.

The SFPUC's *Sewer System Master Plan* (Master Plan) is a comprehensive plan that charts a long-term vision and strategy for the management of the City's wastewater and stormwater. The Master Plan is intended to maximize system reliability and flexibility and to lay a path for capital investment and management of the City's infrastructure for the next 30 years. The Master Plan presents Low Impact Design (LID) as a major tool for addressing the City's drainage management needs. LID is an innovative stormwater management approach that is modeled after nature: it advocates managing runoff at its source using decentralized micro-scale facilities. The Master Plan contains protocols for using LID in ongoing repair and replacement projects as a part of its overhaul of drainage infrastructure.

The *Better Streets Plan* is a collaborative effort between the SFPUC, the Planning Department, the Public Works Department, the City's transit agencies, and other relevant agencies, to create a unified set of standards, guidelines, and implementation strategies that will govern how the City designs, builds, and maintains the public rights-of-way. The goal of the *Better Streets Plan* is to update applicable standards to improve pedestrian safety, enhance landscaping, and identify innovative methods for reducing stormwater runoff from the streets and sidewalks to create a more attractive and sustainable public realm in San Francisco.

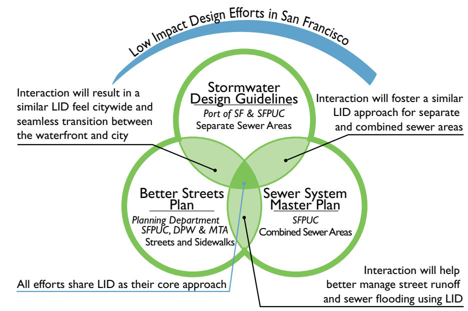


Figure 3. *LID is the common thread linking a number of major planning efforts currently underway in San Francisco.*

A cistern at Mills College in Oakland, CA is a stormwater BMP and a design element. Photo: Ingrid Severson

The Green Building Ordinance is a third initiative that will work in tandem with the *Guidelines*. The ordinance expands the scope of green building standards to apply not only to public buildings but also to private development and redevelopment projects in San Francisco. The task force was charged with creating building requirements that would foster environmentally sensitive design and sustainability in new development projects. As a part of this effort, SFPUC and Port staff developed stormwater management performance standards for new and redevelopment projects over 5,000 square feet. The Ordinance references the *Guidelines* and provides the regulatory authority to implement stormwater management requirements in combined sewer areas.

San Francisco Building Code Requirements

Projects that are implementing the *Guidelines* will also be subject to review by the San Francisco Department of Building Inspection (DBI) or the Port Building Department. Both DBI and the Port administer building codes that include provisions for managing drainage for new construction. Section 306.2 of the San Francisco Plumbing Code and Section 1506.1 of the San Francisco Building Code were amended on June 28, 2005 to allow roofs and other building areas to drain to locations other than the combined sewer. The 2005 amendments anticipated LID strategies such as downspout disconnection and rainwater harvesting, which are described in the *Guidelines*.

They now read as follows:

- **Plumbing Code, Section 306.2:** Roofs, inner courts, vent shafts, light well, or similar areas having rainwater drains shall discharge directly into a building drain or sewer, or to an approved alternate location based on approved geotechnical and engineering designs.
- **Building Code, Section 1506.1:** All storm or casual water from roof areas which total more than 200 square feet shall drain or be conveyed directly to the building drain or storm drain or to an approved alternate location based on approved geotechnical and engineering design. Such drainage shall not be directed to flow onto adjacent property or over public sidewalks. Building projections not exceeding 12 inches in width are exempt from drainage requirements without area limitations.

San Francisco Stormwater Design Guidelines

In the amended codes listed above, "approved alternate location" is the key phrase that allows for downspout disconnection and encompasses all properly designed stormwater management facilities, including rain barrels or cisterns.

In 2008, the SFPUC, DBI, and the Department of Public Health (DPH) signed a Memorandum of Understanding (MOU) for Rainwater Harvesting Systems. The MOU records a technology-based agreement between the three agencies, which concludes that project applicants can safely harvest rainwater and use it for non-potable applications such as toilet flushing, irrigation, and vehicle washing without treating it to potable standards. More detailed specifications and permitting requirements for rainwater harvesting can be found on the "Rainwater Harvesting" fact sheet in Appendix A.

An interior roof drain discharges to a vegetated swale in Emeryville, CA. This properly designed and permitted stormwater facility is an example of an "approved alternate location" for stormwater discharge.

Regulatory Context

Name/Title	Administered By	Summary
FEDERAL REQUIREMENTS		
National Pollutant Discharge Elimination System (NPDES) Phase II General Permit	California Regional Water Quality Control Board (RWQCB)	Requires municipalities to develop programs to control runoff pollution from both new and redevelopment projects. The *Guidelines* provide standards and guidance to implement the requirements of the Phase II Municipal General Permit.
NPDES Industrial Permits	RWQCB	Requires facilities subject to the requirements of the Industrial Permit to implement BMPs to prevent or reduce pollution in stormwater runoff. Newly constructed industrial facilities over 5,000 square feet must implement post-construction controls per requirements of the *Guidelines* .
Federal Clean Water Act 401 Certification	RWQCB	The RWQCB must certify that construction projects taking place in or over federal and state water bodies do not negatively impact water quality. The *Guidelines* will help project proponents comply with post-construction stormwater control requirements often included as conditions of 401 certification.
303(d) Impaired Water Bodies - Clean Water Act - Total Maximum Daily Load (TMDL) Program	RWQCB	San Francisco Bay and other water bodies are impaired by pollutants such as mercury and PCBs. TMDLs require pollutant sources to reduce levels of pollutant loading associated with water quality impairment. Stormwater treatment control selection should consider TMDL pollutant removal.
Secretary of the Interior's Standards for the Treatment of Historic Properties	National Park Service/California State Office of Historic Preservation	In order to qualify for Federal Rehabilitation Tax Credits, construction within designated Historic Districts must avoid or minimize changes that would adversely affect an historic resource's character defining features. Stormwater management measures selected for a given project must comply with these standards as applicable.
Americans with Disabilities Act (ADA) California Code of Regulations Title 24	San Francisco Department of Building Inspection (DBI) San Francisco Department of Public Works (SFDPW)	The ADA establishes requirements for accessibility to places of public accommodation and commercial facilities by individuals with disabilities. Stormwater management measures described in the *Guidelines* must accommodate ADA requirements, including curb ramp standards promulgated through SFDPW Order No. 175,387. Treatment controls located in the public right-of-way must comply with ADA architectural guidelines.
STATE REQUIREMENTS		
California Environmental Quality Act (CEQA)	San Francisco Planning Department	A process to review new and redevelopment projects for potential impacts to the environment and, as necessary, propose mitigation measures to substantially lessen the project's significant environmental effects. The *Guidelines* include measures that will substantially reduce water quality and hydrological impacts associated with new and redevelopment projects.
REGIONAL REQUIREMENTS		
San Francisco Bay Basin Plan	RWQCB	Designates the beneficial uses and water quality objectives designed to protect those beneficial uses for state waters in the San Francisco Bay Region. Stormwater management measures described in the Guidelines promote restoration and maintenance of beneficial uses for waters in and around San Francisco.
San Francisco Bay Sea Port Plan and San Francisco Special Area Plan Maritime Commerce, Land Use and Public Access	San Francisco Bay Conservation and Development Commission (BCDC)	Policies that guide BCDC regulation within 100 feet of the shoreline edge, including most of the Port's piers. Policies are geared to limiting Bay fill, protecting water quality, and encouraging maximum feasible public access that does not impact commercial maritime activities. Wherever practical projects should retain or restore native vegetation buffer zones, rather than hardscape shoreline development. Applicable to waterfront development within 100' of the shoreline. Stormwater management measures described in the *Guidelines* are consistent with BCDC policy goals.

Table 2. *Relevant jurisdictions, codes, and ordinances*

Name/Title	Administered By	Summary
SAN FRANCISCO REQUIREMENTS		
San Francisco Public Works Code	San Francisco Department of Public Works - Bureau of Streets and Mapping (SFDPW-BSM)	SFDPW-BSM permits and approves all work in the public right-of-way, streets and sidewalks (including paper streets). Permits tree-lawns and planting strips. Permits sidewalk, curb and gutter, pavement, or any other facilities in the public right-of-way improvements. Stormwater management measures described in the *Guidelines* must satisfy Public Works Code requirements for design and construction within the public right-of-way.
San Francisco Public Works Code	San Francisco Department of Public Works - Bureau of Hydraulics	San Francisco Department of Public Works - Bureau of Engineering provides technical review on behalf on the San Francisco Public Utilities Commission (SFPUC), and designs and contracts sewer improvements. Stormwater management measures described in the Guidelines must comply with engineering standards administered by San Francisco Department of Public Works - Bureau of Hydraulics.
San Francisco Better Streets Master Plan	Mayor's Office of Greening, San Francisco Planning Department, DPW, Municipal Transportation Agency, and the SFPUC	Guides design and construction within the public right-of -way and streets. Stormwater management measures proposed in the *Guidelines* are consistent with those considered in the *Better Streets Plan* . For design standards applicable to stormwater, the *Guidelines* will take precedence.
Waterfront Land Use Plan - Waterfront Design and Access Element	Port of San Francisco	Guides the physical form of the waterfront revitalization envisioned in the *Port Waterfront Land Use Plan;* provides guidance on public access and waterfront accessibility, planting (both the presence and type of vegetation), protection and preservation of historic resources; and defines distinct geographic areas wherein specific design criteria apply.
Recycled Water Policy	San Francisco Department of Public Health (DPH)	Recycled water must be treated to Title 22 standards, which differ according to the proposed use of the water.
Rainwater Harvesting Policy	Department of Building Inspection (DBI), SFPUC, and the DPH	Rain barrels less than 100 gallons may be installed without a permit if they are used for irrigation and not connected to indoor or outdoor plumbing. Permits must be obtained from DBI for rainwater harvesting systems over 100 gallons that are connected to indoor or outdoor plumbing and are used for irrigation or toilet flushing. Rainwater harvesting systems for indoor uses other than toilet flushing must obtain permits from DBI and DPH.
Greywater Policy	DBI and the DPH	Untreated greywater may be used for subsurface irrigation. For all other uses, greywater must be treated to Title 22 standards, which differ according to the proposed use of the water.
Plumbing and Connections	DBI	The Plumbing Inspection Division (PID) of DBI is responsible for assuring, through permitting and inspection, the proper functioning for installations of drainage, water, gas, and other mechanical systems covered in the Plumbing and Mechanical Codes. These inspections are carried out in buildings that are newly constructed, remodeled, or repaired. Stormwater management measures must be implemented in a manner that satisfies DBI requirements.
San Francisco Planning Code, Article 10	San Francisco Planning Department, Landmarks Preservation Advisory Board and the City Planning Commission	Exterior alterations to San Francisco properties that are designated local landmarks will be reviewed for consistency with requirements set forth in the Secretary of the Interior's Standards for the Treatment of Historic Properties. Stormwater management measures described in the *Guidelines* must comply with Article 10 and the Secretary Standards.
San Francisco Health Code, Article 22A	DPH	The Maher Ordinance regulates construction and post-construction activities for properties constructed on fill materials adjacent to the historic Bay shoreline. Much of the waterfront and other areas in San Francisco are subject to the Maher Ordinance. Soil and groundwater in areas of the San Francisco Waterfront subject to the Maher Ordinance may contain pollutants that preclude the use of stormwater treatment controls using infiltration.

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Boardwalks provide access across waterfront bioretention facilities in Seattle, WA.

Before San Francisco developed into the thriving city it is today, it consisted of a diverse range of habitats including oak woodlands, native grasslands, riparian areas, wetlands, and sand dunes. Streams and lakes conveyed and captured rainwater. Wetlands lined the Bay and functioned as natural filtering systems and as buffers from major storms. Rainwater infiltrated into the soil, replenishing groundwater supplies and contributing to stream base flow.

The Urban Watershed

Watershed function

Today, impervious surfaces such as buildings, streets, and parking lots have covered most of the City, preventing rainfall infiltration. Over time, creeks were buried and connected to the sewers, and wetlands were filled. Instead of percolating into soils, runoff now travels over impervious surfaces, mobilizes pollutants like oil and debris, and washes them into the sewer system or receiving water bodies—creeks, lakes, San Francisco Bay, and the Pacific Ocean. During heavy rain events, stormwater runoff can contribute to localized flooding, combined sewer discharges, and the degradation of surface water quality. Moreover, the decrease in infiltration resulting from paved surfaces contributes to groundwater depletion. LID can help to mitigate these adverse effects. With every project contributing incremental improvements, San Francisco can work toward restoring natural hydrologic function in its urban watersheds.

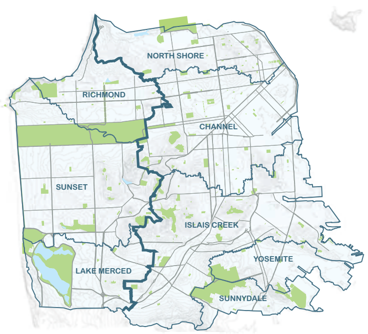


Figure 4. *San Francisco's topography divides the Westside Basins from the Eastside Basins.*

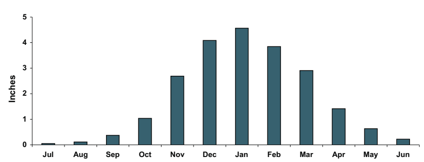


Figure 5. *Average monthly rainfall for San Francisco.*
Source: National Weather Service Gage, Federal Office Building, July 1907 to June 1978

Environment

San Francisco is roughly divided into two major drainages: the eastern and western basins (see Figure 4). These are comprised of eight major sub-basins containing diverse urban neighborhoods with a range of residential, commercial, and industrial land uses, open spaces, and natural areas. Each sub-basin is underlain with unique topography, hydrology, soils, vegetation and water resources that create opportunities and challenges for drainage and stormwater management.

San Francisco has a temperate Mediterranean climate, with dry summers and rainy winters (see Figure 5). In a typical year, San Francisco receives less than an inch total of rain from May through September and an average of 20 inches of rain between November and March. Rainfall is not distributed evenly across the City. It ranges from approximately 22 inches in the south, to 20 inches along the western edge and northeastern quadrant, to 18 inches in the extreme northeast. Like all Mediterranean climates, San Francisco experiences periods of drought punctuated by intense winter rains, often resulting in water scarcity in the summer and flooding in the winters.

The potential for stormwater to infiltrate varies dramatically by location. Infiltration may be limited in areas that have steep slopes, shallow depth to bedrock or to the water table, clay soils, contaminated soils, or are built on bay mud and fill over former creeks and wetlands. However, in many areas of the City, particularly in the western basins, soils are generally sandy and have the potential to provide excellent infiltration rates and pollution removal. Where infiltration is limited, a wide array of stormwater management strategies that do not depend upon infiltration can be implemented.

San Francisco Stormwater Design Guidelines

San Francisco's Stormwater Infrastructure

While the creation of these *Guidelines* is driven primarily by regulatory requirements for the City's separate sewer areas, the majority of San Francisco (90%) is served by a combined sewer system (see Figure 6). The stormwater management goals for areas served by separate storm sewers are different from those for areas served by the combined sewer system. Despite this, many of the fundamental design concepts for stormwater management apply to both areas, and as such, the *Guidelines* can be used as a tool in both the separate and combined sewer areas of San Francisco. Using landscape-based stormwater infrastructure will enhance and diversify the functions of both the separate and combined systems.

Approximately 10% of the City is served by a **separate storm sewer system** or is lacking stormwater infrastructure; in most of these areas stormwater flows directly to receiving waters without treatment. In the separate storm sewer areas, the primary reason for implementing post-construction controls is to improve stormwater quality before it reaches a receiving water body. These controls are aimed at removing specific pollutants of concern and treating what is known as the "first flush". The first flush is the dirtiest runoff, usually generated during the beginning of a rain event; it mobilizes the majority of the pollutants and debris that have accumulated on impervious surfaces since the last rain.

A **combined sewer system** conveys wastewater and stormwater in the same set of pipes. The combined flows receive treatment at wastewater treatment plants before being discharged to the Bay and Ocean. Conventional separate storm sewer systems provide no stormwater treatment, while combined sewer systems treat most urban runoff to secondary standards, including the first flush and most additional stormwater runoff. However, when the capacity of the system is exceeded by large storm events, localized flooding and combined sewer discharges (CSDs) can occur. In the event of a CSD, the system discharges a mixture of partially treated sanitary effluent and stormwater to receiving water bodies. While these discharges are dilute (typically consisting of roughly six percent sewage and 94 percent stormwater), they can cause public health concerns and lead to beach or Bay access closures.

The primary reason for implementing LID measures in a combined sewer system is to reduce and delay the volumes and peak flows of stormwater reaching the sewer system. Volume reductions and peak flow desynchronization can help reduce the number of CSDs, reduce flooding, and protect water quality. Post-construction controls in the combined system can also improve the capacity and efficiency of the City's treatment facilities.

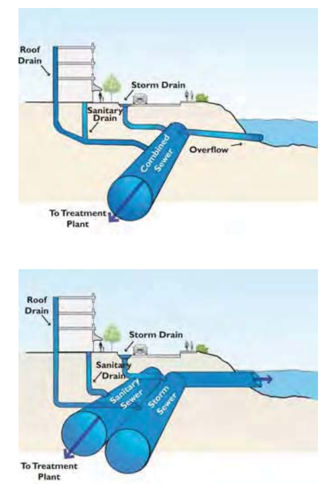


Figure 6. *Combined sewer systems (top) serve 90% of San Francisco. Separate sewer systems (bottom) serve 10%. Image: modified from King County Wastewater Management Division*

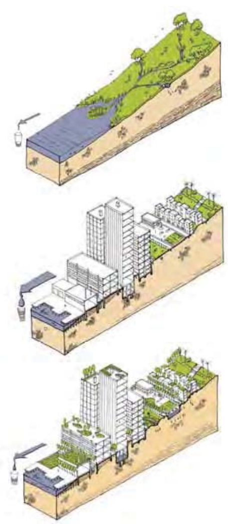


Figure 7. *Low Impact Design seeks to reduce runoff and restore hydrologic function through effective site planning, increased permeability, and landscape-based BMPs.*

Managing Stormwater in San Francisco

Low Impact Design

To lessen the impacts of urbanization on stormwater quality and peak flows, cities around the world are taking advantage of Low Impact Design (LID), which promotes the use of ecological and landscaped-based systems to manage stormwater. LID aims to mimic pre-development drainage patterns and hydrologic processes by increasing retention, detention, infiltration, and treatment of stormwater runoff at its source. This decentralized approach not only treats stormwater at its source and facilitates the best and highest use of stormwater; it also allows greater adaptability to changing environmental conditions than do centralized conveyance systems.

LID strategies direct runoff to BMPs such as flow-through planters, swales and rain gardens. These BMPs capture, filter, and slow stormwater runoff, thereby improving stormwater quality and reducing the quantity of runoff. Strategic placement of BMPs helps to ameliorate the negative water quality and ecosystem impacts of impervious surfaces. LID also emphasizes the integration of stormwater management with urban planning and design and promotes a comprehensive, watershed-based approach to stormwater management.

Figure 7 shows how LID can be incorporated into an urban setting like San Francisco without compromising its character and livability. Vegetated roofs and landscaped areas minimize the amount of stormwater runoff. BMPs are incorporated into the fabric of the city, doubling as recreational areas, wildlife habitat, and landscaping. These measures may increase initial capital costs (approximately 3%), but they bring multiple benefits to the site and the city: not only do they protect water quality and provide open space, they may also decrease downstream stormwater infrastructure costs because they lessen stormwater flows and volumes.

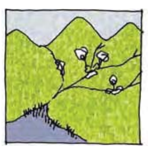
The most effective application of LID is a comprehensive approach that includes *site design*, *source controls*, and *treatment controls*. Careful site design can minimize the impacts of stormwater runoff from the outset. The more that stormwater management is integrated into the design process, the easier it is to create a successful and multi-purpose stormwater management strategy for a given site. The following pages list a set of goals to guide site design.

Mint Plaza, San Francisco, CA is an example of how LID can be integrated into an ultra-urban setting. The design includes rain gardens, permeable paving, and a subsurface infiltration gallery.

Figure 8. Site Design Goals

1. Do no harm: preserve and protect existing waterways, wetlands, and vegetation.

Creeks and wetlands are natural drainage features that can define the character and aesthetic value of a site. Moreover, they are already designed to convey and treat stormwater. Trees and ground cover act as natural stormwater management measures. They capture rainwater in their foliage, slow its progress through the landscape, and facilitate its infiltration into the soil.



2. Preserve natural drainage patterns and topography and use them to inform design.

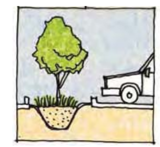
Existing topography and drainage networks can be used as a framework around which to organize development. Changing the topography of a site through grading significantly increases the chances of diminishing water quality by delivering sediment to receiving waters; it also increases project costs.

3. Think of stormwater as a resource, not a waste product.

Stormwater has traditionally been viewed as a nuisance to be eliminated. It is actually an untapped resource that can offset potable water use for irrigation, toilet flushing, cooling towers, and many other applications. It also offers opportunities to create interesting and site-specific designs using water features, rain-irrigated landscapes, and educational elements.

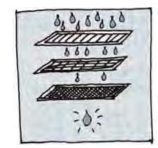
4. Minimize and disconnect impervious surfaces.

Minimizing and disconnecting impervious surfaces allows designers to treat relatively small volumes of runoff from multiple surfaces on a site, rather than treating relatively large volumes of stormwater that have mobilized diverse pollutants from impervious surfaces across an entire site. Disconnecting impervious surfaces and directing runoff to BMPs can be thought of as creating an obstacle course for stormwater; it increases the time needed for runoff to travel from its source to its discharge point, thereby increasing opportunities for treatment, flow reduction, and volume reduction.



5. Treat stormwater at its source.

Treating stormwater pollutants at their source can reduce the need to treat multiple pollutants or higher pollutant loads further downstream in the drainage area. Treating at the source can result in smaller, less costly and more effective stormwater treatment facilities.

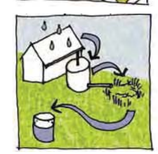


6. Use treatment trains to maximize pollutant removal.

In most scenarios, treatment to the MEP cannot always be achieved with a single BMP. In most cases, a series of linked BMPs called a treatment train must be used to maximize pollutant removal. Like a series of ever-finer sieves, treatment trains clean stormwater by running it through a series of BMPs, each designed to remove specific pollutants, from large pieces of trash, to suspended solids, to dissolved pollutants.

7. Design the flow path of stormwater on a site all the way from first contact to discharge point.

It is important to delineate the path of travel of stormwater from its first surface contact (where it changes from rain to stormwater runoff) to its final discharge point after treatment. All BMPs must have an approved overflow discharge location for storm flows that exceed the design criteria and in case of clogging.



The Ekostaden residential development in Malmo, Sweden, channels all stormwater runoff through BMP treatment features such as bioswales, ponds, and wetlands as shown here.
Photo: Brooke Ray Smith

During the site design process, designers should identify potential sources of stormwater pollution and select appropriate source controls to minimize their impacts. Source controls are stormwater management measures that prevent pollutants from entering stormwater runoff. Source controls can be design measures, such as enclosing trash areas to prevent trash from contacting stormwater; materials choices, such as using non-toxic roofing materials to prevent runoff from entraining pollutants from roof contact; and operational procedures, such as sweeping streets. See page 81 of the *Guidelines* for a description of how to select and locate source controls.

Site design strategies and source control measures minimize the quantity and improve the quality of stormwater runoff from a site. However, it is impossible to eliminate all surfaces that will contribute runoff. Treatment controls must therefore be implemented to accommodate the remaining runoff from the site. Treatment controls are permanent stormwater facilities such as vegetated swales or flow-through planters that are designed to receive and treat runoff from the site. Treatment control BMPs are typically designed to accomplish one or more of the following five stormwater treatment strategies: infiltration, detention, biofiltration, harvesting or retention, or bioretention. Each of these treatment strategies is described in Appendix A. Infiltration is typically the easiest and most cost-effective strategy for managing stormwater but, in areas where this is not feasible, designers can use a combination of the other four strategies. See page 83 of the *Guidelines* for a description of how to select, locate, and size treatment controls.

San Francisco Stormwater Design Guidelines ■

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Multi-Purpose Design

Low Impact Design can be integrated into the site design process in a way that protects water quality, contributes to the quality of the site design, and meets the stormwater performance measures required by the Port and SFPUC.

LID is the multi-purpose integration of infrastructure, architecture, and landscape and can be a catalyst for design innovation in all three disciplines. LID can integrate water quality protection with improvements to the public realm, create and enhance urban wildlife habitat, promote responsible use of water, and advance environmental education and watershed stewardship.

Traditional urban design goals can also be achieved through the implementation of stormwater BMPs. Stormwater facilities can enhance the aesthetics of the built environment, increase pedestrian safety, calm traffic, make streets and public spaces greener, and provide structure, texture, and identity to the City's streets and other public spaces.

Stormwater BMPs bring designers a diverse palette of paving surfaces, vegetation, and drainage strategies, and also a new purpose that can inform design: to improve water quality and restore ecological function.

Open space is a valuable amenity in San Francisco, now the second densest city in the nation. LID measures can double as **civic spaces**, **open spaces and recreational areas**: a constructed wetland filters stormwater and could be the center of a neighborhood nature

Rain gardens and a creek daylighting project are the centerpieces of open space adjacent to the Headwaters development in Portland, OR.

A community in Germany integrates LID into the parking.

area; a vegetated roof that reduces stormwater discharge can also be a gathering area. At Potsdamer Platz, Berlin, Germany, stormwater management strategies include rainwater harvesting for non-potable uses such as toilet flushing and fire safety, vegetated treatment modules, and water features. Stormwater management forms the centerpiece of this major civic space.

LID can also contribute to San Francisco's **urban ecosystem** by enhancing existing wildlife habitats and creating new ones. San Francisco's trees are concentrated in its parks, not on its streets; the city has roughly 40% fewer street trees per mile than the national average and many of its tree lawns and tree wells have been paved over. Expanding the City's urban forest with careful attention to species selection would simultaneously address stormwater issues, increase wildlife habitat, improve air quality, and create a network of green corridors that would contribute to the aesthetics and health of the City's neighborhoods. Habitat can also be created by implementing stormwater BMPs on the roofs and walls of buildings. In London, England, and Basel, Switzerland, vegetated roofs are being used to provide patches of foraging, breeding, and nesting habitat for endangered wildlife. See Appendix D for a vegetation palette listing climate appropriate plants and their habitat value.

Integrating LID into the **streetscape** yields a more attractive pedestrian realm through the inclusion of vegetated curb extensions, sidewalk planters, street trees, pervious surfaces, and other stormwater BMPs that add attractive, pedestrian-scale details. These elements can simultaneously achieve stormwater management goals and improve streets for pedestrians and local residents by encouraging walking, reducing noise, and calming traffic. They can improve neighborhood aesthetics, safety, quality of life, and even property values. In Vancouver, B.C., Canada, a stormwater management project on Crown Street eliminated curbs, added clustered parking, and designed infiltration areas underneath the parking. The narrow street and clustered parking allows more space to be dedicated to biofiltration areas and plantings, which create a lush and pleasant streetscape.

Stormwater is also a valuable **water resource**. Using stormwater on-site rather than releasing it downstream decreases demand for potable water and can protect receiving waters by reducing runoff rates, volumes, and pollutant loads. Rain barrels and cisterns collect stormwater and store it for later use in irrigation and toilet flushing, uses that unnecessarily burden potable water supplies. Stormwater can even contribute to future potable water supplies, by recharging underground aquifers. In Cambria, California, a two-million gallon cistern beneath an athletic field harvests rainwater from the Cambria

Elementary School site. The water is sufficient for year-round irrigation of the multiple athletic fields.

LID can also be a useful tool for **environmental education** when it is integrated into school curricula, public outreach, or interpretive signs. LID concepts can be presented at many different levels of complexity, from an introduction to watersheds to an explanation of the hydrologic cycle and environmental stewardship. LID concepts touch upon numerous disciplines, including biology, ecology, watershed planning, engineering, design, and resource management. The Eco-Center at Heron's Head Park in the Bayview-Hunters Point neighborhood is an environmental education center for local students of all ages. Educational programs at the Eco-Center focus on habitat conservation and community stewardship. A collaboration between Literacy for Environmental Justice, the Port of San Francisco, and the San Francisco Department of the Environment, the Eco-Center includes a vegetated roof, rainwater harvesting, photovoltaic panels, solar hot water generation, native planting, and other LID features. At the time of writing these *Guidelines*, this project was under construction.

Lastly, LID can help the design and development community achieve **environmental performance measures**, which aim to minimize the environmental impacts of development and provide high quality, healthy environments. In San Francisco, both Leadership in Energy and Environmental Design (LEED®), a green building rating system developed by the U.S. Green Building Council, and the GreenPoint Rated system, a rating system developed by the non-profit Build It Green, are being used to assess the environmental quality of site and building design. In both systems, stormwater management facilities can earn points toward certification.

Environmental Justice

Over the past decade, increased attention has been given to the disproportionate impact of environmental pollution on socio-economically disadvantaged communities. The USEPA defines environmental justice as "the fair treatment of people of all races, cultures and income, regarding the development of environmental laws, regulations and policies." This issue is of concern in many areas of San Francisco, and in particular the Bayview-Hunters Point neighborhood, former home to Hunters Point Shipyard, the only federal Superfund site in San Francisco.

The Bayview-Hunters Point neighborhood contains over 100 brownfield sites. The residents of the primarily African-American neighborhood have borne the environmental and health impacts of these brownfield sites. The *Guidelines* proposes LID measures that can effectively manage stormwater runoff at the Shipyard and other areas of Bayview-Hunters Point, while at the same time improving the quality and safety of neighborhoods by providing attractive landscape features, traffic calming measures, and a safer pedestrian realm.

A vegetated roof and other LID features at the Eco-Center at Heron's Head Park help illustrate sustainable design practices to students in San Francisco's Bayview-Hunters Point neighborhood.

LEED Category	Credits		Points
Sustainable Sites	SS6.1	Stormwater quantity control	1
	SS6.2	Stormwater quality control	1
	SS5.1	Protect or restore habitat	1
	SS5.2	Maximize open space	1
	SS7.1	Urban heat island effect - non-roof	1
	SS7.2	Urban heat island effect – roof	1
Water Efficiency	WE1.1	Water efficient landscaping - reduce by 50%	1
	WE1.2	Water efficient landscaping - no potable water use or no irrigation	1
	WE2	Innovative wastewater technologies	1
	WE3.1	Water use reduction - 20% reduction	1
	WE3.1	Water use reduction - 30% reduction	1
		Total stormwater-related credits	**11**

Table 3. *LEED® credits related to stormwater in LEED-NC® Version 2.2.*

In Southern California, Santa Monica's Main Library used an innovative stormwater management design to help achieve its water-saving goals and receive a LEED Gold rating: a 225,000-gallon cistern under the building stores stormwater for irrigation of both landscaping at the library and adjacent street plantings.

Many of the LEED certification systems include credits that explicitly address stormwater. In LEED for New Construction, these credits are in the Sustainable Sites category (see Table 3). Implementing LID measures such as habitat enhancement, reduction of impervious surfaces,

The Academy of Sciences in Golden Gate Park is targeting LEED Platinum certification and includes a 2.5 acre vegetated roof.
Photo: Rana Creek - Living Architecture

vegetated roofs, and rainwater harvesting can also help project applicants earn credits in other areas.

The GreenPoint Rated system includes many measures that are related to stormwater, although it does not propose any quantitative performance measures for stormwater management (Table 4). Stormwater-related points can be earned in the areas of site design, landscaping, exterior finishing, and innovation in the water category. To be considered GreenPoint Rated, a home must achieve 50 total points, with a minimum number of points in each of the five environmental categories (Community, Energy Efficiency, Indoor Air Quality, Water Conservation and Resource Conservation). Single family projects require at least eight points earned in the water category, while multifamily projects require at least three points earned in the water category. The GreenPoint Rating system specifically encourages rainwater harvesting and water efficient landscaping.

GreenPoint Checklist	Feature		Points (Category)
Multifamily	A.3.a.	Protect soil & existing plants & trees	1 (Community)
	A.7.c.	Specify drought-tolerant California natives, Mediterranean or other appropriate species	1 (Water)
	A.7.d.i.	Mulch all planting beds to a depth of 2 inches or greater as per local ordinance	1 (Water)
	A.7.d.ii.	Amend with 1 inch of compost or as per soil analysis to reach 3.5 % soil organic matter	1 (Water)
	A.7.e.i.	Specify smart (weather-based) irrigation controllers	1 (Water)
	A.7.e.ii.	Specify drip, bubblers, or low-flow sprinklers for all non-turf landscape areas	1 (Water)
	A.7.f.	Group plants by water needs (hydrozones)	1 (Water)
	A.9.	Cool site through permeable paving (minimum of 30% of site)	1 (Community)
	C.12.a.	A portion of the low-slope roof area is covered by a vegetated or "green" roof (25% or greater)	1(Community) 1(Water)
	D.14.b.	Use captured rainwater for landscape irrigation or to flush 5% of toilets and/or urinals	4 (Water)
	F.2.a.	Provide O & M manual to building maintenance staff	1 (Energy)
	F.2.b.	Provide O & M manual to occupants	1 (Energy) 1(Water)
		Total points:	**17**
Single Family	A.1.a.	Protect topsoil from erosion & reuse after construction	1 (Community) 1 (Water)
	A.1.b.	Limit & delineate construction footprint for maximum protection	1 (Water)
	C.1.a.	No invasive species listed by Cal-IPC are planted	1 (Water)
	C.1.c.	75% of plants are California natives or Mediterranean species or other appropriate species	3 (Water)
	C.4.	Plant shade trees	3 (Water)
	C.5.	Group plants by water needs (hydrozoning)	2 (Water)
	C.6.a.	System uses only low-flow drip, bubblers or low-flow sprinklers	2 (Water)
	C.6.b.	System has smart (weather-based) controllers	3 (Water)
	C.7.	Incorporate 2 inches of compost in the top 6-12 inches of soil	3 (Water)
	C.8.	Mulch all planting beds to the greater of 2 inches or local water ordinance requirement	2 (Water)
		Total points:	**22**

Table 4. *GreenPoint Rated credits related to stormwater*

If stormwater is clean enough, it can be used to fill swimming pools.
Photo: Bassin Takis in Paris, KMD Architects

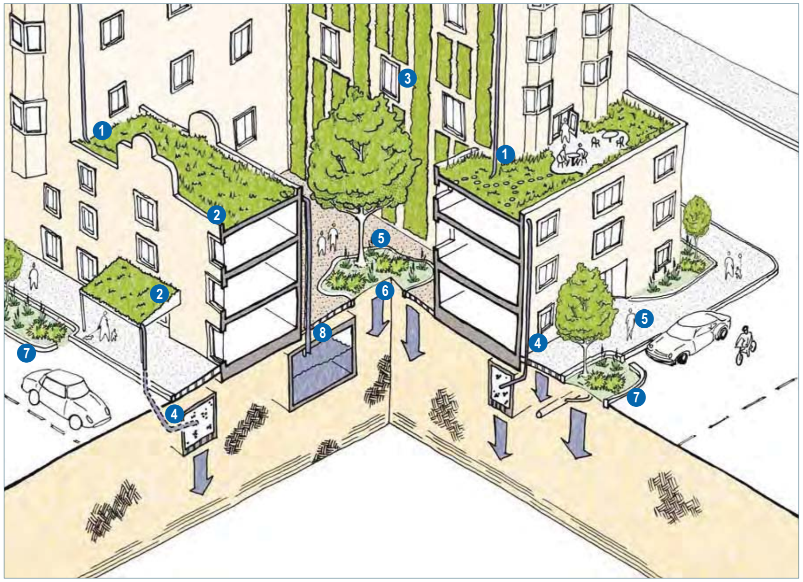
Integrating LID into San Francisco's Urban Landscape

The illustrations on the following pages show how LID can be integrated into San Francisco's diverse land uses to both protect water quality and contribute to the character of a given location. The figures illustrate stormwater management strategies appropriate for each of the following land uses:

- High-density Residential
- Low-density Residential
- Mixed Use
- Industrial
- Open Space and Natural Areas
- Piers over Water
- Former Shipyards

The figures are not meant to provide a comprehensive list of stormwater design solutions that are possible in San Francisco. Rather, they offer ideas and examples of the benefits that result from the implementation of multi-purpose LID.

A creek daylighting project in Zurich, Switzerland protects and improves water quality, by keeping it out of the sewer, and transforms the streetscape.



High-density Residential

Figure 9. High-density Residential

In San Francisco, high-density residential development is classified as 40 or more living units per acre. Some defining characteristics of high-density residential are zero-lot line development, reduced, public open space, and high levels of imperviousness. In this context, the greatest opportunities for stormwater management reside in replacing impervious surfaces with pervious surfaces and adding green space to roofs and interior courtyards. Ample roof space with relatively low pollutant loads provides opportunities for eco-roofs and rainwater harvesting. Interior courtyards can accommodate landscape-based BMPs, permeable paving, and subsurface treatment or capture systems. Sidewalks and streets adjacent to high-density residential development are often the nearest public open spaces available to residents. As such, they are ideal places to site stormwater management BMPs that also improve streetscape aesthetics and provide wildlife habitat, such as biofiltration areas, street trees, green walls, and bioretention bulbouts. All of these measures help to manage stormwater runoff; they also reduce the volumes of stormwater generated by the site in the first place.

1. Downspout Discharges to Vegetated Roof to Reduce Runoff
2. Vegetated Roof to Reduce Runoff
3. Green Wall to Slow Runoff
4. Downspout Connected to Dry Well
5. PermeablePaving in Pedestrian Areas
6. Rain Garden for Bio-Infiltration
7. Bio-Retention Planter with Curb Cuts
8. Downspout Connected to Large-Scale Cistern for Rainwater Harvesting

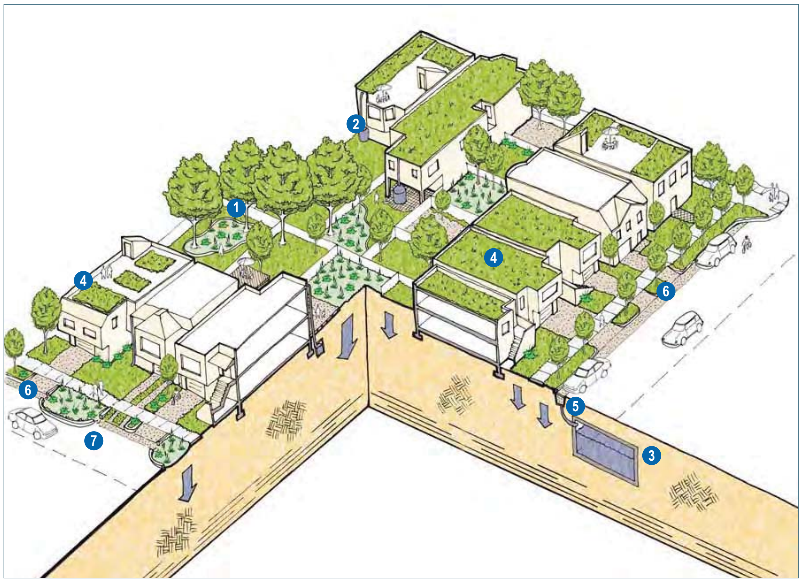


Figure 10. Low-density Residential

In San Francisco, low-density residential development refers to 24 living units per acre or fewer. Low-density residential parcels typically include open space in the form of yards and setbacks, wider sidewalks than those found in high-density residential, and rooftops that are more likely to be under the control of a single owner. Low-density residential parcels therefore tend to both generate less stormwater and have more space in which to manage stormwater than high-density areas. Diverse parcel sizes and shapes, along with variability in building footprints, provide opportunities for site-specific stormwater management designs.

1. Rain Garden for Bio-Infiltration
2. Downspout Connected to a Rain Barrel
3. Cistern to Store Rainwater for Irrigation
4. Vegetated Roof to Reduce Runoff
5. Infiltration Trench
6. Permeable Paving
7. Bio-Retention Planter with Curb Cuts

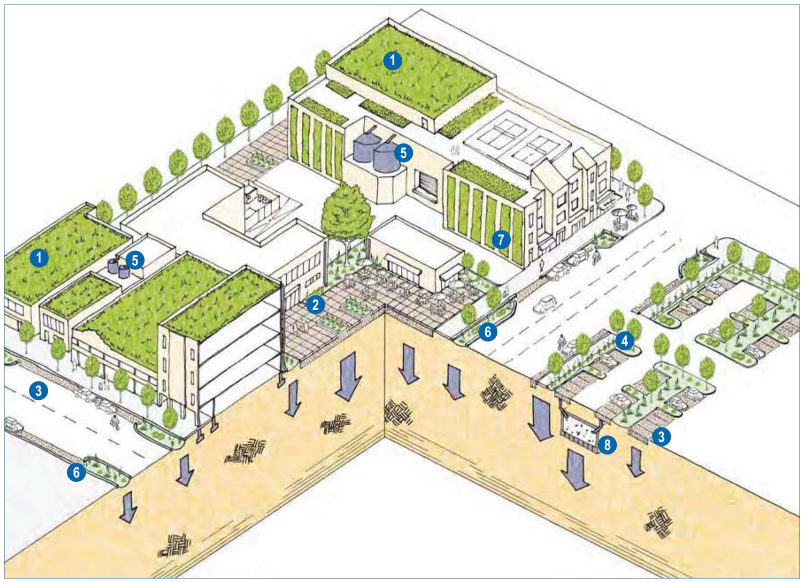


Figure 11. Mixed Use

Many new, redevelopment, and infill projects in San Francisco include mixed-use areas. Mixed use development fosters a high level of activity throughout the day, resulting in an active public realm. Roofs, public plazas, setbacks, parking lots, and the public right-of-way are all spaces that can double as LID measures that improve the quality of the public realm and achieve stormwater management goals. Of these spaces, roofs generally have the lowest pollutant loads while streets have the highest. The commercial elements of mixed use development sometimes require special attention. For example, restaurants and light industrial activities will need to implement source controls targeting grease, litter, and other food wastes.

1. Vegetated Roofs to Reduce Runoff
2. Permeable Paving in Pedestrian Areas
3. Permeable Paving in Parking Areas
4. Swales in Parking Lots
5. Cistern to Store Rainwater for Toilet Flushing
6. Bio-Retention Planter with Curb Cuts
7. Green Wall to Slow Runoff
8. Dry Well

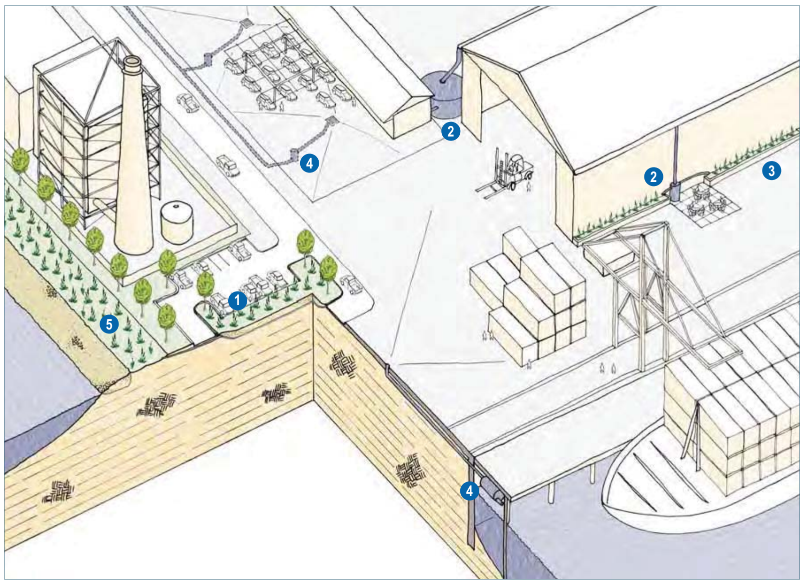


Figure 12. Industrial

Industrial land uses in San Francisco are concentrated in the Bayside watersheds. Because industrial areas often contain potentially polluting activities coupled with large impervious areas, treating stormwater on-site in these areas is essential. Industrial land use is generally characterized by large, low-density structures that provide ample space for treatment measures. Stormwater management strategies in industrial areas can serve not only to protect water quality but also to provide high quality rest areas for workers, act as a buffer for adjacent land uses, and maintain public access to waterfront open space where appropriate. Pollutants associated with industrial activities – chemical waste storage, for example – require special source control strategies such as hydraulic isolation and treatment in areas where polluting activities occur.

1. Swales in Parking Lots
2. Cisterns to Store Rainwater for Vehicle Washing
3. Flow-through Planters to Improve Water Quality
4. Vortex/Swirl Separator or Media Filter
5. Vegetated Buffer Strip

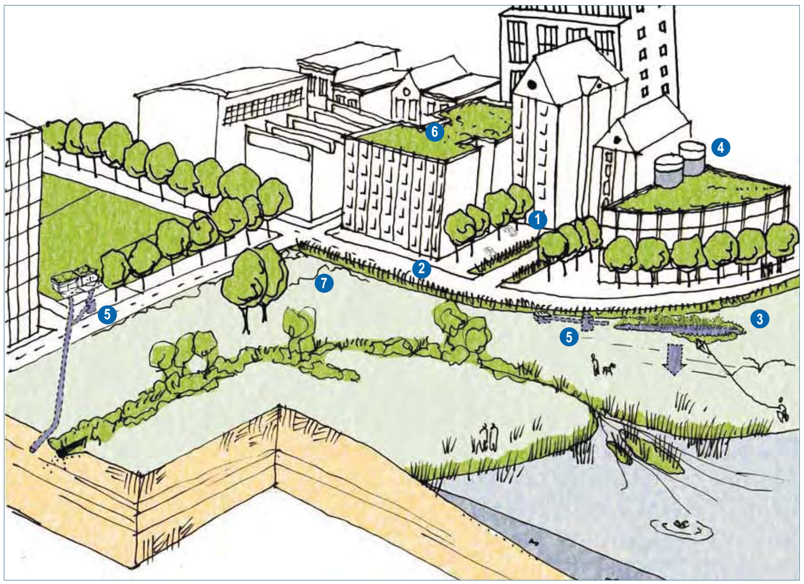
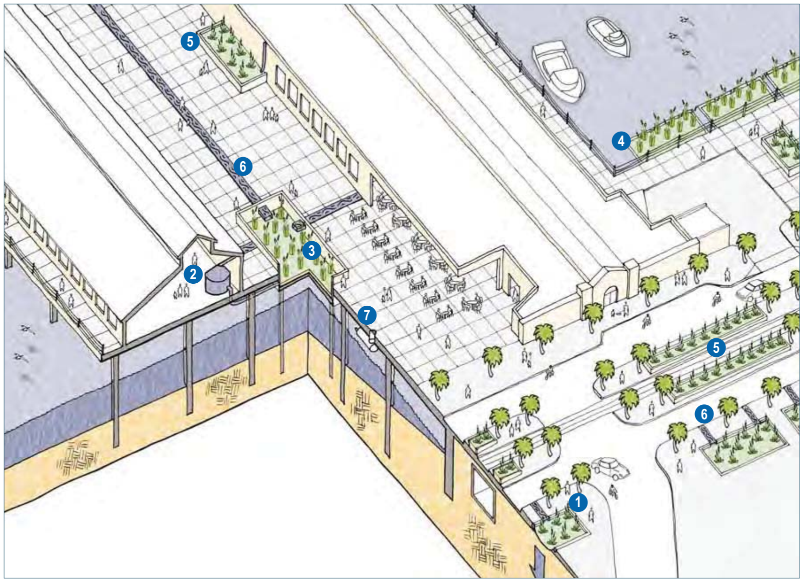


Figure 13. Open Space

San Francisco's open spaces provide space for passive and active recreation, wildlife habitat, and environmental education. Open space areas also contribute to air and water quality protection. Some open space areas, most notably Lake Merced, include water bodies whose health and function depend upon protection from adjacent polluting activities. To that end, stormwater BMPs can be sited on less sensitive open spaces to protect the more sensitive core areas. Open spaces can often accommodate larger stormwater treatment trains that integrate stormwater management with other ecological functions. Because of this, stormwater management in open spaces can make significant contributions toward restoring natural hydrology and ecosystem health. Open spaces that are opportunity sites for LID include parks, recreational areas, school playfields, and natural areas.

1. Swales in Parking Lots and Roadways
2. Swales to Buffer Open Space from Development
3. Constructed Wetlands to Buffer Open Space from Development
4. Cistern to Store Rainwater for Irrigation
5. Street Drains to Wetland via Swirl Separator; Trash Area Drains to Sewer via Swirl Separator
6. Vegetated Roof to Reduce Runoff
7. Vegetated Slope to Reduce Erosion/Sedimentation



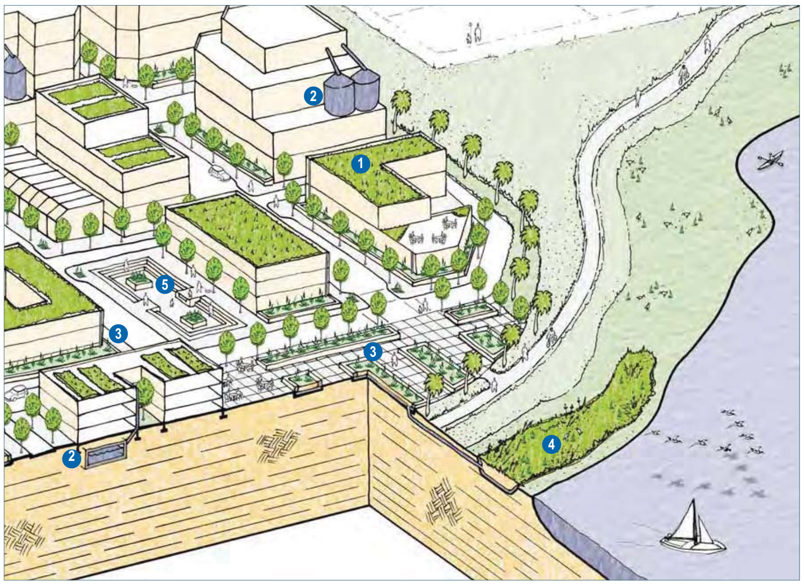
Piers Over Water

Figure 14. Piers Over Water

Piers over water are common along San Francisco's waterfront. They are frequently the site of redevelopment projects seeking to adaptively reuse attractive and unique historic properties. Development on piers over water includes a wide variety of land uses, including commercial, recreational, industrial, and maritime uses. Because runoff from piers over water often flows directly to the Bay without the benefit of dedicated conveyance structures, stormwater management on piers over water requires creative infrastructure solutions. Limited space, cultural and historic preservation requirements, and public access goals all impose additional design constraints. The transition between piers and streetscape may provide opportunities for landscape-based stormwater management strategies that may not be feasible on the piers themselves. In some cases, media filtration devices may be the only feasible option for certain aspects of pier redevelopment.

1. Rain Gardens in the Streetscape
2. Cistern for Rainwater Harvesting
3. Detention Pond
4. Vegetated Pontoons for Biofiltration*
5. Above Ground Planter for Biofiltration
6. Trench Drains for Conveyance
7. Vortex/Swirl Separator or Media Filter

* See the Emerging Technologies factsheet in Appendix C for more about vegetated pontoons.



Former Shipyards

Figure 15. Former Shipyards

A number of San Francisco's redevelopment areas are former shipyards. Former shipyards have a variety of challenging conditions associated with them, such as a high water table, uncompacted fill, and legacy pollutants from historic shipyard activities. Historic pollution can limit the feasibility of certain LID measures, and those LID measures that are implemented will often require engineered liners to prevent mobilization of subsurface contaminants. Despite these challenges, redevelopment of former shipyards offers significant opportunities for innovative and comprehensive stormwater management because it often requires building new infrastructure systems.

1. Vegetated Roofs to Reduce Runoff
2. Cisterns to Harvest Rainwater for Heating and Cooling
3. Rain Gardens for Biofiltration
4. Constructed Wetland to Buffer Water from Urban Development
5. Urban Stormwater Plaza/Detention Pond

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To ensure consistent implementation of LID in new and redevelopment projects in San Francisco's separate sewer areas, the Port requires all projects disturbing 5,000 square feet or more to comply with stormwater performance measures in order to gain plan approval.

Project applicants subject to these *Guidelines* will be required to complete a Stormwater Control Plan (SCP) to demonstrate that they have met San Francisco's stormwater requirements. The requirements are performance-based and are very similar to those used in other Bay Area Cities. The stormwater performance measures for projects served by separate storm sewer systems under Port jurisdiction require the capture and treatment of:

- The flow of stormwater runoff resulting from a rain event equal to at least 0.2 inch per hour intensity; **or**
- Eighty percent or more of the annual stormwater runoff volume, determined from unit basin storage volume curves for San Francisco.

Project applicants developing or redeveloping properties subject to these performance measures must complete a SCP for project approval. The SCP will allow the Port, the SFPUC, and the Planning Department to certify compliance with these requirements. The contents of the SCP are described in the next section, and a SCP template is provided in Appendix C.

Project applicants must also ensure compliance with other stormwater regulations that may apply to their project. For instance, construction sites greater than 1 acre are generally required to seek coverage under the *California Statewide General Permit for Stormwater Discharges Associated with Construction Activities*. Specific types of commercial and industrial operations must seek coverage under the *California Statewide General Permit for Stormwater Discharges Associated with Industrial Activities.*

Port Requirement

All qualifying projects in the separate storm sewer area that disturb 5,000 square feet or more of the ground plane are required to capture and treat rainfall from a 0.2-inch per hour event **or** eighty percent or more of the annual stormwater runoff volume, determined from unit basin storage volume curves for San Francisco. Disturbed area includes any movement of earth, or a change in the existing soil cover or the existing topography. Land disturbing activities include, but are not limited to, clearing, grading, filling, excavation, or addition or replacement of impervious surface.

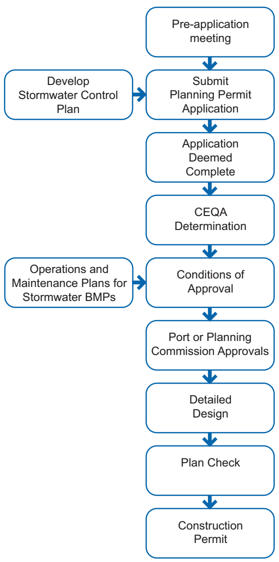

Figure 16. *The SCP submittal and plan approval process.*

The Development Review Process

The Port has integrated SCP review into its existing development review processes. A simplified diagram for a typical development review process is shown in Figure 16.

The SCP must be submitted along with the development application for Planning Review. Planning Department staff will often request that applicants provide a preliminary site layout, preliminary landscaping plan, elevation drawings, or other illustrations for review at a pre-submittal meeting. Project applicants will also discuss their preliminary SCP at the pre-submittal meeting. At this stage project applicants should bring a drainage plan with proposed locations for BMPs.

CEQA

Most projects subject to the requirements of these *Guidelines* will also require some level of CEQA review. The California Environmental Quality Act (CEQA) environmental review imposes both procedural and substantive requirements for environmental protection. CEQA requires local jurisdictions to identify and evaluate the environmental impacts of their actions, including zoning decisions and discretionary land-use approvals. The CEQA process provides decision-makers and members of the public with information about potentially adverse environmental impacts and requires implementation of feasible alternatives and mitigation measures in order to reduce those impacts.

CEQA is intended to minimize the environmental impacts of development activities, which is consistent with the objectives of these *Guidelines*. The basic purposes of CEQA are to:

- Inform decision-makers and the public about the potential significant environmental effects of proposed activities.
- Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.
- Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.

San Francisco Stormwater Design Guidelines

The CEQA Initial Study Checklist

The Phase II General Permit requires local municipalities to evaluate water quality effects and identify appropriate mitigation measures when conducting environmental review of proposed projects. This effort can be integrated into the completion of the CEQA Initial Study Checklist. The CEQA Initial Study Checklist is used to determine whether a given project will have significant impacts on the environment.

The San Francisco Planning Department's Initial Study Checklist contains questions that link potentially significant project impacts to requirements under the CWA and the California Water Code:

- Question 14.a: **"Would the project violate any water quality standards or waste discharge requirements?"** This question evaluates a project's compliance with water quality standards and considers the project's potential effect on water bodies on the Section 303(d) list.
- Question 14.d: **"Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site?"** This question investigates the potential effects of increased runoff peak flows and durations.
- Question 14.e: **"Would the project create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial new sources of polluted runoff?"** This question evaluates the potential impacts of pollutants in runoff and increased stormwater flows to the collection system.
- Question 14.f: **"Would the project otherwise substantially degrade water quality?"** This question is the most tightly linked to the *Guidelines*. The intent of these *Guidelines* is to ensure that projects do not degrade water quality.

Port, SFPUC, and City Planning staff will work with project applicants to ensure that the CEQA Initial Study Checklist clearly articulates potential impacts that the project may have on the quantity and quality of stormwater runoff. BMPs required by the *Guidelines* will reduce stormwater impacts by controlling sources of pollution, reducing site imperviousness, and providing for treatment facilities that retain, detain, or treat runoff.

The CEQA process is generally administered in several steps:

1. Review of the CEQA checklist to determine the appropriate level of review.

2. Issuance of a Categorical Exemption for projects exempt from CEQA review.

3. Preparation of an Initial Study to characterize the environmental effects of the project.

4. Preparation of an Environmental Impact Report (EIR) or Negative Declaration.

In cases where a higher level of environmental review is required for project approval, such as a Mitigated Negative Declaration or an EIR, the CEQA process may require the consideration of project alternatives. Because the final project configuration is uncertain, it may not be possible to complete a SCP prior to CEQA approval. In such cases, a preliminary SCP would be required to be completed once the project configuration is finalized. The SCP must be completed and approved before the applicant begins final design drawings for the project.

If CEQA approval for a project includes mitigation measures, project applicants will be required to participate in a mitigation monitoring and reporting program (MMRP). CEQA requires the MMRP to ensure compliance with adopted mitigation measures during project implementation. The MMRP specifies the required actions and monitoring that are required for each mitigation measure recommended in the EIR. The requirements for the construction and maintenance of stormwater BMPs described in the SCP can be used in the MMRP for EIRs and Mitigated Negative Declarations.

The San Francisco Planning Department prepares CEQA documents for proposed City projects. If the CEQA analysis determines that a project would have a significant or potentially significant impact on hydrology and water quality, then the project would be required to administer mitigation measures that would reduce the impact to less than significant, or the City would need to make Findings of Overriding Considerations.

Project applicants must meet the stormwater performance measures described in these *Guidelines* to avoid negative impacts to water quality. By doing so, they may avoid triggering CEQA mitigation requirements. Projects receiving a Categorical Exemption or Negative Declaration under CEQA are still required to submit a complete SCP in order to gain project approval.

Multi-Parcel Projects

While compliance with the *Guidelines* is required for all new and redevelopment projects greater than 5,000 square feet, master-planned and multi-parcel projects offer the greatest opportunity for regional LID elements (i.e., stormwater facilities serving more than one parcel) such as treatment wetlands, water features, and wet ponds. The Port and SFPUC will work with project applicants who are proposing large projects to develop a comprehensive Stormwater Control Plan (SCP) that integrates stormwater management approaches across multiple parcels.

Requirements for a comprehensive SCP and associated Operations and Maintenance Plan will follow the methodology for preparation of an SCP, as discussed in later sections of the *Guidelines*. During CEQA review for large projects, greater emphasis will be placed on the relationship between overall stormwater infrastructure development and the development of specific parcels. Please contact Port staff to initiate this process.

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SFPUC Plan Approval

To ensure consistent implementation of LID in new and redevelopment projects in San Francisco, the SFPUC requires all projects disturbing 5,000 square feet or more to comply with stormwater performance measures in order to gain plan approval.

In separate sewer areas under SFPUC jurisdiction, applicants proposing new or redevelopment projects that either a) disturb 5,000 square feet or more of the ground plane, or b) are subject to San Francisco's Green Building Ordinance, are required to:

- Capture and treat the rainfall from a design storm of 0.75 inch using acceptable best management practices (BMPs); and
- Complete a Stormwater Control Plan (SCP) demonstrating how the project will capture and treat rainfall from the 0.75-inch design storm.

This performance measure is equivalent to LEED Sustainable Sites Credit 6.2 titled "Stormwater Design: Quality Control." The rainfall depth of 0.75 inch is the LEED-based performance measure for semi-arid watersheds.

In combined sewer areas under SFPUC jurisdiction, applicants will be required to reduce the flow rate and volume of stormwater going into the combined system by achieving LEED Sustainable Sites Credit 6.1 titled "Stormwater Design: Quantity Control."

The SCP requirement will allow the SFPUC, the Department of Building Inspection (DBI), and the Planning Department to verify compliance with stormwater requirements. The *Guidelines* chapter entitled, "The Stormwater Control Plan," describes the required contents of a SCP and also provides sizing instructions for stormwater treatment BMPs to comply with this requirement. A SCP template is provided in Appendix C.

SFPUC Requirement

Developments or redevelopments disturbing 5,000 square feet or more of the ground surface are required to manage stormwater on-site. Land disturbing activities include, but are not limited to, clearing, grading, filling, excavation, or addition or replacement of impervious surface.

In separate sewer areas, applicants must achieve LEED SS6.2 and demonstrate compliance in a SCP.

In combined sewer areas, applicants must achieve LEED SS6.1 and demonstrate compliance in a SCP.

How does LEED Credit SS6.2 compare to the General Permit requirements?

San Francisco's GBO adopts performance measures drawn from LEED, a nationally-recognized standard. Analysis indicates that the performance measure listed in LEED 6.2 is roughly equivalent to the performance measures listed in the General Permit, with LEED 6.2 being slightly more stringent (by about 2%). The proposal to use LEED-based performance measures was approved by the RWQCB on December 19, 2008.

GBO Project Thresholds

Midsize Residential
(5+ units and < 75 feet height to highest occupied floor)

High-Rise Residential
(5+ units and > or = 75 feet height to highest occupied floor)

Mid-Size Commercial Office
Building of a B Occupancy
(>5,000 SF and <25,000 SF)

New Large Commercial Office
Building of a B Occupancy
(>25,000 SF)

Table 5*. Projects required to achieve stormwater points under the Green Buliding Ordinance*

The Green Building Ordinance

On November 3, 2008, the City of San Francisco's Building Code was amended to include Chapter 13C, "Green Building Requirements," known as the Green Building Ordinance (GBO). The code requires certain types of new and redevelopment projects constructed in San Francisco to meet green building standards developed by San Francisco's Green Building Task Force. Many of the standards are based on LEED, a green building rating system developed by the United States Green Building Council (USGBC). Projects that fall into one of four building categories listed in Table 5 must comply with the GBO by obtaining specified levels of LEED certification. For the full text of the GBO, go to http://www.sfenvironment.org/downloads/library/sf_green_building_ordinance_2008.pdf.

The GBO requires projects to obtain LEED's Sustainable Sites credit entitled "Stormwater Design: Quantity Control" (SS6.1) or "Stormwater Design: Quality Control" (SS6.2), depending on whether the site is in a separate or combined sewer area.

For the full text of Credits SS6.1 and SS6.2, see pages 75-87 of the "LEED for New Construction and Major Renovation Reference Guide, Version 2.2."

The GBO refers to both LEED and these *Guidelines* in Section 1304C.0.3:

Stormwater management shall meet the "Best Management Practices" and "Stormwater Design Guidelines" of the San Francisco Public Utilities Commission, and shall meet or exceed the applicable LEED SS 6.1 and 6.2 guidelines.

The applicable LEED credit for separate sewer areas is SS6.2. while the applicable LEED credit for combined sewer areas is SS6.1. SFPUC staff is currently in the process of modeling the impacts of SS6.1 on the combined sewer area and developing calculators for SS6.1. Until this modeling is completed, applicants with questions about projects in the combined sewer should contact SFPUC staff for direction.

Projects subject to stormwater requirements under the GBO that do not disturb 5,000 square feet of the ground surface must achieve LEED Certification and achieve either LEED SS6.1 or LEED SS6.2, but need not submit a Stormwater Control Plan. Only projects disturbing 5,000 square feet or more need to submit a SCP.

The Development Review Process

The SFPUC has integrated the review of SCPs with the City's development review process. All projects disturbing 5,000 square feet or more must submit a SCP. A diagram showing how the SCP fits into a typical development review process is shown in Figure 17.

Project applicants must also ensure compliance with all stormwater regulations that may apply to their projects. For instance, construction sites greater than 1 acre are generally required to seek coverage under the California Statewide General Permit for Stormwater Discharges Associated with Construction Activities. Specific types of commercial and industrial operations must seek coverage under the California Statewide General Permit for Stormwater Discharges Associated with Industrial Activities.

Permit applicants that are also subject to the GBO will be required to receive third-party verification by the Green Building Certification Institute (GBCI), USGBC's official accreditation and certification body; or by the project's Green Building Compliance Professional of Record. The building permit application must include a complete LEED checklist, as stipulated in Administrative Bulletin for Chapter 13C (AB-093), which outlines administrative procedures for meeting green building requirements (see http://www.sfgov.org/site/dbi_index.asp?id=89703). The LEED Version 2.2 checklist includes Credits SS6.1 and SS6.2, and applicants must indicate their intent to comply in order to receive a building permit.

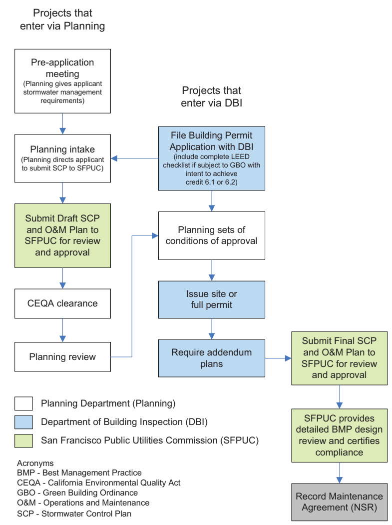

Figure 17*. The Stormwater Control Plan submittal and approval process*

LID measures like the stormwater wetland in Portland's Tanner Springs Park treat polluted street runoff, thereby minimizing negative impacts to water quality.

References and Resources

"Build It Green." 17 November 2008 <http://www.builditgreen.org/>.

"CASQA 2003 Stormwater Best Management Practice Handbook New Development and Redevelopment." <http://www.cabmphandbooks.com>.

San Francisco Department of Building Inspection. 2008. "Green Building Ordinance." 20 November 2008 <http://www.sfgov.org/site/dbi_index.asp?id=89703>.

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"State Water Resources Control Board Order Number 2003-0005-DWQ." 17 November 2008 <http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/final_attachment4.pdf>.

U.S. Green Building Council. 2006. *LEED for New Construction Version 2.2*. Washington, DC: U.S. Green Building Council. <http://www.usgbc.org/>.

San Francisco Stormwater Design Guidelines

The Western Harbor, located in Malmo, Sweden, conveys and treats stormwater by implementing both parcel and block-scale surface systems that direct runoff to vegetation and ponds, which double as amenities throughout the neighborhood. Habitat value is enhanced through the use of various vegetation types.
Photo: Andres Power

Inspection & Enforcement

The SFPUC and the Port require periodic inspections to ensure that BMPs are properly maintained and continue to provide effective stormwater treatment.

Once stormwater management facilities are incorporated into new development and redevelopment projects, the SFPUC and Port require periodic inspections to ensure that they are properly maintained and continue to provide effective stormwater treatment. There are three types of inspections under this operation and maintenance verification program: post-construction building permit inspections, annual self-certification inspections conducted by the property owner, and tri-annual inspections conducted by the Port or the SFPUC, depending on who has jurisdiction on the site. The Port and the SFPUC will also inspect BMPs in response to complaints or emergencies. If maintenance requirements identified through inspections are not completed in accordance with the protocols described in this chapter, the SFPUC or the Port will enact enforcement procedures.

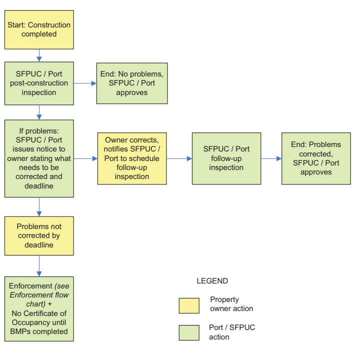


Figure 18. *Post-construction inspections.*

Inspections

Post-construction inspections

The Port or the SFPUC will inspect stormwater BMPs upon completion of construction. These inspections will be based on a standardized inspection checklist. Inspection staff will confirm that stormwater facilities are built in conformance with approved plans.

If there are issues that require follow-up, the Port or the SFPUC will send the property owner a notice stating what corrective action needs to be taken and the timeframe for corrective action. The deadline will be between 24 hours and 30 days from the date of the notice, depending on the severity of the problem. The property owner is responsible for correcting these issues and scheduling a follow-up inspection by the Port or the SFPUC. If the issues are rectified by the time of the follow-up inspection, the Certificate of Occupancy will be issued. A diagram showing the post-construction inspection process is shown in Figure 18.

Annual self-certification

Once BMPs are successfully built, the Port or the SFPUC will send self-certification inspection reminders to property owners at all sites with stormwater BMPs. The reminder will include a submittal deadline and a blank self-certification checklist. The property owner will perform the self-certification inspection and digitally submit the completed checklist and maintenance logs from that year to the SFPUC Collection System Division or to the Port. With this submittal, the property owner will propose either approval or maintenance they will perform if there are outstanding issues that have not been resolved by the submittal date. The Port or the SFPUC will either approve the submittal and renew the certificate of compliance or contact the property owner to schedule an inspection.

If a Port or SFPUC inspection is necessary, the property owner must be present and provide annual maintenance logs. If the issues are rectified by the time of the inspection, the certificate of compliance will be renewed.

For sites at which the property owner does not submit self-certification documents, the Port or the SFPUC will send a notice stating that the deadline has passed and will contact the property owner to schedule an inspection. The notice will include a fee to cover the cost of the inspection plus a penalty. If the inspection indicates that there no maintenance issues requiring follow-up action, the certificate of compliance will be renewed. A diagram showing the annual self-certification process is shown in Figure 19.

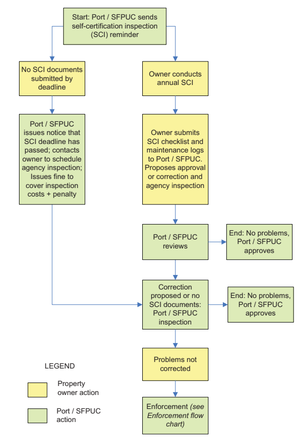


Figure 19. *Annual self-certification inspections.*

Tri-annual Port / SFPUC inspections

Every third year, the Port or the SFPUC will inspect stormwater BMPs. The agency with jurisdiction on the project site will send inspection notices to property owners at sites due for inspection. The notice will include a proposed inspection date and time and a phone number to call should the proposed date not work for the property owner. The property owner must be present and provide annual maintenance logs. If the inspection indicates that there no maintenance issues requiring follow-up action, the certificate of compliance will be renewed.

If there are issues that require follow-up, the Port or the SFPUC will send the property owner a notice stating what corrective action needs to be taken and the deadline. The deadline will be between 24 hours and 30 days from the date of the notice, depending on the severity of the problem. The property owner is responsible for rectifying the issues and scheduling a follow-up inspection by the Port or the SFPUC within the time allotted. If the inspection indicates that the issues are rectified, the certificate of compliance will be renewed. A diagram showing the tri-annual Port or SFPUC inspection process is shown in Figure 20.

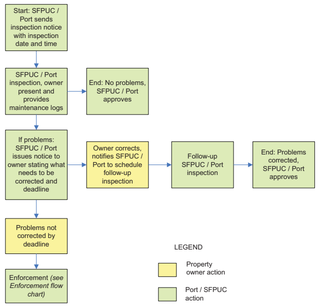


Figure 20. *Tri-annual Port / SFPUC inspections.*

Enforcement

For all three types of inspections, if the property owner is unresponsive or if maintenance issues are not rectified by prescribed deadlines, the Port or the SFPUC will carry out an enforcement action. If an enforcement action becomes necessary, the Port or the SFPUC will issue a warning with a 15-day deadline for the property owner to take corrective action and schedule a follow-up inspection. The warning will include a fee to cover the cost of the inspection plus a penalty. If the inspection indicates that maintenance issues requiring follow-up action have been rectified, the annual certificate of compliance will be renewed. If there are outstanding issues requiring maintenance action or if the owner is unresponsive, the Port or the SFPUC will issue a notice of violation stating that the property owner will be fined. Fines will be levied based upon Article 4.1 of the San Francisco Public Works Code.

If the issues have not been rectified by the end of 25 days, the Port or the SFPUC will perform the required maintenance and will bill the owner for the fine plus the cost of the work. If the owner does not pay the fine and the bill within 30 days, the Port or the SFPUC have the option to initiate lien proceedings against the property. A diagram showing the enforcement process is shown in Figure 21.

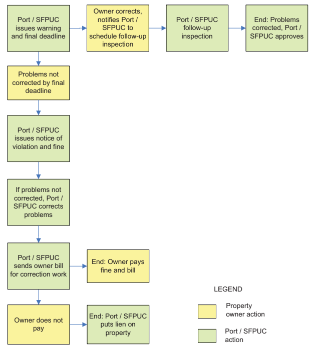
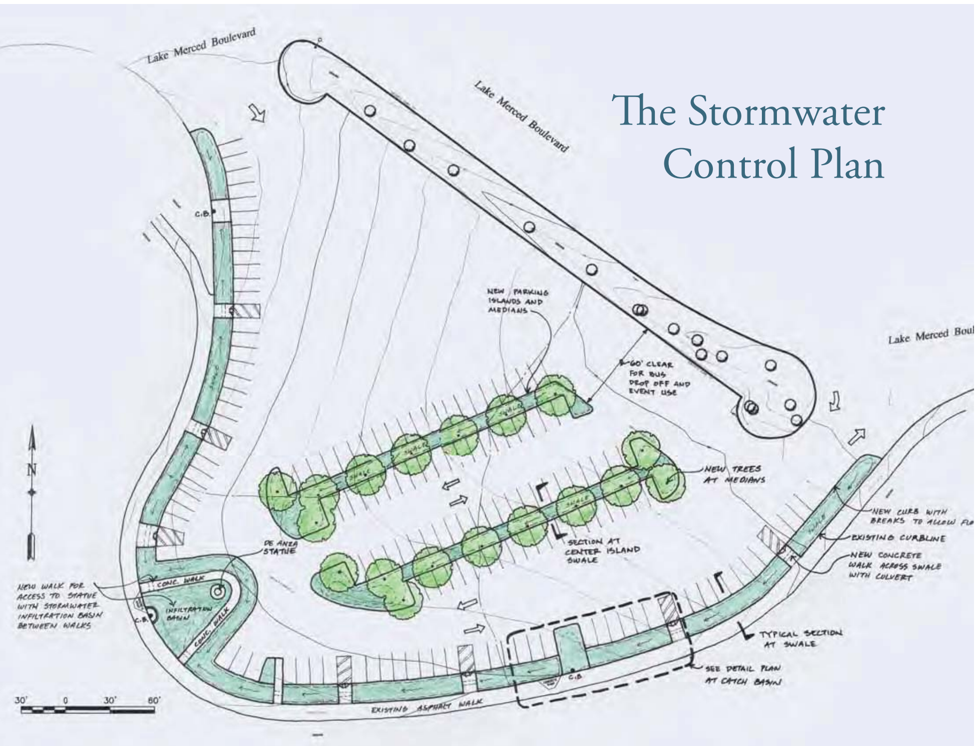


Figure 21. *Enforcement.*

The Stormwater Control Plan



The Port and SFPUC require submittal of a Stormwater Control Plan (SCP) with every development application for discretionary planning approval in San Francisco for all projects disturbing 5,000 square feet or more of the ground plane.

The Port and SFPUC require the submission of a Stormwater Control Plan (SCP). The SCP will allow the Port, the SFPUC, and the Planning Department to review projects that are subject to the *Guidelines* and ensure compliance with them. SCPs must be reviewed and stamped by a California licensed landscape architect, architect, or engineer.

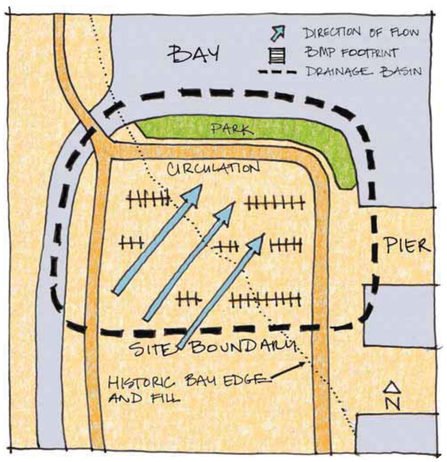
Project applicants must complete each of the following elements in their SCPs to be eligible for project approval:

1. Characterize existing site conditions
2. Identify design and development goals
3. Develop a site plan
4. Develop a site design
5. Select and locate source controls
6. Select and locate treatment BMPs
7. Size treatment BMPs
8. Check against design goals and modify as necessary
9. Develop an operations and maintenance plan
10. Compile the Stormwater Control Plan

Although the elements of the SCP are presented as a series of steps, in practice they should be iterative. For example, although site design comes before BMP sizing in the SCP checklist, BMP sizing results may require designers to make changes to the original site design. The following section provides an overview of each element of the SCP, illustrated by a conceptual drawing. An example of a completed SCP is included in Appendix C.

Requirement

The Stormwater Control Plan (SCP) must be reviewed and stamped by a licensed landscape architect, architect, or engineer.



Step 1

Characterize existing conditions

The stormwater management approach available to a given site is largely dictated by existing site conditions. Soil types, topography and drainage, vegetation types, wildlife habitat, proximity to receiving waters, existing structures, adjacent land uses, and historical and cultural features are all factors that project proponents should consider prior to initiating design of stormwater BMPs. A comprehensive checklist of site conditions that should be evaluated during the site analysis phase can be found in the SCP (Appendix C).

Jurisdictional concerns can influence a site as much as physical conditions. For example, parcels within 100 feet of the San Francisco Bay shoreline are subject to San Francisco Bay Conservation and Development Commission (BCDC) policies governing public access, circulation, and landscaping. Alterations to structures along most of the San Francisco Northern Waterfront are subject to the requirements of a National Historic Register District. Some properties may have deed restrictions establishing requirements for the management of residual soil and groundwater pollution. Port, SFPUC, and City Planning staff will work with project applicants to identify jurisdictional issues that are relevant to the site.

Characterizing existing conditions helps to define the opportunities and constraints that will shape the site design. Opportunities include existing drainage patterns and vegetation, oddly configured or otherwise unbuildable parcels, easements, and landscape amenities, including open spaces that can serve as locations for BMPs. Differences in elevation across the site

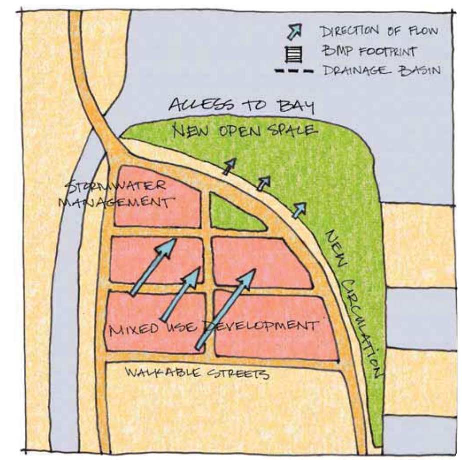
and existing low-lying areas present opportunities to implement BMPs that reduce or eliminate the need for pumping or other mechanical conveyance, a savings in both installation and long-term operation costs.

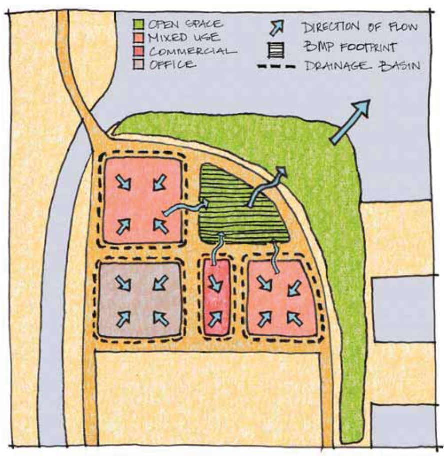
Constraints might include impermeable soils, a high water table, contaminated soils, geotechnical instability, existing utilities, and historic and cultural resources. Site-specific percolation tests and other geotechnical investigations by a certified engineer will be needed to ensure the most effective design solutions.

Step 2

Identify design and development goals

Every project applicant will begin the design process with a set of goals that will impact stormwater management requirements for the site. The program, density, and intensity of land use on a site present both opportunities and constraints for stormwater management. A project applicant intending to build a mixed-use development with high-density housing in the Bayview-Hunters Point neighborhood will approach the design process differently from a project applicant seeking to develop an industrial facility on a waterfront pier. The former might use stormwater to define the character of the public realm and create water features in community open spaces. The latter might use stormwater in cooling towers and wash-down areas to offset potable water use.





Step 3

Develop a site plan

Using the evaluation of existing conditions, along with the design and development goals, project applicants can begin to see how their project will integrate with or alter the hydrology of the site. The site plan should delineate the proposed land uses and major post-development drainage basins and should show, at the conceptual level, how water will move across the site.

Step 4

Develop a site design

Page 28 of this document introduced seven goals to guide the integration of stormwater management into site design. This section identifies strategies to achieve each goal.

Goal 1: Preserve and protect creeks, wetlands, and existing vegetation and other wildlife habitat.

- Incorporate creeks, wetlands, and existing vegetation into the site design (See Appendix D for appropriate vegetation).
- Develop setbacks that protect creeks, wetlands, and sensitive wildlife habitats and also provide usable open space for the public.
- Concentrate development in already developed areas.

San Francisco Stormwater Design Guidelines

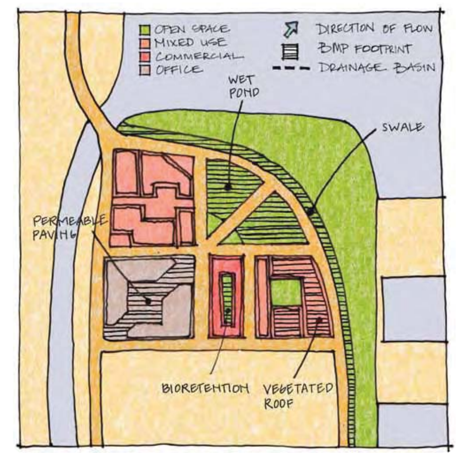
- Encourage high-density, transit-accessible development.
- Encourage clean-up and reuse of brownfield sites.
- Look at each site as an opportunity to protect, enhance, or create wildlife habitat.

Goal 2: Preserve natural drainage patterns and topography and incorporate them into site design.

- Daylight historic watercourses and make them a central element of site design.
- Design stormwater BMPs to take advantage of existing slopes and drainage paths.
- Minimize re-grading and soil impacts.
- Prioritize the use of infiltration-based BMPs where soils, groundwater, and geology allow.

Goal 3: Minimize and disconnect impervious surfaces.

- Design compact, multi-story structures, as allowed by applicable zoning regulations.
- Cluster buildings to reduce the length of streets and driveways, minimize land disturbance, and protect natural areas.
- Design narrow streets and driveways, as allowed by the local jurisdiction.
- Use landscape and permeable paving materials rather than traditional hardscape. Plazas, sidewalks, driveways, streets, parking areas, and patios can be constructed from materials such as crushed aggregate, decomposed granite, turf block, unit pavers, porous asphalt, or pervious concrete.
- Install vegetated roofs to reduce runoff from buildings.
- Minimize parking lot footprints and impacts by building structured parking with alternative roof uses and designing compact parking spaces and space-efficient circulation patterns.



Stormwater treatment facilities enhance public spaces in Portland's South Waterfront redevelopment area.

From the Site to the City

LID is implemented site by site, but each site should be considered in the context of its watershed-wide goals. Over time, incremental improvements will add up to long-term water quality protection for the Bay and Ocean, the restoration of hydrologic function in San Francisco's watersheds, and city-wide greening.

- Drain runoff from impervious areas to pervious areas. In cases where infiltration is not appropriate, landscape features can serve as treatment and conveyance structures and can be fitted with an underdrain to allow for discharge to the municipal storm sewer system or receiving waters.

Goal 4: Design the flow path of stormwater on a site all the way from the first contact to the discharge point.

- Identify the location where stormwater will first enter a site. For example, the first point of contact is often a roof. How will the water travel from the roof to a BMP? In the event that the BMP overflows, where will it discharge?
- Identify an approved discharge location (downstream conveyance system, another BMP or receiving water body) to accommodate flows beyond the capacity of each BMP.
- Design and clearly identify an overflow conveyance system to accommodate flows beyond the BMP's treatment capacity and up to a 100-year storm. All BMPs must have an approved discharge location.

Goal 5: Treat stormwater as a resource, not a waste product.

- Capture stormwater for irrigation, toilet flushing, cooling towers, vehicle wash-down areas, and other non-potable applications.
- Design multi-purpose BMPs that not only manage stormwater but also improve streetscape and public space design.
- Use stormwater for design inspiration.
- Incorporate environmental education and interpretation into LID where appropriate.

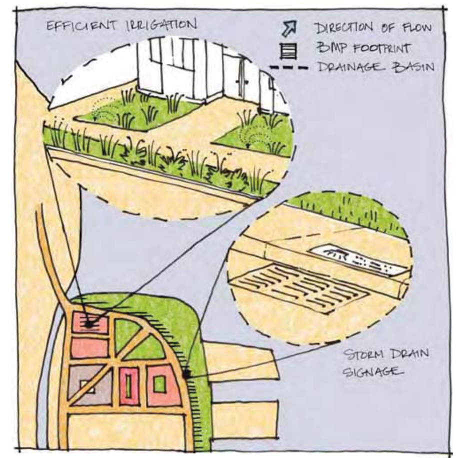
Goal 6: Treat stormwater at its source.

- Identify pollutants of concern and their sources early in the design process and install source control measures where appropriate.
- Aim for ubiquitous infiltration of stormwater on site.
- Place treatment BMPs as close to the source of runoff as possible.

Goal 7: Use treatment trains to address a broad array of pollutants.

- Combine stormwater BMPs that target different pollutants to create a treatment train. This strategy ensures higher levels of treatment and reduces the required size of each BMP in the treatment train.
- Pretreatment BMPs, such as sediment forebays, help reduce maintenance costs and improve the overall performance of stormwater BMPs.

Step 5



Select and locate source controls

Everyday activities such as recycling, trash disposal, and vehicle and equipment washing generate pollutants such as trash, sediments, oil and grease, nutrients, pesticides, and metals that can be mobilized by stormwater runoff and carried to receiving waters. These pollutants can be minimized by applying source control BMPs. Source control BMPs prevent pollutant generation and discharge by controlling pollution at its source, or, at a minimum, limiting pollutant exposure to stormwater.

Source control BMPs include both structural features and operational practices. Typical structural source control BMPs involve covering, berming, or hydraulically isolating a potential pollutant source area.

Operational source control measures include routine pavement sweeping and substituting traditional materials with those that are less toxic; for example, replacing traditional anodized chain link fencing with vinyl coated fencing.

Specific requirements for land uses and activities that will need to implement source control measures are found in Attachment 4 of the Phase II General Permit (http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/final_attachment4.pdf). The Fact Sheets (Appendix A) include a list of resources for source control measures. Form A of the SCP (Appendix C) guides the project proponent through the source control BMP selection process.

Source Control Requirement

The following uses and activities are required to implement specific source control measures as specified in Attachment 4 of the Phase II General Permit (http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/final_attachment4.pdf):

- 100,000 sq. ft. commercial developments
- Restaurants
- Retail gasoline outlets
- Automotive repair shops
- Parking lots

A drain adjacent to a trash compactor is connected to the sanitary sewer system. A concrete berm surrounding the trash storage area hydraulically isolates stormwater runoff in this area from the rest of the site.

Hydraulic Isolation

Hydraulic isolation is the practice of separating one drainage area from surrounding areas such that fluids cannot pass between them. This can be done using grading or constructed barriers. Hydraulic isolation allows designers to treat runoff and waste from the isolated area according to the specific pollutants found there. In some cases, hydraulically isolated areas can be connected to the sanitary sewer system rather than the storm sewer system.

Vehicle wash racks and trash compactor areas are examples of areas that can be hydraulically isolated to protect surrounding areas from the soap, grease, oil, sediments, trash and other pollutants associated with those activities.

Integrated Pest Management

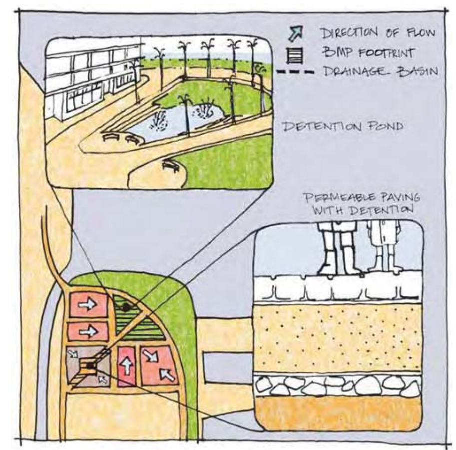
Integrated Pest Management (IPM) is an ecological approach to suppressing pests. IPM uses information on the life cycle of pests, along with multiple pest control techniques, to keep pests at acceptable levels in an economical and environmentally safe way. IPM focuses on monitoring and preventing pests and using low-risk pest control techniques. Because pest problems are often symptomatic of ecological imbalances, the goal is to plan and manage ecosystems to prevent organisms from becoming pests in the first place. This means developing landscape plans that focus on the use of native or Mediterranean plant species suited to San Francisco's climate and soil conditions (Appendix D). IPM principles help to reduce or eliminate the use of pesticides; thereby reducing the risk that stormwater runoff will mobilize pesticides and carry them to collection systems or receiving water bodies.

Step 6

Select and Locate Treatment BMPs

Site design and source control make significant contributions to effective stormwater management. But achieving treatment to the MEP also requires the implementation of treatment control BMPs. The selection of stormwater treatment BMPs is guided by existing site conditions, design and development goals, and the pollutants of concern for the site.

The two-step BMP selection process outlined here will help project applicants to identify a suite of site-specific treatment BMPs. The first step is to use the BMP Decision Tree (see Figure 22), to identify BMPs that are suitable for a given site. The second step is to narrow the list of suitable BMPs to the ones that target the pollutants of concern that have been identified for a given site.



The BMP Decision Tree

The BMP Decision Tree will help project applicants use site-specific information to select the BMPs that are most appropriate given the conditions at their site. BMPs that are not suitable will be eliminated from consideration.

The BMP Decision Tree prompts the project applicant to consider specific site characteristics that affect BMP design. The answers narrow the field of appropriate BMPs. On-site percolation tests and geotechnical investigations must be done during the site analysis to determine whether infiltration-based BMPs are feasible for the site (for instance, is there adequate depth to groundwater, which for most sites will be 10 feet). However, infiltration-

El Monte Sagrado Spa in Taos, New Mexico uses wetlands to treat stormwater so that it can be used to fill spa pools.

Permeable pavement can be integrated into a variety of hardscapes such as roads and sidewalks, plazas, terraces and patios.

based BMPs need not always be eliminated based upon this information. Rather, a modified design solution can make a BMP feasible. Vegetated swales can be used for stormwater treatment in areas with poor infiltration or contaminated soils provided that they are lined with an impermeable liner, underdrained, and constructed with clean import soil. See the BMP Fact Sheets in Appendix A for information on liners and underdrains.

Steep slopes can limit the range of appropriate BMPs for a given site because they can cause high flow rates and instability. Terracing the site is one design solution that could allow the implementation of slope-dependent BMPs on a steep site. Check dams can also be used to mitigate problems caused by steep slopes.

After all of the information has been evaluated, the BMP Decision Tree will indicate one of three outcomes for a given site:

- All BMPs are feasible;
- A subset of BMPs is feasible for unconditional implementation; or
- A subset of BMPs is feasible with conditions.

The resulting list of BMPs can then be evaluated for their effectiveness in treating the pollutants of concern for the project. Project applicants should include the results of the Decision Tree process in their SCP.

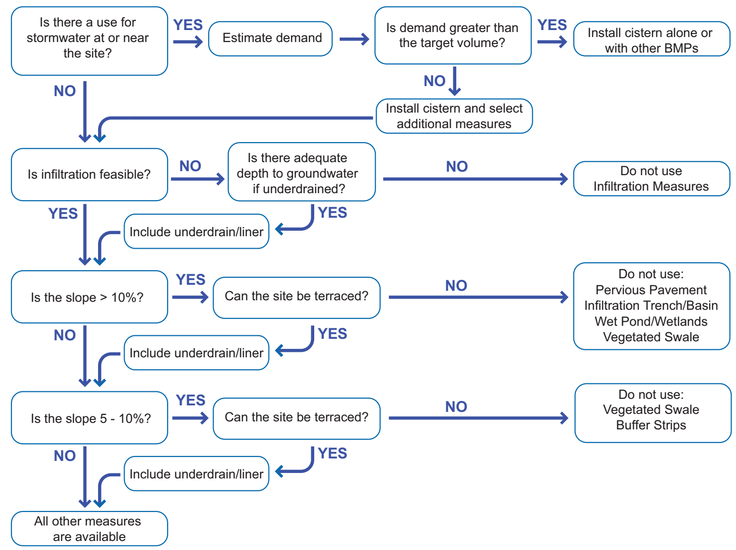


Figure 22. *Stormwater BMP Decision Tree*

Weirs (top) and cascades (bottom) make street-side bioretention possible on steep slopes in Seattle, WA.

Match BMPs with Pollutants of Concern

Table 6 includes a list of pollutants typically found in stormwater runoff and their association with common San Francisco land uses. Project applicants can use the table to screen for likely pollutants of concern, but identifying the specific commercial and industrial activities proposed for a site provides a better indication of which pollutants to target. For example, a restaurant would need to include BMPs to prevent oil and grease from contacting stormwater, and roadways in any project bring up concerns about metals, oil and grease, and sediments.

After project applicants consult Table 6 to anticipate the pollutants of concern for their proposed land uses, they can use Table 7 to identify BMPs that both treat pollutants of concern and are deemed appropriate for the physical site conditions by the BMP Decision Tree. To learn more about each BMP listed in the table, see the BMP Fact Sheets in Appendix A.

Land Use Type	Metals	Sediments	Trash	Oil and Grease	Organics	Nutrients
High Density Residential	•	•	•	•		•
Low Density Residential	•	•	•	•		•
Mixed Use	•	•	•	•	•	•
Light Industrial	•	•	•	•		
Heavy Industrial	•	•	•	•	•	
Open Space		•	•		•	•
Piers Over Water	•	•	•			
Former Shipyards	•	•	•	•	•	•

Table 6. *Typical pollutants associated with common San Francisco land uses*

Treatment Control		Metals	Sediments	Trash	Oil and Grease	Bacteria	Organics	Nutrients
Infiltration								
	Dry Well	●			●	●	●	●
	Infiltration Basin	●	○p	○p	●	●	●	●
	Infiltration Trench	●	○p	○p	●	●	●	●
	Permeable Pavement	◒	●p	○p	○	◒	◒	●
Detention								
	Constructed Wetland	●	●p	○p	●	●	●	◒
	Detention Pond	◒	◒p	○p	◒	◒	◒	○
	Detention Vault	○	◒	○	◒	○	○	○
	Wet Pond	●	●p	○p	●	●	●	◒
Bioretention								
	Flow-through Planter	●	●p	○p	●	●	●	◒
	Rain Garden	●	●p	●p	●	●	●	●
Biofiltration								
	Vegetated Buffer Strip	●	●p	◒p	◒	○	◒	○
	Vegetated Swale	◒	◒	○	◒	○	◒	○
	Media Filter	●	●p	●p	●	●	●	●
	Sand Filter	●	●	●	●	●	◒	◒
	Vegetated Rock Filter	◒	●p	○p	●	◒	●	●
	Swirl Separator	○	●	●	◒	○	○	○
	Water Quality Inlet	○	◒	◒	◒	○	○	○
	Drain Insert	◒	◒	●	◒	○	○	○
Retention								
	Rainwater Harvesting*							

○ Low ◒ Moderate ● High p Requires Pre-treatment

*Rainwater Harvesting does not provide stormwater treatment. However, it prevents polluted stormwater from reaching receiving water bodies.

Table 7. *BMPs that capture or treat pollutants typically found in stormwater runoff.*

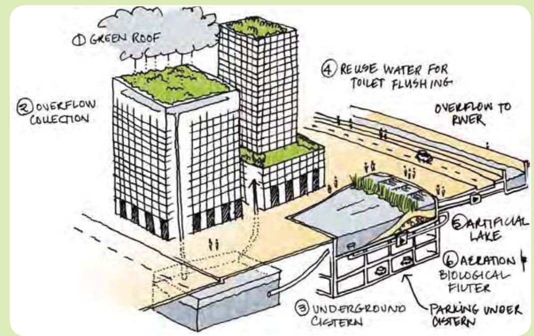
Treatment Trains

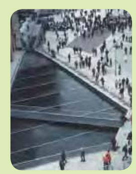
A single treatment BMP may not adequately treat the entire range of pollutants from its contributing watershed, especially in large developments involving diverse activities. For example, some treatment BMPs are designed to remove fine suspended sediment but may not be able to remove dissolved metals. Because of this, a combination of several BMPs in succession may be needed to treat all of the pollutants on a given site.

A combination of BMPs, constructed in a series to target specific pollutants, is called a treatment train. Treatment trains not only improve water quality, they also improve the long-term efficiency and reduce the maintenance requirements for each treatment BMP involved in the train. Heavy sediments and trash can negatively impact BMP performance, thus silt traps and sediment forebays are commonly used as a first step in the treatment process. In the same way that pre-rinsing dirty dishes increases the efficacy and efficiency of a dishwasher, removing sediment prior to infiltration of stormwater will improve the long-term capacity of the underlying soils to infiltrate water by preventing sediment from clogging pore spaces that allow the movement of water through the soil.

Common treatment train configurations include:

- Silt trap → Swale → Wetland
- Cistern → Rain garden
- Retention basin → Sand filter
- Vegetated strip → Infiltration trench



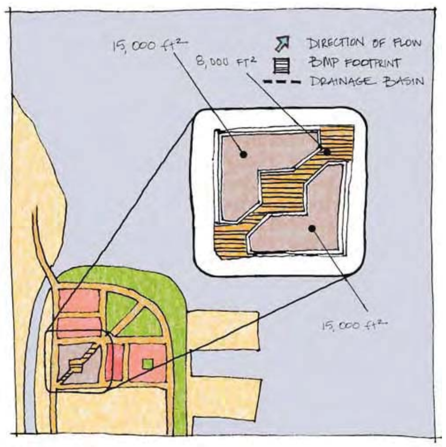



Case Study: Berlin Treatment Train

The design for Potsdamer Platz, one of Berlin's most important public squares, includes a stormwater treatment train that uses multiple stormwater management strategies (indoor use, storage, biofiltration, and outdoor use) to control both the quality and the volume of stormwater on-site. The roofs of the development, some of which are vegetated roofs and some of which are traditional, harvest rainwater to be used in the buildings for toilet flushing and irrigation. During large storm events, five underground cisterns store rainwater and then release it slowly into a series of pools and planted 'biotopes' for filtration. In the summer months, additional filters can be added to remove algae. Treated rainwater then flows through a very popular outdoor waterscape where employees and visitors gather. Like San Francisco, Berlin has an average annual rainfall of 21 inches.

Treatment Train Principles

- Think of each element in a treatment train as a separate functional unit.
- Before adding additional elements to a treatment train, analyze their performance relative to previous BMPs in the train. If the expected water quality benefits are limited, the increase in cost may outweigh the benefits.
- Do not alter or remove design measures used to reduce the size of stormwater treatment measures without a corresponding resizing of associated stormwater treatment BMPs, otherwise the capacity of the BMPs will be exceeded.



Step 7

Size Treatment BMPs

After selecting a suite of treatment BMPs that are appropriate for the site conditions and target the pollutants of concern, project applicants will need to size these BMPs to achieve the required stormwater performance standards. This section explains how to size treatment BMPs, but project applicants can also use the automated electronic sizing spreadsheets provided in Appendix B, which can also be found on the SFPUC and Port websites at www.sfwater.org and www.sfport.com. While the Port and SFPUC do not require the use of the sizing spreadsheets for BMP design, project applicants must complete Table 1 of the electronic sizing spreadsheet in Appendix B to document drainage parcels and design flow rates and volumes. This information is required in the SCP.

The performance measures discussed in this section aim to protect the water quality of receiving water bodies. They meet all regulatory requirements and are the foundation of the BMP sizing spreadsheet. For information about how the performance measures were developed, please see the resources at the end of this section.

A rain garden at Glencoe Elementary in Portland, Oregon reduces stormwater flows to Portland's collection system.

Treatment Control		Sizing Design Criteria	
		Flow-based	Volume-based
Infiltration	Dry Well		•
	Infiltration Basin		•
	Infiltration Trench		•
	Permeable Pavement		•
Detention	Constructed Wetland		•
	Detention Pond		•
	Detention Vault		•
	Wet Pond		•
Bioretention	Flow-through Planter	•	
	Rain Garden	•	• (if infiltrating)
Biofiltration	Vegetated Buffer Strip	•	
	Vegetated Swale	•	
	Media Filter	•	
	Sand Filter	•	
	Vegetated Rock Filter	•	
	Swirl Separator	•	
	Water Quality Inlet	•	
	Drain Insert	•	
Retention	Rainwater Harvesting		•

Table 8. *Treatment control measures and sizing methods*

Port Requirements

Stormwater performance measures for areas in the separate sewers operated by the Port require the capture and treatment of:

(a) The flow of stormwater runoff resulting from a rain event equal to at least 0.2 inch per hour intensity; or

(b) Eighty percent or more of the annual stormwater runoff volume, determined from unit basin storage volume capture curves for San Francisco (see Figure 23).

Performance measure (a) should be used for sizing flow-based BMPs, such as vegetated swales or flow-through planters. These are BMPs whose primary mode of pollutant removal depends on the flow rate of runoff through the BMP. Performance measure (b) should be used for sizing volume-based BMPs, such as infiltration basins or detention basins. These are BMPs whose primary mode of pollutant removal depends on the volumetric capacity of the BMP. These performance measures are adapted from the General Permit.

Requirement

The Port's stormwater performance measures for areas served by separate storm sewers require the capture and treatment of:

(a) The **flow** of stormwater runoff resulting from a rain event equal to at least 0.2 inch per hour intensity; **or**

(b) Eighty percent or more of the annual stormwater runoff **volume** determined from design rainfall capture curves for San Francisco. The maximum drawn-down time for stormwater captured during a rain event is 48 hours.

Project applicants should determine which sizing criteria apply to each BMP and size the facility accordingly. Many BMPs can be designed to attain both flow-based and volume-based stormwater management goals, but they are most often categorized as one or the other (see Table 8).

Flow-based Sizing

The recommended method for hydraulically sizing flow-based treatment BMPs is the Uniform Intensity Approach and is used in conjunction with the Rational Method for estimating stormwater flows. It is also described in the CASQA 2003 Stormwater Best Management Practice Handbook New Development and Redevelopment. Automated electronic sizing spreadsheets can be found at www.sfwater.org and www.sfport.com, and are described in Appendix B. The Rational Method is used as follows:

1. **Identify each drainage management area on the site.** A drainage management area is a discrete area or subwatershed. The runoff from each drainage management area will drain its own treatment control BMP(s). The steps below should be applied to each drainage management area.

2. **Determine the area in acres (A)** of the drainage management area that drains to the proposed BMP(s).

3. **Assign a Runoff Coefficient**, or C-factor, to each land surface in the drainage management area. The C-factor describes the percentage of runoff generated by different types of surfaces during rain events. Surfaces that produce higher volumes of runoff, such as concrete, have relatively higher C-factors, while surfaces that produce lower volumes of runoff, such as landscaped areas, have relatively lower C-factors. Table 9 lists established C-factor values for each land surface.

4. **Calculate the Composite C-factor (C)**, a weighted average of all the C-factors for all the surfaces in the drainage management area. Multiply each C-factor by the area of the surface it applies to. Add the results and divide by the total site area.

Flow-Based Sizing

The Rational Method: Q=CiA

Where:

Q = flow in ft^3/second

C = composite runoff coefficient (composite C-factor)

i = rainfall intensity in inch/hour (0.2 inch/hr recommended)

A = drainage area in acres

Type of Surface	Typical Range	Recommended Value
Asphalt	0.7 - 0.95	0.8
Concrete	0.8 - 0.95	0.9
Brick	0.7 - 0.85	0.8
Roofs	0.75 - 0.9	0.85
Pervious Concrete	0.1 - 0.3	0.2
Pervious Asphalt	0.1 - 0.3	0.2
Paving Stones	0.1 - 0.7	0.4
Grass Pavers/Turf Blocks	0.15 - 0.6	0.35
Lawns and Grass:		
sandy soil, slope <2%	0.05 - 0.1	0.08
sandy soil, slope >7%	0.15 - 0.2	0.17
heavy soil, slope <2%	0.13 - 0.17	0.15
heavy soil, slope >7%	0.25 - 0.35	0.3
Landscaping	0.15 - 0.3	0.2
Crushed Aggregate	0.15 - 0.3	0.25

Table 9. *Typical runoff coefficients*

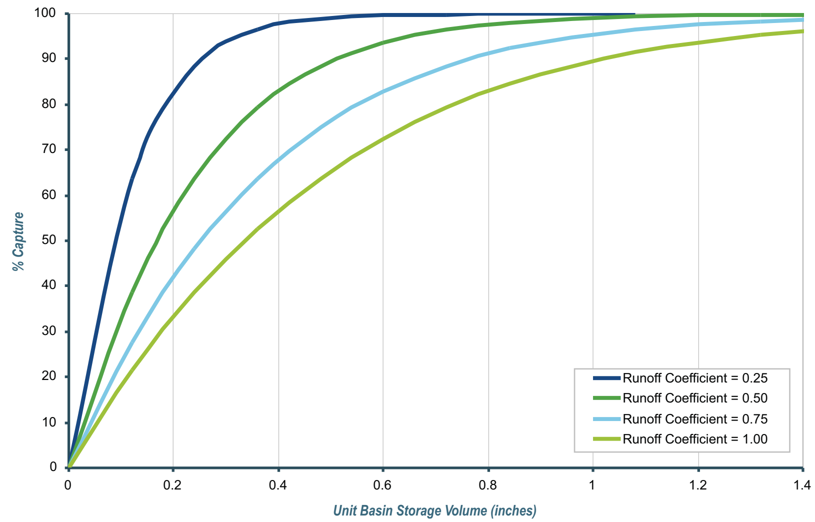


Figure 23. *Composite runoff coefficients and unit basin storage volume for 80 percent capture with 48-hour drawdown*

5. **Use a design rainfall intensity (i) of 0.2 inch per hour**. This intensity represents twice the 85th percentile hourly depth, which can be derived by ranking the hourly depth of rainfall from storms over the period of record. The General Permit specifies that, for water quality protection, the design rainfall intensity be equal to or greater than twice the 85th percentile hourly depth.

Q = CiA yields the design flow rate (**Q**), in cubic feet per second, that a BMP must accommodate to meet the performance measures. For more information on sizing flow-based treatment BMPs, see the Fact Sheets in Appendix A and the sizing spreadsheets in Appendix B.

Volume-based Sizing

The recommended method for hydraulically sizing volume-based stormwater treatment BMPs is based upon a goal of 80% annual stormwater volume capture within a 48-hour draw-down period. This method is further described in CASQA's 2003 Stormwater Best Management Practice Handbook New Development and Redevelopment, which is available at www.cabmphandbooks.com.

The following steps explain how to calculate each variable.

1. **Identify each drainage management area on the site.** A drainage management area is a discrete area or subwatershed. The runoff from each drainage management area will drain its own treatment control BMP(s). The steps below should be applied to each drainage management area.

2. **Determine the area in acres (A)** of the drainage management area that drains to the proposed BMP.

3. **Calculate the Composite C-factor** for the drainage management area using the method described in steps 3 and 4 of the flow-based sizing section.

4. **Use the composite C-factor** to interpolate a Unit Basin Storage Volume value (in inches) from the unit basin storage volume curves in Figure 23. Interpolate between the reference C values as necessary to determine a Unit Basin Storage value. A 48-hour draw-down time is recommended, unless soils at the site are coarse.

Volume-Based Sizing

BMP Capture Volume =
BMP Drainage Area x **Unit Basin Storage Volume**

Where:

BMP Capture Volume = the volume of water that the BMP must capture to achieve compliance with the volume-based performance measures.

BMP Drainage Area = the contributing drainage area for the BMP.

Unit Basin Storage Volume = the depth of rainfall, in inches, that is related to a percentage of annual runoff capture. It is determined for various runoff coefficients from historical rainfall records.

Rainwater harvesting is a volume-based BMP that can be used to collect water for various types of industrial operations, resulting in reduced utility costs.

5. **Calculate the BMP Capture Volume** by multiplying the **BMP Drainage Management Area** by the **Unit Basin Storage Volume**. Convert to cubic feet for easy interpretation.

The BMP Capture Volume is the volume needed to meet regulatory standards for stormwater treatment. This or a larger volume must be used for BMP design. The BMP Capture Volume must be recorded and submitted in the SCP. The BMP Fact Sheets in Appendix A and sizing spreadsheets in Appendix B also contain information pertinent to sizing volume-based treatment BMPs.

SFPUC Requirements

Stormwater performance measures for areas in the separate sewers under the jurisdiction of the SFPUC require the capture and treatment of rainfall from a 0.75-inch design storm, which is equivalent to LEED Sustainable Sites Credit 6.2.

To meet the SFPUC performance measure and earn LEED Credit SS6.2, use the following calculation:

V = CAd, where **V** = Volume of water in cubic feet, **A** = size of the drainage management area in square feet, **C** = runoff coefficient, and **d** = rainfall depth in inches.

1. **Determine the area in square feet (A)** of the drainage management area, also known as a subwatershed, that drains to the proposed BMP.

2. **Calculate the Composite C-factor (C)** for the drainage management area using the method described in steps 3 and 4 of the flow-based sizing section.

3. **Use 0.75 inch as the design rainfall depth (d)** for the facility. This design rainfall depth corresponds to LEED Credit SS6.2 for semi-arid watersheds.

5. **Calculate the Volume** by multiplying **C**, **A**, and **d**. Divide by 12 to convert to cubic feet. The maximum allowable draw-down time is 48 hours.

The BMP must capture a volume of water equal to or greater than the volume calculated using the equation above to meet regulatory standards for stormwater treatment. The volume that the BMP will capture must be recorded and submitted in the SCP. The

BMP Sizing

V=CAd

Where:

V = volume in ft^3

C = composite runoff coefficient (composite C-factor)

A = drainage area in square feet

d = design rainfall depth in inches (use 0.75 inch)

"BMP Fact Sheets" in Appendix A and the sizing spreadsheets in Appendix B also contain information pertinent to sizing volume-based treatment BMPs.

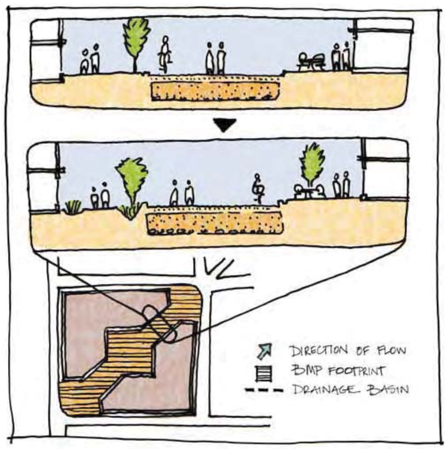
Project applicants in combined sewer areas under SFPUC jurisdiction must achieve LEED SS6.1 to reduce the flow and volume of stormwater into the collection system. SFPUC staff is in the process of creating additional guidance for achieving SS6.1. In the meantime project applicants are encouraged to consult *LEED for New Construction Version 2.2* and contact Urban Watershed Management Program staff if necessary.

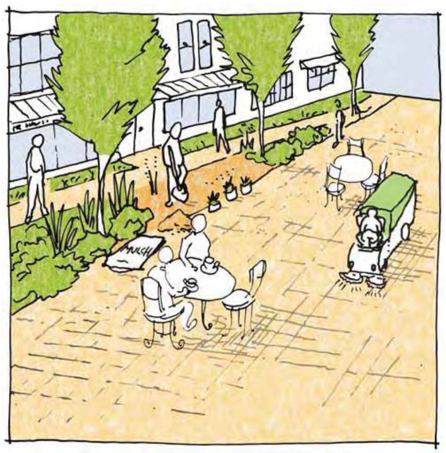
Step 8

Check against Design Goals and Modify if Necessary

After site design, source control, BMP selection, and BMP sizing are completed, project applicants should review the original design goals and evaluate whether they have been achieved. If not, an iterative design process that may include BMP relocation or resizing can ensure that the project achieves its design and development goals and complies with stormwater treatment requirements.

At this stage in the design process, there is a general understanding of how the runoff will move across the site, source control measures have been identified and located, treatment controls have been selected based on site conditions and pollutants of concern, and target water quality volumes and flow rates have been calculated. The next task is to locate and size the actual treatment controls. Sizing tools for each treatment control are





included with the Fact Sheets in Appendix B, and are available electronically at www.sfwater.org and www.sfport.com.

Step 9

Develop an Operations and Maintenance Plan

Treatment and control facilities must be regularly maintained to ensure that they continue to provide effective treatment and do not harbor mosquitoes, cause flooding, or otherwise create a nuisance. Improper maintenance is one of the most common reasons for BMP underperformance and failure.

The General Permit requires that project applicants provide verification of maintenance provisions "through such means as may be appropriate, including, but not limited to legal agreements, covenants, CEQA mitigation requirements and/or Conditional Use Permits." Stormwater facilities installed as part of new development or redevelopment projects will be incorporated into both the Port's and SFPUC's operation and maintenance verification program. An operations and maintenance plan is a required element of the SCP. To develop an operations and maintenance program for new facilities, follow these steps:

1. **Identify who will own or have operational responsibility** for the facility. In the case of Port facilities, operational responsibility will be assigned through lease and development agreements. In the case of privately owned facilities regulated by the SFPUC the property owner will be responsible for operations and maintenance.

2. **Identify applicable maintenance requirements** for each stormwater control at the facility and list the requirements into the SCP. The SCP must identify any title transfers, lease provisions, or maintenance agreements that will be executed before construction is complete.
3. **Develop an Operations and Maintenance Plan** (O&M Plan) for the site incorporating detailed requirements for each treatment and control BMP at the facility. The O&M Plan must be submitted before the building permit is finalized and a certificate of occupancy is issued. Any necessary agreements must be executed concurrent with submittal of the O&M Plan.
4. **Maintain the facilities** from the time of construction until ownership or lease is formally transferred.
5. **Formally transfer** operation and maintenance responsibilities to any new owner, occupant or lessee. **The transfer will require the new owner, occupant, or lessee to maintain facilities in perpetuity and comply with Port and SFPUC self-inspection, reporting, and verification requirements.**

Mulching is an important part of BMP maintenance.

Designing to Minimize Maintenance

Streamlined maintenance and maximized performance can be achieved by considering the following design features:

- Use pretreatment systems to remove coarse sediment and litter, particularly for infiltration systems. Pretreatment systems can also reduce the velocity of flows entering the treatment BMP, reducing wear on the BMP and extending its useful life.
- Use deeper rooted vegetation in conjunction with infiltration BMPs. Good root structure helps to maintain soil porosity and reduces the maintenance needs of the BMP. For a list of recommended vegetation species, see Appendix D.
- Whenever possible, select BMPs that do not require slow-release control structures. Such structures can clog and require periodic inspection and maintenance.
- Stormwater facilities that are above-ground are more likely to be visible and therefore receive maintenance.

Regular inspections are required in order to maintain the effectiveness of treatment control BMPs. Inspection and maintenance activities can be divided into two functions:

1. Scheduled routine inspection and maintenance, and
2. Non-routine repair and maintenance.

Routine inspection can reveal potential problems with BMP operations and help to ensure the highest level of pollutant removal. Routine maintenance refers to activities performed on a regular basis to keep the BMP in good working order. These activities are generally not complicated (sediment removal, landscape work, etc.) and can be performed by most facility maintenance staff. Typical maintenance activities are described in each of the BMP Fact Sheets included in Appendix A.

Step 10

Compile the Stormwater Control Plan

A Stormwater Control Plan (SCP) with exhibits – as described in the SCP template (Appendix C) – must be submitted to the Port or SFPUC as part of the planning approval process. The completed SCP must include the following information:

- Information on Project Owner/Developer and Design Team
- Project location
- Project description
- A site plan showing proposed project
- Any soils or geotechnical reports necessary to complete stormwater design
- Site analysis for locating and sizing BMPs
- A site drainage plan showing direction of stormwater flow to the point where it enters the storm sewer system or receiving waters
- Stormwater sizing calculations
- A post-construction O&M Plan
- Refer to Appendix C for a template of an SCP.

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San Francisco Stormwater Design Guidelines
November 2009 Version - Updates and errata will be published as necessary

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EXHIBITS 5-13

To Mission Bay Alliance Comment Letter dated July 24, 2015

Re: Hydrology, Water Quality and Biological Impacts - Comments on Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 (Warriors Arena Project); San Francisco Planning Department Case No. 2014.1441E; State Clearinghouse No. 2014112045

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EXHIBIT 5

http://www.epa.gov/pcbsincaulk/
Last updated on 2/21/2014

Polychlorinated Biphenyls (PCBs)

You are here: EPA Home Wastes Polychlorinated Biphenyls (PCBs) PCBs in Caulk in Older Buildings

PCBs in Caulk in Older Buildings

You will need Adobe Reader to view some of the files on this page. See EPA's PDF page to learn more.

Page Contents

PCBs in Caulk Hotline

For additional information call 1-888-835-5372

Highlights

PCB Guidance Reinterpretation

Important Resources

- Find your EPA Regional PCB Coordinator
- Preventing Exposure to PCBs in Caulking Material (PDF) (4 pp, 1.1 MB) || en Español (PDF) (4 pp, 2.7 MB)
- General information on PCBs in older schools and buildings (PDF) (1 pp, 162 KB)
- Schools checklist (PDF) (1 pp, 414 KB)
- Contractors Handling PCBs in Caulk During Renovation HTML || PDF (4 pp, 1.9MB) || PDF en Español (4 pp, 1.8 MB)
- PCBs in School Research
- Public Health Levels for PCBs in Indoor School Air (PDF) (2 pp, 14 KB)
- Steps to Safe Renovation and Abatement of Buildings That Have PCB-Containing Caulk

Overview

In recent years, EPA has learned that caulk containing potentially harmful polychlorinated biphenyls (PCBs) was used in many buildings, including schools, in the 1950s through the 1970s. Most schools and buildings built after 1979 do not contain PCBs in caulk. On September 25, 2009, EPA announced new guidance for school administrators and building managers with important information about managing PCBs in caulk and tools to help minimize possible exposure. Through EPA PCB Regional Coordinators, the Agency will also assist communities in identifying potential problems and, if necessary, developing plans for PCB testing and removal.

For more information:

- PCBs in Caulk Fact Sheet (PDF) (2 pp, 26 KB)
- PCBs In Caulk Frequent Questions (PDF) (14 pp, 101 KB)

The EPA is conducting research to address several unresolved scientific questions that must be better understood to assess the magnitude of the problem of PCBs in caulk and identify the best long-term solutions. For example, the link between the concentrations of PCBs in caulk and PCBs in the air or dust is not well understood. The Agency is doing research to determine the sources and levels of PCBs in schools and to evaluate different strategies to reduce exposures. The results of this research will be used to provide further guidance to schools and building owners as they develop and implement long-term solutions. Read more about Research on PCBs in Caulk.

EPA has calculated prudent public health levels that maintain PCB exposures below the "reference dose" – the amount of PCB exposure that EPA does not believe will cause harm. Read Public Health Levels for PCBs in Indoor School Air || PDF version (2 pp, 14 KB)

Background

Caulk is a flexible material used to seal gaps to make windows, door frames, masonry and joints in buildings and other structures watertight or airtight. At one time caulk was manufactured to contain PCBs because PCBs imparted flexibility.

First Step: Take Steps to Minimize Exposure

Although this is a serious issue, the potential presence of PCBs in schools and buildings should not be a cause for alarm. If your school or building was built or renovated between 1950 and 1979, there are several steps schools can take to reduce potential exposure until it can be determined with certainty if PCBs are present in caulk used in the building and any contaminated caulk can be removed. One of the most important steps is to minimize the potential for PCBs to be present in the indoor air. Indoor air levels of PCBs within a school can be reduced by ensuring that the ventilation system is operating as designed, and to repair or improve the system if it is not.

Many old lighting systems contain ballasts manufactured with PCBs. These PCBs can get into the air if the ballast fails or ruptures. Replacement of old lighting systems with new, energy efficient systems will eliminate a potential source of PCBs.

Other steps include:

- Clean frequently to reduce dust and residue inside buildings.
- Use a wet or damp cloth or mop to clean surfaces.
- Use vacuums with high-efficiency particulate air (HEPA) filters.
- Do not sweep with dry brooms; minimize the use of dusters.
- Wash children's hands with soap and water often, particularly before eating.
- Wash children's toys often.
- Wash hands with soap and water after cleaning, and before eating or drinking.

EPA also has developed an informational brochure to provide the general public with important information on PCBs in building caulk, Preventing Exposure to PCBs in Caulking Material || PDF version (4 pp, 2.7 MB) || en Español (PDF) (4 pp, 2.7 MB), EPA Publication EPA-747-F-09-005.

Testing

Air

If school administrators and building owners are concerned about potential PCBs in the caulk, they should consider testing to determine if PCBs are present in the air. If testing reveals PCB levels above the levels EPA has determined to be safe, schools should attempt to identify any potential sources of PCBs that may be present in the building, including testing samples of caulk and looking for other potential PCB sources (e.g., old transformers, capacitors, or fluorescent light ballasts that might still be present at the school).

If elevated levels of PCBs are found in the air, schools should also have the ventilation system evaluated to determine if it is contaminated with PCBs. Although the ventilation system is unlikely to be an original source of PCB contamination, it may have been contaminated before other sources of PCBs were removed from the school and may contribute to elevated air levels of PCBs. Contaminated ventilation systems should be carefully cleaned. Ideally, such cleaning should be planned in concert with removal of any sources of PCBs that are found to avoid re-contamination of the system.

During the search for potential sources, schools should be especially vigilant in implementing practices to minimize exposures and should retest to determine whether those practices are reducing PCB air levels. It is important to note that interior surfaces and settled dust can absorb PCBs from contaminated air, and these "secondary sources" can emit PCBs after the primary source is removed. Therefore, a remediation plan should consider the potential effects for these secondary sources on indoor air quality.

Other Sources, Including Caulk

Should those practices not reduce exposure, caulk and other known sources of PCBs (e.g., paints, floor and ceiling tiles) should be removed as soon as practicable. Please note that you cannot tell if caulk has PCBs by looking at it. While it is possible that PCBs could be released into the environment through the cracking or flaking of caulk, EPA believes the old caulk that is still flexible or is in visibly good condition could be a significant source of PCBs into the air. The only way to be sure that caulk has PCBs is to have a professional test the caulk.

Where schools or other buildings were constructed or renovated between 1950 and 1979, EPA recommends that PCB-containing caulk be removed during planned renovations and repairs (when replacing windows, doors, roofs, ventilation, etc.).

Based on EPA's Office of Research and Development's (ORD) laboratory research, encapsulation was found to be most effective for interior surfaces that contain low levels of PCBs (i.e. several hundred parts per million). Depending on the PCB reduction goal, the performance of the encapsulant, and the conditions of the building, the upper limit of the PCB concentration for successful encapsulation may vary. Therefore, post-encapsulation monitoring is an essential part of the encapsulation process. Building owners should consult EPA's research on this issue for more specifics. Encapsulation may be useful for the reduction of emissions from secondary sources such as contaminated building materials under and around PCB-containing caulk or paint that has been removed. Encapsulation was not found to be effective in reducing emissions from sources that have a high PCB content (for example caulk) for more than a short period of time. Because each site will present unique circumstances, please consult your EPA PCB Regional Coordinator regarding the application of encapsulation measures on a case by case basis. It is critically important to assure that PCBs are not released to air during replacement or repair of caulk in affected buildings. Assessment of the ventilation system for potential contamination, proper cleaning when required, and isolation of the system to prevent further contamination are also important.

Test Methods

For determining the presence of PCBs in indoor air, EPA has two approved methods:

- Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air - Compendium Method TO-4A (high air volume) (PDF) (53 pp, 665 KB)
- Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air - Compendium Method TO-10A (low air volume) (PDF) (37 pp, 288 KB)

EPA recommends that caulk suspected to contain PCBs be tested directly for the presence of PCBs and removed if PCBs are present at significant levels. The PCB regulations provide appropriate methods for testing. More information on these procedures can be found at:

- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846
- Wipe Sampling (PDF) (31 pp, 86K)

Contact EPA's Toxic Substances Control Act (TSCA) Hotline at 1-888-835-5372 or the EPA PCB Regional Coordinator for your state for assistance.

Schools Information Kit

A Schools Information Kit provides information for parents, students and staff about PCBs in caulk, including:

- General information on PCBs in older schools and buildings || PDF version (1 pg, 564 KB) || en Español (PDF) (1 pg, 517 KB)
- Schools checklist || PDF version (1 pg, 416 KB) || en Español (PDF) (1 pg, 221 KB)

Information for Contractors Working in Older Buildings

Read Contractors Handling PCBs in Caulk During Renovation, EPA's guidance to contractors and maintenance personnel working in older buildings that may contain PCB-contaminated caulk.

Read EPA's Steps to Safe Renovation and Abatement of Buildings that Have PCB-Containing Caulk.

Additional Information

Additional EPA brochures and fact sheets on best practices for addressing PCBs in caulk:

- Fact Sheet: Testing for PCBs in Buildings
- Fact Sheet: Interim Measures for Reducing Risk and Taking Action to Reduce Exposures
- Fact Sheet: Removal and Clean-Up of PCBs in Caulk and PCB-Contaminated Soil and Building Materials

- Fact Sheet: Disposal Options for PCBs in Caulk and PCB-Contaminated Soil and Building Materials

Where Can I Get More Information?

For more information on how to properly test for and address PCBs in caulk, call the EPA's Toxic Substances Control Act (TSCA) Hotline at 1-888-835-5372 or contact the EPA PCB Regional Coordinator for your state.

EXHIBIT 6

Project Map

PCBs in Caulk Project

PCBs–polychlorinated biphenyls–are a probable human carcinogen and may be causing reproductive failure in birds and affecting immune response in harbor seals in the Estuary. SFEP's PCBs in Caulk Project was created to address potential impacts of polychlorinated biphenyls (PCBs) in caulks and sealants released into stormwater runoff during demolition or remodeling projects in the San Francisco Bay Area. The project is assisting the implementation of the Total Maximum Daily Load (TMDL) for PCBs in San Francisco Bay. The PCBs TMDL includes a plan for reducing PCBs loads that is implemented through permits, including the Municipal Regional National Pollutant Discharge Elimination System (NPDES) Permit for Stormwater (MRP). In the first five-year permit term, starting in 2009, stormwater Permittees are required to investigate the costs, effectiveness, and technical feasibility of several categories of potential PCBs control measures. The PCBs in Caulk Project focused on one such category of potential PCBs controls: measures to minimize the release of PCBs in caulks and sealants to stormwater runoff during demolition or remodeling projects.

The grant-funded PCBs in Caulk Project concluded at the end of 2011.

UPDATE: EPA Proposes Reinterpretation PCBs in Caulk Regulations

Since the SFEP PCBs in Caulk materials were published, EPA issued a notice of proposed rulemaking soliciting comment on how PCBs in caulk were treated under EPA regulations. After consideration of those comments, EPA has proposed a reinterpretation of what materials are considered PCB bulk product waste versus PCB remediation waste. See fuller information at http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/reinterpret.htm

Final Report on PCBs in Bay Area Buildings – Sampling Results and Estimate of Loadings to SF Bay

- Report: Estimated Stock in Currently Standing Buildings and Releases to Stormwater during Renovation and Demolition by San Francisco Estuary

Institute (SFEI), 2011.

- Supporting documents:

1. Calculations of mass estimates
2. Calculations of demolition and renovation releases

Model Regulatory Program

Disclaimer: To the extent that Permittees will be required in future permits to control PCBs in caulks and sealants released during building demolition or remodeling, these documents are intended to assist in complying with such requirements. **At the time of publication (2011), municipalities are not required to implement the BMPs or Model Implementation Process.**

- Best Management Practices to control PCBs in caulk at demolition or renovation.
- Model Implementation Process to incorporate requirement to use BMPs into municipal demolition permitting process. This document breaks new ground as the first known attempt to create a potential regional regulatory process to manage PCBs in caulks and sealants to protect water quality. It also leaves many issues for potential future implementers to address, compiled in Appendix A of this document on Obstacles, Challenges, and Future Needs.
- Training Strategy to train and deploy municipal staff, such as hazardous material or building inspectors, to ensure proper implementation of the BMPs and compliance with the program. This is a supplement to the MIP.

  - *The BMPs, MIP, and Training Strategy were authored by Larry Walker Associates, Inc., Geosyntec Inc., and TDC Environmental, LLC in November, 2011.*

- Technical Memorandum on existing regulatory controls and policies related to managing wastes and hazardous materials during building demolition and/or remodeling programs.

  - *Please see also the Resources section at the bottom of this page for additional related materials.*

Workshop Held 7/26/11 to Test New Regulatory Process Adding PCB Control to Demolition Permitting

Who: Municipal staff with responsibility for demolition permitting
When: Tuesday, July 26, 1:00pm to 5:00pm
Where: Menlo Parks Arrillaga Family Recreation Center, 700 Alma Street (Juniper Room) Workshop invitation

Requests for Participation in Sampling and Implementation Trial Elements of the Project

Request for Participation – Sampling Element
Request for Participation – Implementation Trials Element (for municipalities)
Request for Participation – Implementation Trials Element (for non-municipal agencies and organizations)

2nd Stakeholder Meeting, October 26, 2010, Oakland

The project's second stakeholder meeting provided an opportunity to review a draft management procedure for PCBs in caulk at demolition/renovation. The authors described and solicited feedback on draft Best Management Practices, an implementation guide, and training materials. Discussion centered on the theme: "how would these documents work for your agency?"

Physical meeting location: 1515 Clay Street in Oakland, Room 1411 with call-in available.
Materials:
Meeting Invite Flyer and Agenda
Presentation 1 (SFEP Overview)
Presentation 2 (LWA and Geosyntec)

1st Stakeholder Meeting, July 15, 2010, Oakland

A team of municipalities, scientists, and stormwater quality managers are developing a process to manage PCBs in caulk. The management process is intended to protect San Francisco Bay from PCBs in caulk released when buildings are demolished or renovated. Developing best management practices (BMPs) and a process to implement those BMPs is required under the new municipal stormwater permit.

This stakeholder meeting introduced the project and identify opportunities to provide feedback into the development of the BMPs and implementation process. We are seeking input from a variety of sectors which may find this project relevant, including: Construction/demolition managers, contractors, building industry associations; Air/water/waste regulators; Public health and safety; Environmental remediation specialists; Municipal permitting, community development, public works departments; and Building managers or facilities managers.

The meeting was held at Joseph P. Bort MetroCenter Auditorium, 101-8th Street, Oakland (Lake Merritt BART) on Thursday, July 15 from 1-4pm.
SFEP presentation, Details of Grant Support
LWA presentation, Developing a Process to Manage PCBs in Caulk During Building Demolition/Renovation in the Bay Area

Invite Flyer

CLOSED: RFP for PCBs in Caulk BMPs Development

The RFP was posted March 4, 2010, and closed April 2 at 5:00pm. The San Francisco Estuary Partnership (SFEP), a project of the Association of Bay Area Governments (ABAG), a joint powers agency, formed under California Government Code Sections 6500, et seq., invites qualified organizations (such as a consultant or team of consultants) to respond to this Request for Proposals (RFP) for developing Best Management Practices (BMPs) to reduce or prevent discharge of polychlorinated biphenyls (PCBs) from release during building demolition/remodeling, as part of the PCBs in Caulk project managed by SFEP. This project is funded by the State Revolving Fund under the American Recovery and Reinvestment Act of 2009 (ARRA) and is subject to federal stimulus terms and conditions. Proposals were due April 2, 2010 at 5:00pm.

Archive of RFP-related materials

- RFP posted March 4, 2010
- Proposal/references forms in Word
- ABAG/ARRA contract provisions

Resources

- Cleaning up PCBs in San Francisco Bay, a fact sheet by the San Francisco Regional Water Quality Control Board
- PCBs in Caulk Project Request for Participation (2009)
  - Overall Project Fact Sheet (2008)
  - Sampling Methods Fact Sheet (2008)
- Clean Estuary Partnership memo 7/16/2007, Re: First Phase Support Information for PCB Portion of Taking Action for Clean Water Grant
- This project is required under the San Francisco Regional Water Board's Municipal Regional Stormwater NPDES Permit (MRP), section C.12.b.
  - Section C.12.b alone or with background material (Water Board's PCBs Fact Sheet)
  - Full MRP (section C.12.b is on page 95).
- EPA's PCBs in Caulk in Older Buildings page
- Treatment technology to extract and destroy PCBs (powerpoint by Tom Krug, Geosyntec)

San Francisco Estuary Partnership
1515 Clay Street, Suite 1400

Association of

San Francisco Estuary Partnership » Taking Action for Clean Water – PCBs in Caulk Project http://www.sfestuary.org/taking-action-for-clean-water-pcbs-in-caulk-project/

Oakland, CA 94612
(510) 622-2304

Bay Area Governments

Contact Us | Site Map | Site Design

EXHIBIT 7

Polychlorinated Biphenyls (PCBs)

What is a PCB Transformer?

Serious Health Concerns

State Contacts

National Information

PCBs in Caulk in Older Buildings

PCBs in Caulk Hotline
For additional information call
1-888-835-5372

PCB Transformers

What is a PCB Transformer?

A PCB Transformer is a transformer that contains PCBs at concentrations greater than 500 parts per million (ppm). Polychlorinated biphenyls (PCBs) were used in electrical transformers because of their useful quality as being a fire retardant. These transformers were manufactured between 1929 and 1977. The majority of these PCB Transformers were installed in apartments, residential and commercial buildings, industrial facilities, campuses, and shopping centers constructed before 1978. If your facility currently uses or plans to dispose of a PCB Transformer you should be aware that the United States Environmental Protection Agency (EPA) regulates the use, storage and disposal of PCB Transformers. PCB-Contaminated Transformers containing between 50 and 499 ppm PCBs are also subject to EPA's regulations.

Do You Own a PCB Transformer?

Generally, a transformer will have a nameplate attached to one side of the unit indicating the trade name of the dielectric fluid, the approximate weight in pounds, and the amount of fluid, usually in gallons.
Since PCBs were marketed under different trade names, the nameplate on a PCB Transformer may not carry the specific term "PCBs". Trade names for PCBs could include:

- Abestol, Aroclor, Askarel, Chlophen
- Chlorextol, DK, EEC-18, Fenclor
- Inerteen, Kennechlor, No-Flamol, Phenoclor
- Pyralene, Pyranol, Saf-T-Kuhl, Solvol
- Non-Flammable Liquid

If the nameplate says "PCBs" or any of the names on the above list, then the transformer most likely contains PCBs in concentrations of between 600,000 and 700,000 ppm. Should your transformer's nameplate not carry any of the above labels, or if the label is missing or illegible, your utility company may be able to tell you if the transformer contains PCBs. Otherwise the only way to be certain is to test the electrical fluid.

PCB Transformer Regulations

Certain requirements have been established to assist the owners or operators in the use of PCB Transformers. These regulations can be found in Title 40 of the Code of Federal Regulations (40 C.F.R.), Part 761. If you are the owner or operator of a commercial building, you have a special responsibility to reduce the potential threat of a fire in or near a PCB Transformer. A commercial building is a non-industrial building - such as an apartment house, school, train station, hospital, or store - which is typically accessible to the general public. These requirements for PCB Transformers currently in use include

Use:

- Certain PCB Transformers must be equipped with enhanced electrical protection or removed from service (40 C.F.R. § 761.30 (a)(1)(iv));
- All PCB Transformers must be registered with fire response personnel (40 C.F.R. § 761.30 (a)(1)(vi));
- PCB Transformers in use in or near commercial buildings must be registered with the building owners (40 C.F.R. § 761.30 (a)(1)(vii));
- Combustible materials must not be stored within a PCB Transformer enclosure or within 5 meters of a PCB Transformer enclosure or PCB Transformer (40 C.F.R. § 761.30 (a)(1)(viii));
- Visual inspections of each PCB Transformer must be conducted quarterly (40 C.F.R. § 761.30 (a)(1)(ix));
- Visual inspections must be conducted daily if the PCB Transformer is leaking and corrective measures must be taken immediately (40 C.F.R. § 761.30 (a)(1)(x)).

Labels:

- Proper PCB identification labels must be affixed to the access to the transformers and also the transformer itself (40 C.F.R. § 761.40 (a)).

Recordkeeping:

- Records of inspections and maintenance must be maintained (40 C.F.R. § 761.30 (a)(1)(xii));
- Annual documents and annual document logs describing the inventory and disposition of PCB Transformers and other PCB Equipment must be kept (40 C.F.R. § 761.180 (a)).
- **All records for inspections and annual documents must be retained for a minimum of three (3) years after the last PCB Item has been disposed of.**

Storage and Disposal

PCB Transformers removed from service can be temporarily stored up to 30 days on pallets while incorporating inspection safeguards. Otherwise, PCB Transformers that are stored for disposal in an area that meets the requirements of 40 C.F.R. § 761.65(b) must be disposed of within a year.

Spills

If a PCB spill occurs in your facility, you should report the spill within 24 hours to the **EPA Region 3 Emergency Response Section (215-814-3255) and the National Response Center (800-424-8802)**. Immediately take control measures for the spread of the spill by damming or libbing the leak, using absorbent materials, and cordon off the area. Once a spill is contained, cleanup must be initiated within 48 hours of the spill. For more information concerning the PCB spill cleanup requirements, see EPA's PCB Spill Cleanup Policy at 40 C.F.R. § 761.120 and the Requirements for PCB Spill Cleanup at 40 C.F.R. § 761.125.

The above information contains only a partial summary of the PCB Regulations. Please refer to the full text of the Code of Federal Regulations (C.F.R.) at 40 C.F.R. Part 761 to determine which requirements apply to your circumstances.

Additional Reference Materials Related to PCBs:

- PCB Information Package
- PCBs in Fluorescent Light Fixtures
- Decontamination Levels for PCB Cleanup
- Verification of PCB Spill Cleanup by Sampling and Analysis
- The Toxics Substances Control Act
- Guidance on Remedial Actions for Superfund Sites with PCB Contamination
- PCB Transformers and the Risk of Fire

Further Information

For further information regarding the use, storage and disposal of PCB Transformers, please contact the EPA, Region 3, Land and Chemicals Division at (215) 814-2177, (215) 814-2151 or in WV or VA call (304)231-0501.

- Toxic Substances Control Act (TSCA) Hotline: 202-554-1404
- EPA Region 3 Customer Hotline: 800-438-2474
- EPA, Region 3, Land and Chemicals Division: (215) 814-2177, 2151 or (304) 231-0501
- E-mail to:Kelly Bunker (bunker.kelly@epa.gov) or Craig Yussen (yussen.craig@epa.gov)

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Serious Health Concerns

There are a number of adverse health effects associated with this chemical. Tests on animals show that PCBs can harm reproduction and growth, and can cause skin lesions and tumors. When PCB fluid is partially burned-as it may be in a transformer fire-the PCB fluid produces by-products, which include polychlorinated dibenzo dioxin and polychlorinated dibenzo furans , that are much more toxic than the PCBs themselves. Tests on rats show that furans can cause anemia and other blood problems. Dioxin is associated with a number of health risks, and has been shown to cause cancer of the liver, mouth, adrenal gland, and lungs in laboratory animals.

For further information regarding the disposal of PCB ballasts, please contact the EPA, Region 3, Land and Chemicals Division at (215)814-2177 or (215) 814-2165.

EXHIBIT 8

Contractors: Handling PCBs in Caulk During Renovation

This brochure is meant to provide contractors, parents, teachers, and school administrators a general overview of the practices a contractor should consider when conducting the renovation of a building that has polychlorinated biphenyl (PCB)-containing caulk. PCBs were not added to caulk after 1979. Therefore, in general, schools built after 1979 do not contain PCBs in caulk.

Contractors play an important role in protecting public health by helping prevent exposure to toxic PCBs. Ordinary renovation and maintenance activities involving the removal of PCB-containing caulk and the surrounding contaminated substrate (brick, masonry, cinder block, wood, etc.) can create dust that contains PCBs which can expose children and adults. PCBs have been demonstrated to cause a variety of adverse health effects, including cancer in animals. PCBs have also been shown to cause a number of serious non-cancer health effects in animals, including effects on the immune system, reproductive system, nervous system, endocrine system, and other health effects.

Consider Testing the Air in Buildings Built Between 1950 and 1979 to Determine Whether Your School or Building May Have PCBs

If school administrators and building owners are concerned about exposure to PCBs and wish to supplement the steps recommended in this brochure, EPA recommends testing to determine if PCB levels in the air exceed EPA's suggested public health levels. If testing reveals levels above the suggested public health levels, school and building operators should be especially vigilant in implementing and monitoring practices to minimize exposures. If PCBs are found in the air, EPA will assist in developing a plan to reduce exposure and manage the caulk. You cannot tell if caulk has PCBs by looking at it. EPA believes the old caulk that is still flexible or is in visibly good condition may be a significant source of PCBs into the air. The only way to be sure that caulk has PCBs is to have a professional test the caulk. Your EPA Regional PCB Coordinator can direct you to a PCB testing lab.

Take Site-Specific Protective Measures

- Be in compliance with occupational protection regulations for contractors (PDF) (2 pp, 286K).
- Protect building occupants and passersby by containing the work area to prevent PCB-containing caulk dust from getting into the surrounding environment.
- Determine disposal options based on concentration and type of material.
- Place an encapsulant underneath the new caulk/sealant (since PCBs in the adjoining material can move into the new caulk/sealant). Use replacement caulk/sealant that is free of environmental hazards.

A pilot renovation project may be warranted to verify whether the renovation goals can be met. It will allow you to compare methods, tools, and protective measures to get specific information about their effectiveness and cost.

Before Starting the Job, Consider the Types of Tools and Machinery for Removing Caulk

- Manual tools are recommended for soft flexible caulk:
  - Advantages: no dust and no heat
  - Disadvantages: labor intensive and slow
- Electromechanical tools are recommended for hardened/brittle caulk:
  - Advantages: faster, less labor intensive
  - Disadvantages: generate heat (which can volatilize the PCBs) and dust, requiring added protective measures. Also must consider the potential abrasive effects on sensitive adjoining structures (e.g., wood and metal).
- EPA recommends removing as much of the old caulk as possible, since any residual caulk left in place can contaminate any new caulk or sealant that is applied.

Notify Interested Parties and Plan for Emergencies

- Communicate the goals, type, and length of projects and specific behavior rules to the affected groups (PTA, school principal, etc.).

- Have an emergency contact list (hospitals, police, etc.).
- Ensure workers are properly trained.
- Prevent unauthorized persons from entering the site.

Take General Protective Measures

- Ensure workers are properly trained.
- Choose the method that minimizes the amount of dust generated.
- Choose methods that protect workers, building users, passersby, and the surroundings of the restoration project.
- Use proper containers to hold removed caulk.
- Use gloves and skin protection.
- Use eye goggles.
- Do not smoke, drink, or eat in the work area.
- Wash hands prior to breaks.
- In dusty work areas, have showers available and separate changing areas so that dust on clothing is not brought home.
- If working with solvents, provide respirators.

Interior Areas

- Cover work areas with plastic.
- Use signs to keep residents and pets out of the work area.
- Remove furniture and belongings, or cover them securely with heavy plastic sheeting.
- Use heavy plastic sheeting to cover floors and other fixed surfaces like large appliances in the work area.
- Improve ventilation and add exhaust fans. Close and seal the ventilation system in the work area and, if necessary, turn off forced-air heating and air-conditioning systems.
- Regularly clean the work area with an industrial (HEPA) vacuum and by wet mopping.
- Properly dispose of personal protective equipment and cleaning material.

Exterior Areas

- Mark off the work areas to keep non-workers away.
- Cover the ground.
- Enclose scaffolding.
- Cover the ground and plants with heavy plastic sheeting.
- Close windows and doors near the work area.
- Move or cover play areas near the work area.

Leave the Work Area Clean

On a daily basis you should:

- Put trash and debris in heavy-duty plastic bags.
- Wrap waste building components, such as windows and doors, in heavy plastic sheeting and tape shut.
- Ensure everything, including tools, equipment, and even workers, are free of dust and debris before leaving the work area.
- HEPA vacuum the work area.
- Remember, you do not want to bring PCB dust home and expose your family.
- Remind residents to stay out of the work area. When the job is complete, you should also:
    - Remove the plastic sheeting carefully, mist with water, fold dirty side in, tape shut, and dispose of it.
    - HEPA vacuum all surfaces, including walls.
    - Wash the work area with a general purpose cleaner.
    - Check your work carefully for dust because hazardous amounts may be minute and not easily visible. If you see any dust or debris, then re-clean the area.

Dispose of Renovation Waste Materials that Contain PCBs in Compliance with the Toxic Substances Control Act (TSCA)

- PCB-containing caulk is considered *PCB bulk product waste* if the concentration of PCBs in the caulk is greater than or equal to (=) 50 parts per million (ppm).
- Surrounding building materials to which PCB caulk is still attached may be disposed of as a PCB bulk product waste, if there is no source of PCB contamination other than the caulk. This could apply in situations such as demolition and disposal of entire buildings, walls, etc. (Note: if your abatement plan states that you intend to dispose of the PCB caulk and any contaminated building materials together, you may dispose of all the materials as a PCB bulk product waste, even if the

PCB caulk becomes separated from the adjacent contaminated building materials during remediation. EPA realizes that the PCB caulk may need to be separated during removal from adjacent contaminated building materials due to the presence of other hazardous materials or may accidentally be separated during the removal process.)
- If PCB caulk has been removed from the surrounding building material and disposed of separately, any contaminated surrounding building materials and adjacent soil are considered PCB remediation waste. This could apply in situations where the PCB caulk is removed, but the contaminated substrate is to be remediated.
- The decision on how to manage PCB contaminated substrate may be subject to a variety of site-specific facts. The appropriate EPA regional office and regional PCB coordinator can be consulted as necessary for assistance with making these decisions. For instance, property owners have identified instances where PCB caulk contained high levels of other hazardous constituents such as asbestos. Similarly, there are cases where PCB paint has been found to contain high levels of leachable metals. In these scenarios, care must be taken to fully characterize the waste to determine the appropriate disposal option.

Disposal Options

PCB bulk product waste: The disposal of *PCB bulk product waste* is regulated under 40 CFR § 761.62 of TSCA. Under this provision, PCB bulk product waste must be disposed of in one of two ways: disposal in a permitted solid waste landfill or via risk-based disposal approval process.

Disposal in solid waste landfills: Certain PCB bulk product waste, such as PCB-containing caulk, even if the concentration of PCBs in the caulk is equal to or greater than 50 ppm, may be disposed of in non-hazardous waste landfills permitted by states. Disposal under this option does not require you to obtain approval from EPA. However, EPA recommends that you determine prior to shipment that the landfill is willing and able to accept the PCB waste. Anyone sending PCB bulk product waste to a non-hazardous waste landfill permitted by a state must send written notice to the landfill prior to shipment of the waste stating that the waste contains PCBs at greater than 50 ppm (see 40 CFR 761.72(b)(4)(ii)). This guidance document does not replace or supersede any (sampling) requirements that the receiving facility may deem necessary to determine acceptance of the waste into its facility. Additionally, this guidance does not supersede state requirements which may be more stringent than those mandated by the federal government for management of this debris.

Risk-based option: The risk-based option allows for a site-specific, risk-based evaluation of whether *PCB bulk product waste* may be disposed of in a manner other than under the performance-based disposal option or the solid waste landfill disposal option. Disposal of *PCB bulk product waste* under this option requires you to obtain approval from EPA based on a finding that the disposal will not present an unreasonable risk of injury to health or the environment.

PCB remediation waste: The disposal of PCB remediation waste is regulated under 40 CFR § 761.61 of TSCA. There are three options for management of *PCB remediation waste*:

- ***Self-implementing cleanup and disposal:*** The self-implementing option links cleanup levels with the expected occupancy rates of the area or building where the contaminated materials are present. The disposal requirements for the self-implementing regulatory option vary based on the type of contaminated material and concentration of PCBs in the materials, among other things. Cleanup and disposal under this option requires you to notify your EPA Regional PCB Coordinator.

- ***Performance-based disposal:*** The performance-based option allows for disposal of the contaminated materials in either a TSCA chemical waste landfill or TSCA incinerator, through a TSCA-approved alternate disposal method, under the TSCA-regulated decontamination procedures, or in a facility with a coordinated approval issued under TSCA. Disposal under this option generally does not require you to obtain approval from EPA.

- ***Risk-based cleanup and disposal:*** The risk-based option allows for a site-specific evaluation of whether *PCB remediation waste* may be cleaned up or disposed of in a manner other than the alternatives provided under the self-implementing or the performance-based disposal options. Disposal of PCB remediation waste under this option requires you to obtain an approval from EPA based on a finding that the disposal will not present an unreasonable risk of injury to health or the environment.

Additional Information on EPA's Website

EPA has developed an informational brochure and fact sheets to provide building owners and managers with key information on the current best practices for addressing PCBs in caulk. View these documents here.

Preventing Exposure to PCBs in Caulking Material || PDF version (2 pp, 2.7MB)

Fact Sheet: Testing for PCBs in Caulk in Buildings

Fact Sheet: Interim Measures for Reducing Risk and Taking Action to Reduce Exposures

Fact Sheet: Removal and Clean-Up of PCBs in Caulk and PCB-Contaminated Soil and Building Materials

Fact Sheet: Disposal Options for PCBs in Caulk and PCB-Contaminated Soil and Building Materials

EPA is Helping to Address the Issue of PCBs in Caulk

Where Can I Get More Information

EPA has conducted research on how the public is exposed to PCBs in caulk and on the best approaches for reducing exposure and potential risks associated with PCBs in caulk. Where PCBs have been found in the air, soil, or in the caulk and other building materials, EPA is committed to helping schools and communities enact plans to reduce exposure. Please contact your regional PCB coordinator for help with assessing contamination and exposure and developing cleanup plans. Please contact your regional EPA Regional PCB Coordinator help with assessing contamination and exposure and developing cleanup plans.

EXHIBIT 9

CNPS Botanical Survey Guidelines

CALIFORNIA NATIVE PLANT SOCIETY
December 9, 1983
Revised June 2, 2001

The following recommendations are intended to help those who prepare and review environmental documents determine when a botanical survey is needed, who should be considered qualified to conduct such surveys, how surveys should be conducted, and what information should be contained in the survey report. The California Native Plant Society recommends that lead agencies not accept the results of surveys unless they are conducted and reported according to these guidelines.

1. Botanical surveys are conducted in order to determine the environmental effects of proposed projects on all botanical resources, including special status plants (rare, threatened, and endangered plants) and plant (vegetation) communities. Special status plants are not limited to those that have been listed by state and federal agencies but include any plants that, based on all available data, can be shown to be rare, threatened, or endangered under the following definitions:

   A species, subspecies, or variety of plant is “endangered” when the prospects of its survival and reproduction are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, or disease. A plant is "threatened" when it is likely to become endangered in the foreseeable future in the absence of protection measures. A plant is "rare" when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens.[1]

   Rare plant (vegetation) communities are those communities that are of highly limited distribution. These communities may or may not contain special status plants. The most current version of the California Natural Diversity Database's *List of California Terrestrial Natural Communities*[2] should be used as a guide to the names and status of communities.

   Consistent with the California Native Plant Society’s goal of preserving plant biodiversity on a regional and local scale, and with California Environmental Quality Act environmental impact assessment criteria[3], surveys should also assess impacts to locally significant plants. Both plants and plant communities can be considered significant if their local occurrence is on the outer limits of known distribution, a range extension, a rediscovery, or rare or uncommon in a local context (such as within a county or region). Lead agencies should address impacts to these locally unique botanical resources regardless of their status elsewhere in the state.

2. Botanical surveys must be conducted to determine if, or to the extent that, special status or locally significant plants and plant communities will be affected by a proposed project when any natural vegetation occurs on the site and the project has the potential for direct or indirect effects on vegetation.

3. Those conducting botanical surveys must possess the following qualifications:
   a. Experience conducting floristic field surveys;
   b. Knowledge of plant taxonomy and plant community ecology and classification;
   c. Familiarity with the plants of the area, including special status and locally significant plants;

[1] California Environmental Quality Act Guidelines, §15065 and §15380.
[2] List of California Terrestrial Natural Communities. California Department of Fish and Game Natural Diversity Database. Sacramento, CA.
[3] California Environmental Quality Act Guidelines, Appendix G (Initial Study Environmental Checklist).

   d. Familiarity with the appropriate state and federal statutes related to plants and plant collecting; and,
   e. Experience with analyzing impacts of a project on native plants and communities.

4. Botanical surveys should be conducted in a manner that will locate any special status or locally significant plants or plant communities that may be present. Specifically, botanical surveys should be:

   a. Conducted in the field at the proper times of year when special status and locally significant plants are both evident and identifiable. When special status plants are known to occur in the type(s) of habitat present in the project area, nearby accessible occurrences of the plants (reference sites) should be observed to determine that the plants are identifiable at the time of survey.

   b. Floristic in nature. A floristic survey requires that every plant observed be identified to species, subspecies, or variety as applicable. In order to properly characterize the site, a complete list of plants observed on the site shall be included in every botanical survey report. In addition, a sufficient number of visits spaced throughout the growing season is necessary to prepare an accurate inventory of all plants that exist on the site. The number of visits and the timing between visits must be determined by geographic location, the plant communities present, and the weather patterns of the year(s) in which the surveys are conducted.

   c. Conducted in a manner that is consistent with conservation ethics and accepted plant collection and documentation techniques[4,5]. Collections (voucher specimens) of special status and locally significant plants should be made, unless such actions would jeopardize the continued existence of the population. A single sheet should be collected and deposited at a recognized public herbarium for future reference. All collections shall be made in accordance with applicable state and federal permit requirements. Photography may be used to document plant identification only when the population cannot withstand collection of voucher specimens.

   d. Conducted using systematic field techniques in all habitats of the site to ensure a thorough coverage of potential impact areas. All habitats within the project site must be surveyed thoroughly in order to properly inventory and document the plants present. The level of effort required per given area and habitat is dependent upon the vegetation and its overall diversity and structural complexity.

   e. Well documented. When a special status plant (or rare plant community) is located, a California Native Species (or Community) Field Survey Form or equivalent written form, accompanied by a copy of the appropriate portion of a 7.5-minute topographic map with the occurrence mapped, shall be completed, included within the survey report, and separately submitted to the California Natural Diversity Database. Population boundaries should be mapped as accurately as possible. The number of individuals in each population should be counted or estimated, as appropriate.

5. Complete reports of botanical surveys shall be included with all environmental assessment documents, including Negative Declarations and Mitigated Negative Declarations, Timber Harvesting Plans, Environmental Impact Reports, and Environmental Impact Statements. Survey reports shall contain the following information:

   a. <u>Project location and description</u>, including:

[4] Collecting Guidelines and Documentation Techniques. California Native Plant Society Policy (adopted March 4, 1995).
[5] Ferren, W.R., Jr., D.L. Magney, and T.A. Sholars. 1995. The Future of California Floristics and Systematics: Collecting Guidelines and Documentation Techniques. *Madroño* 42(2):197-210.

1) A detailed map of the location and footprint of the proposed project.
2) A detailed description of the proposed project, including one-time activities and ongoing activities that may affect botanical resources.
3) A description of the general biological setting of the project area.

b. Methods, including:
1) Survey methods for each of the habitats present, and rationale for the methods used.
2) Description of reference site(s) visited and phenological development of the target special status plants, with an assessment of any conditions differing from the project site that may affect their identification.
3) Dates of surveys and rationale for timing and intervals; names of personnel conducting the surveys; and total hours spent in the field for each surveyor on each date.
4) Location of deposited voucher specimens and herbaria visited.

c. Results, including:
1) A description and map of the vegetation communities on the project site. The current standard for vegetation classification, *A Manual of California Vegetation*[6], should be used as a basis for the habitat descriptions and the vegetation map. If another vegetation classification system is used, the report must reference the system and provide the reason for its use.
2) A description of the phenology of each of the plant communities at the time of each survey date.
3) A list of all plants observed on the project site using accepted scientific nomenclature, along with any special status designation. The reference(s) used for scientific nomenclature shall be cited.
4) Written description and detailed map(s) showing the location of each special status or locally significant plant found, the size of each population, and method used to estimate or census the population.
5) Copies of all California Native Species Field Survey Forms or Natural Community Field Survey Forms and accompanying maps.

d. Discussion, including:
1) Any factors that may have affected the results of the surveys (*e.g.*, drought, human disturbance, recent fire).
2) Discussion of any special local or range-wide significance of any plant population or community on the site.
3) An assessment of potential impacts. This shall include a map showing the distribution of special status and locally significant plants and communities on the site in relation to the proposed activities. Direct, indirect, and cumulative impacts to the plants and communities shall be discussed.
4) Recommended measures to avoid and/or minimize direct, indirect, and cumulative impacts.

e. References cited and persons contacted.

f. Qualifications of field personnel including any special experience with the habitats and special status plants present on the site.

[6] Sawyer, J.O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation.* California Native Plant Society. Sacramento, CA. 471 pp.

EXHIBIT 10

GENERAL RARE PLANT SURVEY GUIDELINES

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All surveys for rare plants should be conducted in accordance with the standardized guidelines issued by the regulatory agencies (U.S. Fish and Wildlife Service 1996, California Department of Fish and Game 2000) and the California Native Plant Society (2001). Some of the requirements specified in the standardized guidelines are that surveys must be conducted during the appropriate season and be floristic in nature. Thus, surveys should not target a single species but should aim to identify any and all rare species and rare plant communities in the area. The guidelines also provide information on selecting a qualified botanist and providing appropriate documentation of surveys. Additional considerations for conducting rare plant surveys are described by Nelson (1987). Permission of the landowner or land-management agency is required for both site access and plant collection. In addition, federal and/or state permits are necessary to collect specimens of plants listed as endangered, threatened, or rare.

The species-specific methods presented below are intended as a supplement to the basic guidelines. They describe the conditions under which the potential for discovering each listed plant species in the survey area will be maximized. Multiple visits to a site may be necessary to ensure that survey conditions have been appropriate for all potentially-occurring rare plant species.

Certain methods are common to all of the following species-specific survey guidelines; similar methods may be employed for species not covered herein. In the southern San Joaquin Valley, many of the listed plants are small and easily obscured by dense vegetation. Thus intensive, systematic surveys are recommended to detect rare plant species in this region. Biologists should walk parallel transects spaced 5 to 10 meters (16 to 33 feet) apart throughout the entire site, regardless of subjective habitat evaluations. Transects may be stratified by topography or plant community for convenience. Field survey crews should include at least one member who has seen the target species growing in its natural habitat. Other team members may be trained using photographs and/or herbarium specimens but should be accompanied in the field by the experienced crew member during all surveys. Project-area surveys are valid only for those species that are evident during the survey period. Prior to conducting surveys in a given year, at least one member of the survey crew should visit known populations of the target species that occur in areas similar in elevation, latitude, vegetation, and topography to the survey area. Such visits will determine whether precipitation has been adequate for germination and growth, as well as confirm current phenology of the target species. Survey reports should document the known locations that were visited, the date of the visit, and the observability and phenology of the target

species at that time, plus the date of the survey, the abundance and distribution of all rare species in the survey area, and any other elements required by the agency guidelines. Information on the locations of known populations may be obtained from agency biologists, the California Natural Diversity Data Base, or local chapters of the California Native Plant Society (see below). The current status and abundance of any known populations visited as well as any new populations discovered also should be reported to the California Natural Diversity Data Base.

Surveys can confirm the presence of rare plants on a site, but negative results do not guarantee that rare plant species are absent. However, for practical purposes, surveys that adhere to the attached species-specific guidelines provide reasonable evidence that the specified plant taxa do not occur in the survey area. Surveys that employ methods or timing other than those recommended herein may be used as evidence of the presence (but not absence) of rare plant species.

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SUPPLEMENTAL SURVEY METHODS FOR SAN JOAQUIN WOOLLY-THREADS

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Literature review

San Joaquin woolly-threads [*Monolopia congdonii* (Gray) B.G. Baldwin] is an annual herb of the aster family (Asteraceae). When first described (Gray 1883), this species was included in the genus *Eatonella*; Greene (1897) later transferred it to *Lembertia*. The name *Lembertia congdonii* (Gray) Greene was in use for many years, but a recent revision based on phylogeny (Baldwin 1999) changed the scientific name to *Monolopia congdonii* (Gray) B.G. Baldwin. San Joaquin woolly-threads is federally listed as an endangered species (U.S. Fish and Wildlife Service 1990).

The plant size and habit of San Joaquin woolly-threads are influenced by associated vegetation. On sparsely-vegetated sites, individuals generally are 2 to 7 centimeters (0.8 to 2.8 inches) tall, erect, and single-stemmed, whereas individuals in tall, dense vegetation may have many decumbent stems up to 45 centimeters (17.7 inches) long (Cypher 1994). In years of below-average precipitation, few seeds of San Joaquin woolly-threads germinate (Twisselmann 1967, Taylor 1989), and those that do typically produce tiny plants (E. Cypher personal observation). Phenology also varies with location and weather conditions. Seed germination may begin as early as November (Taylor 1989) but usually occurs in December and January (Lewis 1993, E. Cypher unpublished data). San Joaquin woolly-threads typically flowers between late February and early April (Taylor 1989), but flowering may continue into early May if conditions are optimal (B. Delgado personal communication). Populations in the northern part of the range flower earlier than those on the Carrizo Plain (Mazer and Hendrickson 1993, Cypher 1994). Small, vegetative individuals closely resemble *Eriogonum* species, but flowering individuals are readily distinguishable (E. Cypher personal observation).

The historical range of this species included Fresno, Kern, Kings, San Benito, San Luis Obispo, Santa Barbara, and Tulare Counties (Taylor 1989, Tibor 2001). San Joaquin woolly-threads occurs in a number of the plant communities described by Holland (1986), including Non-native Grassland, Valley Saltbush Scrub, Interior Coast Range Saltbush Scrub, and Upper Sonoran Subshrub Scrub (Cypher 1994). However, this species typically occupies portions of the habitat with less than 10% shrub cover and may occur in association with cryptogamic crust (Taylor 1989, Cypher 1994). Occurrences have been reported at elevations ranging from as low as 60 m (190 feet) on the San Joaquin Valley floor up to 838 meters (2,750 feet) in the Inner Coast Ranges of San Luis Obispo and Santa Barbara counties (Lewis 1993, California Natural Diversity Data Base 2002).

San Joaquin woolly-threads occurs on soils of alluvial origin that are neutral to subalkaline (Taylor 1989, Lewis 1993). On the San Joaquin Valley floor, this species typically is found on sandy or sandy loam soils, particularly those of the Kimberlina series (Taylor 1989, Taylor and Buck 1993), whereas on the Carrizo Plain it occurs on silty soils (Lewis 1993). San Joaquin woolly-threads frequently occurs on sand dunes and sand ridges (Taylor 1989, California Natural Diversity Data Base 2002) as well as along the high-water line of washes and on adjacent terraces (Lewis 1993, E. Cypher personal observation). Populations of this species have been documented in previously cultivated lands, heavily grazed pastures, and remnant habitat in oil fields (Taylor 1989, Lewis 1993, Taylor and Buck 1993).

Survey guidelines

All surveys for rare plants should be conducted in accordance with the standardized guidelines issued by the regulatory agencies (U.S. Fish and Wildlife Service 1996, California Department of Fish and Game 2000) and the Califomia Native Plant Society (2001). The species-specific methods presented below are intended as a supplement to those standardized guidelines.

Systematic surveys are recommended to detect presence and determine distribution of San Joaquin woolly-threads within the survey area. For systematic searches, biologists should walk parallel transects spaced 5 to 10 meters (16 to 33 feet) apart throughout the entire site, regardless of subjective habitat evaluations. However, transects may be stratified by topography or plant community for convenience. Field survey crews should include at least one member who has seen San Joaquin woolly-threads growing in its natural habitat. Other team members may be trained using photographs and/or herbarium specimens but should be accompanied in the field by the experienced crew member during all surveys.

Prior to beginning surveys in a given year, at least one member of the survey crew should visit one or more known locations of San Joaquin woolly-threads to verify that precipitation has been adequate for germination and to determine current phenology. The known locations should be as similar as possible to the survey area in elevation, habitat, and topography. Species-specific surveys should not be attempted if San Joaquin woolly-threads is not seen at known locations, the densities are very low relative to normal years, or the plants are inconspicuous. Survey reports should document the known locations that were visited, the date of the visit, and the observability and phenology of San Joaquin woolly-threads at that time, plus the date of the survey, the abundance and distribution of all rare species in the survey area, and any other elements required by the agency guidelines. The typical survey period for San Joaquin woolly-threads is March and April.

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SUPPLEMENTAL SURVEY METHODS FOR KERN MALLOW

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Literature review

The taxonomy of Kern mallow (*Eremalche kernensis* C.B. Wolf) is somewhat controversial. At issue are the taxonomic rank and the circumscription of Kern mallow in relation to Parry's mallow [*Eremalche parryi* (Greene) Greene]. Kern mallow was first described as *Eremalche kernensis* (Wolf 1938) but also has been included in the genus *Malvastrum* (Munz and Keck 1959). The most recently-published treatments of this complex (Bates 1992, Bates 1993) assign Kern mallow the name *Eremalche parryi* (Greene) Greene ssp. *kernensis* (Wolf) Bates, and Parry's mallow the name *E. parryi* ssp. *parryi*. Other combinations have been suggested (Leonelli 1986) but have not been validly published. After consultation with species experts, the U.S. Fish and Wildlife Service made the decision to continue using the original name and circumscription for Kern mallow (Medlin in litt. 1995). Kern mallow is federally listed as endangered (U.S. Fish and Wildlife Service 1990). In terms of status, its rank is irrelevant because subspecies also are protected under the federal Endangered Species Act (U.S. Fish and Wildlife Service 1992). Throughout this document, "Kern mallow" refers to *Eremalche kernensis* in the strict sense.

The circumscription debate centers around the gender, size, and color of flowers to be included in each taxon. Certain populations in the Kern/Parry's mallow complex exhibit a condition known as gynodioecy, meaning that some of the plants have only bisexual flowers and other plants in the same population have only pistillate flowers. Bisexual flowers have both male and female parts; these flowers also are known as perfect or hermaphroditic. Pistillate flowers have only female parts; these flowers also are known as male-sterile. Pistillate flowers have shorter petals than bisexual flowers in the same population (Bates 1992, Bates 1993, E. Cypher unpublished data) (Table 1). Experts agree that Kern mallow is gynodioecious. However, any gynodioecious population in the complex keys to *Eremalche parryi* ssp. *kernensis* in Bates (1993), including those that species experts consider to be Parry's mallow (Taylor and Davilla 1986, E. Cypher unpublished data). Other populations in the Kern/Parry's mallow complex consist only of plants with bisexual flowers; these populations key to *Eremalche parryi* ssp. *parryi* (Bates 1993) and are indisputably Parry's mallow. Parry's mallow is generally accepted to have larger flower parts than Kern mallow (Table 1) (Munz and Keck 1959, Bates 1992, Bates 1993, E. Cypher unpublished data).

Gynodioecious populations in the Kern/Parry's mallow complex may have a mixture of flower colors. Kern mallow flowers may be either white or pale lavender, regardless of gender (Wolf

Table 1. Comparison of morphological characters (ranges) of three *Eremalche* species. Compiled from Abrams (1951), Munz and Keck (1959), Bates (1992, 1993), Stebbins et al. (1992), and E. Cypher (unpublished data).

Character	*exilis* (bisexual only)	*kernensis* pistillate flower	*kernensis* bisexual flower	*parryi* [1] pistillate flower	*parryi* [1] bisexual flower
Petal color	white, pinkish, or pale lavender	white or pale lavender	white or pale lavender	mauve, purple, or rose-pink, rarely white or lavender	mauve, purple, or rose-pink, rarely white or lavender
Petal length	3-6 mm	2.5-8.5 mm	3.5-10.5 mm	4.5-11 mm	5-19 mm
Calyx length	3-7 mm	2.5-7 mm	3-8 mm	3.5-9 mm	5-10 mm
Calyx lobe width	1.5-2.5 mm	1-3.5 mm	1-3.5 mm	1-4 mm	1.5-4 mm
Shape of sepal tip	acute	gradually tapering [2]	gradually tapering [2]	abruptly acuminate [2]	abruptly acuminate [2]
Bractlet length	3-7 mm	2-6 mm	2-6 mm	3-7 mm	3-9 mm
Filament length	equal to styles	-	shorter than styles	-	shorter than styles
Anther position	even with stigmas	-	below stigmas	-	below stigmas
Number of carpels	9-13	9-19	7-14	11-23	8-24
Number of rays per stellate hair	?	5-7 [2]	5-7 [2]	10-20 [2]	10-20 [2]

[1] Measurements obtained from plants in Kern, Tulare, and San Luis Obispo counties only.
[2] Not differentiated by flower gender.

1938, Munz and Keck 1959, E. Cypher unpublished data). Parry's mallow typically has mauve to purple flowers (Bates 1992), but white or pale lavender flowers are observed occasionally (Taylor and Davilla 1986, E. Cypher unpublished data).

Another source of confusion is that the closely-related desert mallow (*Eremalche exilis*) co-occurs with Kern and Parry's mallows in western Kern County. Desert mallow plants have only bisexual flowers that are similar in size to the pistillate flowers of Kern mallow (Table 1). Despite the gender difference, the bisexual flowers of desert mallow are easily mistaken for the pistillate flowers of Kern mallow due to their size and the fact that the anthers of the former are not easily distinguished from the stigmas (Andreasen et al. in press). Desert mallow is known to grow sympatrically with Kern mallow in the Lokern area but occupies a much broader range overall (Twisselmann 1956, Twisselmann 1967, Hoover 1970, Bates 1993, Andreasen et al. in press). Although Mojave desert populations of desert mallow typically have trailing stems, those in western Kern County and San Luis Obispo County may have either trailing stems or robust, upright stems. Numerous populations attributed to Kern mallow in the past actually consist of desert mallow (Andreasen et al. in press). Due to their morphological similarity, close inspection is required to differentiate the two species.

Widely varying geographical ranges have been reported for Kern mallow due to the unresolved taxonomic problems and misidentifications of desert mallow. Kern mallow in the strict sense occurs only in the Lokern area of Kern County (Wolf 1938, Munz and Keck 1959, Taylor and Davilla 1986, Tibor 2001, Andreasen et al. in press). Plants reported from elsewhere in Kern County or from San Luis Obispo, Santa Barbara, and Tulare counties (Hoover 1970, Leonelli 1986, Taylor and Davilla 1986, Olson and Magney 1992, Stebbins et al. 1992, California Natural Diversity Data Base 2002, E. Cypher personal observations) are referable either to Parry's mallow or desert mallow (Andreasen et al. in press). These erroneous locations include Buena Vista Valley, Carrizo Plain, Cuyama Valley, Elk Hills, Elkhorn Plain, Fellows, Lost Hills, Maricopa, McKittrick Hills, Panorama Hills, Pixley, Telephone Hills, and the Temblor Range. The distribution map in the recovery plan for Kern mallow (U.S. Fish and Wildlife Service 1998) has been invalidated by the recent research of Andreasen et al. (in press).

As with many desert annuals, the height, habit, density, and phenology of Kern mallow vary greatly depending on precipitation. Kern mallow may not germinate in dry years (Twisselmann 1956, Bates 1992). True Kern mallow typically flowers in March and early April, although flowers may be present in late February or into May if weather conditions are favorable (Taylor and Davilla 1986, E. Cypher unpublished data). The majority of Kern mallow flowers open in late morning (approximately 10:00 am standard time) and wither by late afternoon (approximately 3:00 pm standard time) of the same day. Desert mallow in Lokern begins flowering somewhat earlier in the season and flowers are open only for a few hours at mid-day (E. Cypher personal observation).

Kern mallow occurs primarily in the Valley Saltbush Scrub plant community (cf. Holland 1986) and its ecotones with Valley Sink Scrub and Non-native Grassland (Taylor and Davilla 1986, California Natural Diversity Data Base 2002, E. Cypher unpublished data). This species typically grows in areas where shrub cover is less than 25%. However, much of the Kern mallow habitat in Lokern is shrubless due to repeated fires, which type-converted the areas from shrubland to grassland. Herbaceous cover in occupied habitat is variable depending on rainfall; it has ranged from 48% to 97% between 1993 and 2001, but a lower cover probably would be optimal (Taylor and Davilla 1986, Cypher 1994, Anonymous 1997, Anonymous 1998, Anonymous 1999, Anonymous 2000, Anonymous 2001). Elevations at true Kern mallow locations range from 84 to 275 meters (275 to 900 feet) (California Natural Diversity Data Base 2002). The primary soil type supporting Kern mallow is Kimberlina sandy loam, followed by Kimberlina fine sandy loam and Panoche clay loam (E. Cypher unpublished data). Kern mallow occasionally has reinvaded disturbed sites when existing populations remained in adjacent areas to provide sources of seed (Mitchell 1989, E. Cypher unpublished observation).

Survey guidelines

All surveys for rare plants should be conducted in accordance with the standardized guidelines issued by the regulatory agencies (U.S. Fish and Wildlife Service 1996, California Department of Fish and Game 2000) and the California Native Plant Society (2001). The species-specific methods presented below are intended as a supplement to those standardized guidelines.

Systematic surveys are recommended to detect presence and determine distribution of Kern mallow within the survey area. For systematic searches, biologists should walk parallel transects spaced 5 to 10 meters (16 to 33 feet) apart throughout the entire site, regardless of subjective habitat evaluations. However, transects may be stratified by topography or plant community for convenience. Field survey crews should include at least one member who has seen Kern mallow growing in its natural habitat. Other team members may be trained using photographs and/or herbarium specimens but should be accompanied in the field by the experienced crew member during all surveys. The identity of each population discovered must be confirmed by a botanist familiar with both Kern mallow and desert mallow. Any non-flowering *Eremalche* populations that are observed during surveys must be revisited when the flowers are open to confirm their identity.

Prior to beginning surveys in a given year, at least one member of the survey crew should visit one or more known locations of Kern mallow in the Lokern area to verify that precipitation has been adequate for germination and to determine current phenology. The known locations should be as similar as possible to the survey area in elevation, habitat, and topography. Species-specific surveys should not be attempted if Kern mallow is not seen at known locations, the densities are very low relative to normal years, or the plants are inconspicuous. Survey reports should document the known locations that were visited, the date of the visit, and the observability and phenology of Kern mallow at that time, plus the date of the survey, the diagnostic characteristics of any *Eremalche* populations discovered, the abundance and distribution of all rare species in the survey area, and any other elements required by the agency guidelines. The typical survey period for Kern mallow is March and April.

Until biosystematic studies have been conducted to resolve the taxonomic issues, any gynodioecious or small-flowered *Eremalche* population west of the Sierra crest should be reported to the appropriate agency, regardless of flower color or apparent gender. The identity of populations to be acquired as mitigation for disturbance to known Kern mallow should be confirmed by a species expert.

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SUPPLEMENTAL SURVEY METHODS FOR CALIFORNIA JEWELFLOWER

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Literature review

California jewelflower [*Caulanthus californicus* (S. Watson) Payson] is a showy annual belonging to the mustard family (Brassicaceae). It was included previously in the genera *Stanfordia* (Watson 1880) and *Streptanthus* (Greene 1891). California jewelflower is both federally and state listed as an endangered species (U.S. Fish and Wildlife Service 1990, Tibor 2001).

As is typical of annuals, both the size of California jewelflower plants and population size may vary dramatically, depending on site and weather conditions. California jewelflower is most conspicuous during the flowering period, which can range from February into May (Taylor and Davilla 1986, E. Cypher unpublished data). Heights at flowering can range from less than 10 centimeters (4 inches) to 50 centimeters (20 inches) or more (Munz and Keck 1959, Mazer and Hendrickson 1993, Cypher 1994). Even in optimal years, California jewelflower colonies are very limited in extent due to the clumped distribution of plants (Taylor and Davilla 1986, Mazer and Hendrickson 1993).

Other species of *Caulanthus* resemble California jewelflower superficially. However, California jewelflower has smaller flowers and shorter, flatter fruits than Coulter's jewelflower (*C. coulteri* Watson) and desert candle *(C. inflatus* Watson) (Table 1). Depauperate individuals of desert candle may lack the characteristic inflated stems but can be identified by their lavender stigmas (Buck 1993, E. Cypher personal observation). The rosettes of California jewelflower can be confused with those of several other species in the mustard family and aster family (Asteraceae).

Historically, California jewelflower occurred in the San Joaquin Valley and the inner Coast Ranges from Fresno County south to Santa Barbara and Ventura Counties (Taylor and Davilla 1986). Populations have been reported from elevations ranging from approximately 75 to 945 meters (240 to 3,100 feet) and occur on level to gentle sloping (usually <25% slope) terrain. Soils at known locations are primarily subalkaline, sandy loams (Taylor and Davilla 1986, California Natural Diversity Data Base 2002, R. Lewis personal communication).

Plant communities (cf. Holland 1986) supporting extant California jewelflower populations include Non-native Grassland, Upper Sonoran Subshrub Scrub, and Cismontane Juniper Woodland and Scrub (E. Cypher unpublished data). Historical records suggest that California jewelflower also occurred in the Valley Saltbush Scrub plant community (California Natural

Table 1. Diagnostic characters of three *Caulanthus* species. Data from Buck (1993), Munz and Keck (1959), and E. Cypher (unpublished data).

Character	*C. californicus*	*C. coulteri*	*C. inflatus*
Filaments	distinct or 1 pair fused	1-2 pair fused	1-2 pair fused
Stem	not inflated	not inflated	usually inflated
Cauline leaf shape	ovate to rounded	oblong to ovate	oblong to ovate
Sepal length	4-10 mm	5-18 mm	8-10 mm
Petal length	6-11 mm	8-31 mm	8-14 mm
Stigma color	greenish	?	lavender
Mature fruit length	1-6 cm	4-13 cm	5-11 cm
Fruit cross-section	flattened perpendicular to septum	rounded or flattened parallel to septum	rounded to squarish
Seed shape	spheric	oblong	oblique-oblong

Diversity Data Base 2002). Herbaceous cover is dense at most locations except those in Santa Barbara County, where up to 50% of the surface is barren. Native plant species comprise a high proportion of the vegetation at many of the known locations (Taylor and Davilla 1986, Cypher 1994, R. Lewis personal communication).

Survey guidelines

All surveys for rare plants should be conducted in accordance with the standardized guidelines issued by the regulatory agencies (U.S. Fish and Wildlife Service 1996, California Department of Fish and Game 2000) and the California Native Plant Society (2001). The species-specific methods presented below are intended as a supplement to those standardized guidelines.

Systematic surveys are recommended to detect presence and determine distribution of California jewelflower within the survey area. For systematic searches, biologists should walk parallel transects spaced 5 to 10 meters (16 to 33 feet) apart throughout the entire site, regardless of subjective habitat evaluations. However, transects may be stratified by topography or plant community for convenience. Field survey crews should include at least one member who has seen California jewelflower growing in its natural habitat. Other team members may be trained using photographs and/or herbarium specimens but should be accompanied in the field by the experienced crew member during all surveys.

Prior to beginning surveys in a given year, at least one member of the survey crew should visit one or more known locations of California jewelflower to verify that precipitation has been adequate for germination and to determine current phenology. The known locations should be as similar as possible to the survey area in elevation, habitat, and topography. Species-specific surveys should not be attempted if California jewelflower is not seen at known locations, the densities are very low relative to normal years, or the plants are inconspicuous. Survey reports should document the known locations that were visited, the date of the visit, and the observability and phenology of California jewelflower at that time, plus the date of the survey, the abundance and distribution of all rare species in the survey area, and any other elements required by the agency guidelines. The typical survey period for this species is March and April.

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SUPPLEMENTAL SURVEY METHODS FOR BAKERSFIELD CACTUS

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Literature review

The taxonomy of Bakersfield cactus has not been accepted universally, even though it was named over a century ago. Originally, Bakersfield cactus was treated as a full species, *Opuntia treleasii* Coulter (1896). Shortly thereafter, Toumey (1901) renamed Bakersfield cactus as a variety of the more widespread beavertail cactus (*Opuntia basilaris* Englemann and Bigelow), resulting in the combination *O. basilaris* var. *treleasii* (Coulter) Toumey for Bakersfield cactus. Griffiths and Hare (1906) considered Bakersfield cactus to be a distinct species and further subdivided it into two varieties, *O. treleasii* Coulter var. *treleasii* and *O. treleasii* Coulter var. *kernii* Griffiths and Hare. Britton and Rose (1920) corrected the spelling of the epithet to *treleasei* to be consistent with the name of the original collector, William Trelease. In the most recent treatment (Parfitt and Baker 1993), the scientific name of Bakersfield cactus was given as *Opuntia basilaris* var. *treleasei* (Coulter), which includes both varieties of the former *O. treleasei*. Some experts still consider Bakersfield cactus to be a unique species.

Bakersfield cactus differs from the common beavertail cactus (*O. basilaris* var. *basilaris*) in several key characters (Table 1). Bakersfield cactus is unique among the varieties of *O. basilaris* in that the eye-spots contain spines in addition to the bristles. Bakersfield cactus individuals from the type locality near Caliente in Kern County have spines less than 7 millimeters (0.3 inches) long, which may be shorter than the bristles (ESA 1986, R. van de Hoek personal communication). Most other populations of Bakersfield cactus have longer, more conspicuous spines. If the taxonomy of Griffiths and Hare (1906) is used, *O. treleasii* var. *treleasii* refers to the plants with short spines and *O. treleasii* var. *kernii* refers to the form with longer spines. Bakersfield cactus typically flowers in May (Munz and Keck 1959), and plants are less than 35 centimeters (1 foot) tall (Abrams 1951). It is federally and state listed as an endangered species (U.S. Fish and Wildlife Service 1990, Tibor 2001).

Bakersfield cactus is endemic to a limited area of central Kern County, ranging from Granite Station southeast to the Caliente Hills and south to Wheeler Ridge (Twisselmann 1967, U.S. Fish and Wildlife Service 1998, Tibor 2001). Only isolated remnants of the formerly extensive colonies remain (Twisselmann 1967, U.S. Fish and Wildlife Service 1990). Bakersfield cactus occurs on well-drained sandy, gravelly, or loamy soils on stream banks, ridges, bluffs, and rolling hills (ESA 1986, California Natural Diversity Data Base 2002). Historical records indicate that the majority of Bakersfield cactus occurred at elevations ranging from 88 to 396 meters (290 to 1,300 feet) with a few colonies, including the type locality, up to 550 meters

Table 1. Characters differentiating *Opuntia basilaris* var. *basilaris* from var. *treleasei*. Data from Coulter (1896), Griffiths and Hare (1906), Abrams (1951), and Benson (1969).

Character	var. *basilaris*	var. *treleasei*
Joint (pad) shape	obovate to orbicular	obovate to narrowly elliptic
Joint base	flattened	terete
Areoles (eye-spots)	depressed	not depressed
Spine length	absent	4-38 mm

(1,800 feet) in elevation (California Natural Diversity Data Base 2002). Plant communities in which it grows include Sierra-Tehachapi Saltbush Scrub, Relictual Interior Dune Grassland, and Blue Oak Woodland (ESA 1986, Holland 1986, Griggs et al. 1992, California Natural Diversity Data Base 2002, R. van de Hoek personal communication). Beavertail cactus also is found in Kern County, occurring in the Mojave Desert and the western foothills of the Sierra Nevada and Tehachapi mountains (Twisselmann 1967). The ranges of Bakersfield cactus and beavertail cactus may overlap in the Caliente and Kern Canyon areas (Twisselmann 1967, E. Cypher personal observation). Cultivated prickly-pear cacti (*Opuntia* spp.) also have escaped in the vicinity of Bakersfield (E. Cypher personal observation).

Survey guidelines

All surveys for rare plants should be conducted in accordance with the standardized guidelines issued by the regulatory agencies (U.S. Fish and Wildlife Service 1996, California Department of Fish and Game 2000) and the California Native Plant Society (2001). The species-specific methods presented below are intended as a supplement to those standardized guidelines.

Surveys for Bakersfield cactus are possible year-round because it is a perennial. However, vegetative individuals may be obscured by dense annual grasses, and thus plants are most conspicuous while they are in flower. Systematic surveys are recommended to detect presence and determine distribution of Bakersfield cactus within the survey area. For systematic searches, biologists should walk parallel transects spaced 5 to 15 meters (approximately 15 to 50 feet) apart throughout the entire site, regardless of subjective habitat evaluations. However, transects may be stratified by topography or plant community for convenience. Field survey crews should include at least one member who has seen Bakersfield cactus growing in its natural habitat. Other team members may be trained using photographs and/or herbarium specimens but should be accompanied in the field by the experienced crew member during all surveys.

Visits to one or more known locations of Bakersfield cactus are recommended to determine current phenology and observability. The known locations should be as similar as possible to the survey area in elevation, habitat, and topography. Survey reports should document the known locations that were visited, the date of the visit, and the observability and phenology of Bakersfield cactus at that time, plus the date of the survey, the diagnostic characteristics of any *Opuntia* populations discovered, the abundance and distribution of all rare species in the survey area, and any other elements required by the agency guidelines.

Due to the difficulty of identifying short-spined populations of Bakersfield cactus, any wild *Opuntia* population in Kern County west of the Sierra crest should be reported to the appropriate agency. The identity of any such cactus populations outside of the range reported in the recovery plan (U.S. Fish and Wildlife Service 1998) should be confirmed by a species expert before being disturbed or acquired as mitigation for disturbance to known Bakersfield cactus.

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SUPPLEMENTAL SURVEY METHODS FOR HOOVER'S WOOLLY-STAR

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Literature review

Hoover's woolly-star [*Eriastrum hooveri* (Jepson) Mason] is an inconspicuous annual member of the phlox family (Polemoniaceae). It was named originally by Jepson (1943) as *Huegelia hooveri* Jepson but has been known as *Eriastrum hooveri* since Mason (1945) revised the genus. Hoover's woolly-star has small, white to pale blue flowers that are less than 5 millimeters (0.2 inches) long; the stamens are shorter than the corolla (Abrams 1951, Munz and Keck 1959, Patterson 1993). Many-flowered eriastrum [*Eriastrum pluriflorum* (Heller) Mason] frequently occurs in mixed populations with Hoover's woolly-star (Lewis 1992, Cypher 1994). Many-flowered eriastrum can be distinguished by its dark blue flowers that are 16 millimeters (0.6 inches) or more in length and stamens that protrude from the corolla (Abrams 1951, Munz and Keck 1959, Taylor and Davilla 1986, Patterson 1993). Hoover's woolly-star is federally listed as a threatened species (U.S. Fish and Wildlife Service 1990). It has been proposed for delisting (U.S. Fish and Wildlife Service 2001) but must be treated as a listed species until a final rule is published that officially delists this species.

The flowering period for Hoover's woolly-star occurs between March and June (Munz and Keck 1959, Lewis 1992, Cypher 1994), but phenology varies among sites and years. Unlike many other annual forbs, stems of *Eriastrum* species may persist for many months after the plants die. However, surveys outside of the flowering season are unreliable because dead stems do not always persist and even if they do, the plants are not identifiable to species unless the corollas remain attached (Taylor and Davilla 1986, Lewis 1992).

Differing rainfall and site conditions can affect the size of both individual plants and populations (Cypher 1994). The wiry stems of Hoover's woolly-star may be simple or branching and vary in height from 1 to 17 centimeters (0.4 to 6.7 inches) at flowering; similarly, single plants have been observed with as few as 1 and as many as 82 flowers (E. Cypher unpublished data). Densities may vary greatly within a single population (Cypher 1994).

Hoover's woolly-star is known to be extant from Fresno and San Benito Counties south to Kern and Santa Barbara Counties (U.S. Fish and Wildlife Service 1998, Tibor 2001); recently, two populations were discovered in the Antelope Valley of Los Angeles County (Boyd and Porter 1999). The species occurs in a wide variety of sites, from alkali sinks to ridgetops (Lewis 1992). Populations of Hoover's woolly-star have been reported from approximately 50 to 915 meters

(165 to 3,000 feet) in elevation (Danielson et al. 1994, California Natural Diversity Data Base 1995), but the majority of valley-floor populations have been extirpated due to agricultural conversion (Taylor and Davilla 1986).

A wide variety of plant communities support Hoover's woolly-star. Most are dominated by shrubs such as saltbush (*Atriplex* spp.), Mormon tea (*Ephedra* spp.), and iodinebush (*Allenrolfea occidentalis*), but other shrubs, herbs, or trees may dominate the landscape in some areas (Taylor and Davilla 1986, Danielson et al. 1994, California Natural Diversity Data Base 1995). Shrub cover in occupied habitats typically is less than 20% (Taylor and Davilla 1986, Cypher 1994). Features common to many Hoover's woolly-star sites are stabilized silty to sandy soils, a low cover of competing herbaceous vegetation, and presence of cryptogamic crust (Taylor and Davilla 1986, Lewis 1992). However, dense vegetation, other soil types, and lack of cryptogamic crust do not preclude the occurrence of Hoover's woolly-star (Cypher 1994, California Natural Diversity Data Base 1995). Hoover's woolly-star may reinvade disturbed soil surfaces (*e.g.*, well pads, dirt roads) if seeds remain in the vicinity (Lewis 1992, Danielson et al. 1994, Hinshaw et al. 1998, Holmstead and Anderson 1998).

Survey guidelines

All surveys for rare plants should be conducted in accordance with the standardized guidelines issued by the regulatory agencies (U.S. Fish and Wildlife Service 1996, California Department of Fish and Game 2000) and the California Native Plant Society (2001). The species-specific methods presented below are intended as a supplement to those standardized guidelines.

Systematic surveys are recommended to detect presence and determine distribution of Hoover's woolly-star within the survey area. For systematic searches, biologists should walk parallel transects spaced 5 to 10 meters (16 to 33 feet) apart throughout the entire site, regardless of subjective habitat evaluations. However, transects may be stratified by topography or plant community for convenience. Field survey crews should include at least one member who has seen Hoover's woolly-star growing in its natural habitat. Other team members may be trained using photographs and/or herbarium specimens but should be accompanied in the field by the experienced crew member during all surveys.

Prior to beginning surveys in a given year, at least one member of the survey crew should visit one or more known locations of Hoover's woolly-star to verify that precipitation has been adequate for germination and to determine current phenology. The known locations should be as similar as possible to the survey area in elevation, habitat, and topography. Species-specific surveys should not be attempted if Hoover's woolly-star is not seen at known locations, the densities are very low relative to normal years, or the plants are inconspicuous. Survey reports should document the known locations that were visited, the date of the visit, and the observability and phenology of Hoover’s woolly-star at that time, plus the date of the survey, the abundance and distribution of all rare species in the survey area, and any other elements required by the agency guidelines. If *Eriastrum* stems are observed outside of the flowering season, the site should be treated as if a threatened species was present, and the population should be revisited at the appropriate time to determine the identity of the plants. The typical survey period for Hoover's woolly-star is April and May.

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EXHIBIT 11

Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities

State of California
CALIFORNIA NATURAL RESOURCES AGENCY
Department of Fish and Game
November 24, 2009[1]

INTRODUCTION AND PURPOSE

The conservation of special status native plants and their habitats, as well as natural communities, is integral to maintaining biological diversity. The purpose of these protocols is to facilitate a consistent and systematic approach to the survey and assessment of special status native plants and natural communities so that reliable information is produced and the potential of locating a special status plant species or natural community is maximized. They may also help those who prepare and review environmental documents determine when a botanical survey is needed, how field surveys may be conducted, what information to include in a survey report, and what qualifications to consider for surveyors. The protocols may help avoid delays caused when inadequate biological information is provided during the environmental review process; assist lead, trustee and responsible reviewing agencies to make an informed decision regarding the direct, indirect, and cumulative effects of a proposed development, activity, or action on special status native plants and natural communities; meet California Environmental Quality Act (CEQA)[2] requirements for adequate disclosure of potential impacts; and conserve public trust resources.

DEPARTMENT OF FISH AND GAME TRUSTEE AND RESPONSIBLE AGENCY MISSION

The mission of the Department of Fish and Game (DFG) is to manage California's diverse wildlife and native plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. DFG has jurisdiction over the conservation, protection, and management of wildlife, native plants, and habitat necessary to maintain biologically sustainable populations (Fish and Game Code §1802). DFG, as trustee agency under CEQA §15386, provides expertise in reviewing and commenting on environmental documents and makes protocols regarding potential negative impacts to those resources held in trust for the people of California.

Certain species are in danger of extinction because their habitats have been severely reduced in acreage, are threatened with destruction or adverse modification, or because of a combination of these and other factors. The California Endangered Species Act (CESA) provides additional protections for such species, including take prohibitions (Fish and Game Code §2050 *et seq.*). As a responsible agency, DFG has the authority to issue permits for the take of species listed under CESA if the take is incidental to an otherwise lawful activity; DFG has determined that the impacts of the take have been minimized and fully mitigated; and, the take would not jeopardize the continued existence of the species (Fish and Game Code §2081). Surveys are one of the preliminary steps to detect a listed or special status plant species or natural community that may be impacted significantly by a project.

DEFINITIONS

Botanical surveys provide information used to determine the potential environmental effects of proposed projects on all special status plants and natural communities as required by law (i.e., CEQA, CESA, and Federal Endangered Species Act (ESA)). Some key terms in this document appear in **bold font** for assistance in use of the document.

For the purposes of this document, **special status plants** include all plant species that meet one or more of the following criteria[3]:

[1] This document replaces the DFG document entitled "Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened and Endangered Plants and Natural Communities."

[2] http://ceres.ca.gov/ceqa/

[3] Adapted from the East Alameda County Conservation Strategy available at http://www.fws.gov/sacramento/EACCS/Documents/080228_Species_Evaluation_EACCS.pdf

- Listed or proposed for listing as threatened or endangered under ESA or candidates for possible future listing as threatened or endangered under the ESA (50 CFR §17.12).

- Listed[4] or candidates for listing by the State of California as threatened or endangered under CESA (Fish and Game Code §2050 *et seq.*). A species, subspecies, or variety of plant is **endangered** when the prospects of its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, disease, or other factors (Fish and Game Code §2062). A plant is **threatened** when it is likely to become endangered in the foreseeable future in the absence of special protection and management measures (Fish and Game Code §2067).

- Listed as rare under the California Native Plant Protection Act (Fish and Game Code §1900 *et seq.*). A plant is **rare** when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (Fish and Game Code §1901).

- Meet the definition of rare or endangered under CEQA §15380(b) and (d). Species that may meet the definition of rare or endangered include the following:

    - Species considered by the California Native Plant Society (CNPS) to be "rare, threatened or endangered in California" (Lists 1A, 1B and 2);

    - Species that may warrant consideration on the basis of local significance or recent biological information[5];

    - Some species included on the California Natural Diversity Database's (CNDDB) *Special Plants, Bryophytes, and Lichens List* (California Department of Fish and Game 2008)[6].

- Considered a **locally significant species,** that is, a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region (CEQA §15125 (c)) or is so designated in local or regional plans, policies, or ordinances (CEQA Guidelines, Appendix G). Examples include a species at the outer limits of its known range or a species occurring on an uncommon soil type.

Special status natural communities are communities that are of limited distribution statewide or within a county or region and are often vulnerable to environmental effects of projects. These communities may or may not contain special status species or their habitat. The most current version of the Department's *List of California Terrestrial Natural Communities*[7] indicates which natural communities are of special status given the current state of the California classification.

Most types of wetlands and riparian communities are considered special status natural communities due to their limited distribution in California. These natural communities often contain special status plants such as those described above. These protocols may be used in conjunction with protocols formulated by other agencies, for example, those developed by the U.S. Army Corps of Engineers to delineate jurisdictional wetlands[8] or by the U.S. Fish and Wildlife Service to survey for the presence of special status plants[9].

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4 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata.

5 In general, CNPS List 3 plants (plants about which more information is needed) and List 4 plants (plants of limited distribution) may not warrant consideration under CEQA §15380. These plants may be included on special status plant lists such as those developed by counties where they would be addressed under CEQA §15380. List 3 plants may be analyzed under CEQA §15380 if sufficient information is available to assess potential impacts to such plants. Factors such as regional rarity vs. statewide rarity should be considered in determining whether cumulative impacts to a List 4 plant are significant even if individual project impacts are not. List 3 and 4 plants are also included in the California Natural Diversity Database's (CNDDB) *Special Plants, Bryophytes, and Lichens List*. [Refer to the current online published list available at: http://www.dfg.ca.gov/biogeodata.] Data on Lists 3 and 4 plants should be submitted to CNDDB. Such data aids in determining or revising priority ranking.

6 Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata.

7 http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/natcomlist.pdf. The rare natural communities are asterisked on this list.

8 http://www.wetlands.com/regs/tlpge02e.htm

9 U.S. Fish and Wildlife Service Survey Guidelines available at http://www.fws.gov/sacramento/es/protocol.htm

BOTANICAL SURVEYS

Conduct botanical surveys prior to the commencement of any activities that may modify vegetation, such as clearing, mowing, or ground-breaking activities. It is appropriate to conduct a botanical field survey when:

- Natural (or naturalized) vegetation occurs on the site, and it is unknown if special status plant species or natural communities occur on the site, and the project has the potential for direct or indirect effects on vegetation; or

- Special status plants or natural communities have historically been identified on the project site; or

- Special status plants or natural communities occur on sites with similar physical and biological properties as the project site.

SURVEY OBJECTIVES

Conduct field surveys in a manner which maximizes the likelihood of locating special status plant species or special status natural communities that may be present. Surveys should be **floristic in nature**, meaning that every plant taxon that occurs on site is identified to the taxonomic level necessary to determine rarity and listing status. "Focused surveys" that are limited to habitats known to support special status species or are restricted to lists of likely potential species are not considered floristic in nature and are not adequate to identify all plant taxa on site to the level necessary to determine rarity and listing status. Include a list of plants and natural communities detected on the site for each botanical survey conducted. More than one field visit may be necessary to adequately capture the floristic diversity of a site. An indication of the prevalence (estimated total numbers, percent cover, density, etc.) of the species and communities on the site is also useful to assess the significance of a particular population.

SURVEY PREPARATION

Before field surveys are conducted, compile relevant botanical information in the general project area to provide a regional context for the investigators. Consult the CNDDB[10] and BIOS[11] for known occurrences of special status plants and natural communities in the project area prior to field surveys. Generally, identify vegetation and habitat types potentially occurring in the project area based on biological and physical properties of the site and surrounding ecoregion[12], unless a larger assessment area is appropriate. Then, develop a list of special status plants with the potential to occur within these vegetation types. This list can serve as a tool for the investigators and facilitate the use of reference sites; however, special status plants on site might not be limited to those on the list. Field surveys and subsequent reporting should be comprehensive and floristic in nature and not restricted to or focused only on this list. Include in the survey report the list of potential special status species and natural communities, and the list of references used to compile the background botanical information for the site.

SURVEY EXTENT

Surveys should be comprehensive over the entire site, including areas that will be directly or indirectly impacted by the project. Adjoining properties should also be surveyed where direct or indirect project effects, such as those from fuel modification or herbicide application, could potentially extend offsite. Pre-project surveys restricted to known CNDDB rare plant locations may not identify all special status plants and communities present and do not provide a sufficient level of information to determine potential impacts.

FIELD SURVEY METHOD

Conduct surveys using **systematic field techniques** in all habitats of the site to ensure thorough coverage of potential impact areas. The level of effort required per given area and habitat is dependent upon the vegetation and its overall diversity and structural complexity, which determines the distance at which plants can be identified. Conduct surveys by walking over the entire site to ensure thorough coverage, noting all plant taxa

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10 Available at http://www.dfg.ca.gov/biogeodata/cnddb

11 http://www.bios.dfg.ca.gov/

12 Ecological Subregions of California, available at http://www.fs.fed.us/r5/projects/ecoregions/toc.htm

observed. The level of effort should be sufficient to provide comprehensive reporting. For example, one person-hour per eight acres per survey date is needed for a comprehensive field survey in grassland with medium diversity and moderate terrain[13], with additional time allocated for species identification.

TIMING AND NUMBER OF VISITS

Conduct surveys in the field at the time of year when species are both evident and identifiable. Usually this is during flowering or fruiting. Space visits throughout the growing season to accurately determine what plants exist on site. Many times this may involve multiple visits to the same site (e.g. in early, mid, and late-season for flowering plants) to capture the floristic diversity at a level necessary to determine if special status plants are present[14]. The timing and number of visits are determined by geographic location, the natural communities present, and the weather patterns of the year(s) in which the surveys are conducted.

REFERENCE SITES

When special status plants are known to occur in the type(s) of habitat present in the project area, observe reference sites (nearby accessible occurrences of the plants) to determine whether those species are identifiable at the time of the survey and to obtain a visual image of the target species, associated habitat, and associated natural community.

USE OF EXISTING SURVEYS

For some sites, floristic inventories or special status plant surveys may already exist. Additional surveys may be necessary for the following reasons:

- Surveys are not current[15]; or
- Surveys were conducted in natural systems that commonly experience year to year fluctuations such as periods of drought or flooding (e.g. vernal pool habitats or riverine systems); or
- Surveys are not comprehensive in nature; or fire history, land use, physical conditions of the site, or climatic conditions have changed since the last survey was conducted[16]; or
- Surveys were conducted in natural systems where special status plants may not be observed if an annual above ground phase is not visible (e.g. flowers from a bulb); or
- Changes in vegetation or species distribution may have occurred since the last survey was conducted, due to habitat alteration, fluctuations in species abundance and/or seed bank dynamics.

NEGATIVE SURVEYS

Adverse conditions may prevent investigators from determining the presence of, or accurately identifying, some species in potential habitat of target species. Disease, drought, predation, or herbivory may preclude the presence or identification of target species in any given year. Discuss such conditions in the report.

The failure to locate a known special status plant occurrence during one field season does not constitute evidence that this plant occurrence no longer exists at this location, particularly if adverse conditions are present. For example, surveys over a number of years may be necessary if the species is an annual plant having a persistent, long-lived seed bank and is known not to germinate every year. Visits to the site in more

[13] Adapted from U.S. Fish and Wildlife Service kit fox survey guidelines available at www.fws.gov/sacramento/es/documents/kitfox_no_protocol.pdf

[14] U.S. Fish and Wildlife Service Survey Guidelines available at http://www.fws.gov/sacramento/es/protocol.htm

[15] Habitats, such as grasslands or desert plant communities that have annual and short-lived perennial plants as major floristic components may require yearly surveys to accurately document baseline conditions for purposes of impact assessment. In forested areas, however, surveys at intervals of five years may adequately represent current conditions. For forested areas, refer to "Guidelines for Conservation of Sensitive Plant Resources Within the Timber Harvest Review Process and During Timber Harvesting Operations", available at https://r1.dfg.ca.gov/portal/Portals/12/THPBotanicalGuidelinesJuly2005.pdf

[16] U.S. Fish and Wildlife Service Survey Guidelines available at http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/docs/botanicalinventories.pdf

than one year increase the likelihood of detection of a special status plant especially if conditions change. To further substantiate negative findings for a known occurrence, a visit to a nearby reference site may ensure that the timing of the survey was appropriate.

REPORTING AND DATA COLLECTION

Adequate information about special status plants and natural communities present in a project area will enable reviewing agencies and the public to effectively assess potential impacts to special status plants or natural communities[17] and will guide the development of minimization and mitigation measures. The next section describes necessary information to assess impacts. For comprehensive, systematic surveys where no special status species or natural communities were found, reporting and data collection responsibilities for investigators remain as described below, excluding specific occurrence information.

SPECIAL STATUS PLANT OR NATURAL COMMUNITY OBSERVATIONS

Record the following information for locations of each special status plant or natural community detected during a field survey of a project site.

- A detailed map (1:24,000 or larger) showing locations and boundaries of each special status species occurrence or natural community found as related to the proposed project. Mark occurrences and boundaries as accurately as possible. Locations documented by use of global positioning system (GPS) coordinates must include the datum[18] in which they were collected;
- The site-specific characteristics of occurrences, such as associated species, habitat and microhabitat, structure of vegetation, topographic features, soil type, texture, and soil parent material. If the species is associated with a wetland, provide a description of the direction of flow and integrity of surface or subsurface hydrology and adjacent off-site hydrological influences as appropriate;
- The number of individuals in each special status plant population as counted (if population is small) or estimated (if population is large);
- If applicable, information about the percentage of individuals in each life stage such as seedlings vs. reproductive individuals;
- The number of individuals of the species per unit area, identifying areas of relatively high, medium and low density of the species over the project site; and
- Digital images of the target species and representative habitats to support information and descriptions.

FIELD SURVEY FORMS

When a special status plant or natural community is located, complete and submit to the CNDDB a California Native Species (or Community) Field Survey Form[19] or equivalent written report, accompanied by a copy of the relevant portion of a 7.5 minute topographic map with the occurrence mapped. Present locations documented by use of GPS coordinates in map and digital form. Data submitted in digital form must include the datum[20] in which it was collected. If a potentially undescribed special status natural community is found on the site, document it with a Rapid Assessment or Relevé form[21] and submit it with the CNDDB form.

VOUCHER COLLECTION

Voucher specimens provide verifiable documentation of species presence and identification as well as a public record of conditions. This information is vital to all conservation efforts. Collection of voucher specimens should

[17] Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata. For Timber Harvest Plans (THPs) please refer to the "Guidelines for Conservation of Sensitive Plant Resources Within the Timber Harvest Review Process and During Timber Harvesting Operations", available at https://r1.dfg.ca.gov/portal/Portals/12/THPBotanicalGuidelinesJuly2005.pdf

[18] NAD83, NAD27 or WGS84

[19] http://www.dfg.ca.gov/biogeodata

[20] NAD83, NAD27 or WGS84

[21] http://www.dfg.ca.gov/biogeodata/vegcamp/veg_publications_protocols.asp

be conducted in a manner that is consistent with conservation ethics, and is in accordance with applicable state and federal permit requirements (e.g. incidental take permit, scientific collection permit). Voucher collections of special status species (or suspected special status species) should be made only when such actions would not jeopardize the continued existence of the population or species.

Deposit voucher specimens with an indexed regional herbarium[22] no later than 60 days after the collections have been made. Digital imagery can be used to supplement plant identification and document habitat. Record all relevant permittee names and permit numbers on specimen labels. A collecting permit is required prior to the collection of State-listed plant species[23].

BOTANICAL SURVEY REPORTS

Include reports of botanical field surveys containing the following information with project environmental documents:

- **Project and site description**
  - A description of the proposed project;
  - A detailed map of the project location and study area that identifies topographic and landscape features and includes a north arrow and bar scale; and,
  - A written description of the biological setting, including vegetation[24] and structure of the vegetation; geological and hydrological characteristics; and land use or management history.
- **Detailed description of survey methodology and results**
  - Dates of field surveys (indicating which areas were surveyed on which dates), name of field investigator(s), and total person-hours spent on field surveys;
  - A discussion of how the timing of the surveys affects the comprehensiveness of the survey;
  - A list of potential special status species or natural communities;
  - A description of the area surveyed relative to the project area;
  - References cited, persons contacted, and herbaria visited;
  - Description of reference site(s), if visited, and phenological development of special status plant(s);
  - A list of all taxa occurring on the project site. Identify plants to the taxonomic level necessary to determine whether or not they are a special status species;
  - Any use of existing surveys and a discussion of applicability to this project;
  - A discussion of the potential for a false negative survey;
  - Provide detailed data and maps for all special plants detected. Information specified above under the headings "Special Status Plant or Natural Community Observations," and "Field Survey Forms," should be provided for locations of each special status plant detected;
  - Copies of all California Native Species Field Survey Forms or Natural Community Field Survey Forms should be sent to the CNDDB and included in the environmental document as an Appendix. It is not necessary to submit entire environmental documents to the CNDDB; and,
  - The location of voucher specimens, if collected.

[22] For a complete list of indexed herbaria, see: Holmgren, P., N. Holmgren and L. Barnett. 1990. Index Herbariorum, Part 1: Herbaria of the World. New York Botanic Garden, Bronx, New York. 693 pp. Or: http://www.nybg.org/bsci/ih/ih.html

[23] Refer to current online published lists available at: http://www.dfg.ca.gov/biogeodata.

[24] A vegetation map that uses the National Vegetation Classification System (http://biology.usgs.gov/npsveg/nvcs.html), for example *A Manual of California Vegetation*, and highlights any special status natural communities. If another vegetation classification system is used, the report should reference the system, provide the reason for its use, and provide a crosswalk to the National Vegetation Classification System.

- **Assessment of potential impacts**
  - A discussion of the significance of special status plant populations in the project area considering nearby populations and total species distribution;
  - A discussion of the significance of special status natural communities in the project area considering nearby occurrences and natural community distribution;
  - A discussion of direct, indirect, and cumulative impacts to the plants and natural communities;
  - A discussion of threats, including those from invasive species, to the plants and natural communities;
  - A discussion of the degree of impact, if any, of the proposed project on unoccupied, potential habitat of the species;
  - A discussion of the immediacy of potential impacts; and,
  - Recommended measures to avoid, minimize, or mitigate impacts.

QUALIFICATIONS

Botanical consultants should possess the following qualifications:

- Knowledge of plant taxonomy and natural community ecology;
- Familiarity with the plants of the area, including special status species;
- Familiarity with natural communities of the area, including special status natural communities;
- Experience conducting floristic field surveys or experience with floristic surveys conducted under the direction of an experienced surveyor;
- Familiarity with the appropriate state and federal statutes related to plants and plant collecting; and,
- Experience with analyzing impacts of development on native plant species and natural communities.

SUGGESTED REFERENCES

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EXHIBIT 12

Forest and Woodlands Alliances and Stands		Global & State Rank
*88.800.00	***Abies amabilis* (Pacific silver fir forest) Alliance**	G5 S1
*88.800.01	*Abies amabilis*	
*88.300.00	***Abies bracteata* (Santa Lucia fir groves) Alliance**	G3 S3
*88.300.01	*Abies bracteata / Galium clementis*	
*88.300.02	*Abies bracteata / Polystichum munitum*	
88.500.00	***Abies concolor* (White fir forest) Alliance**	G5 S4 (some associations are of high priority for inventory)
88.500.40	*Abies concolor - Calocedrus decurrens - Pinus jeffreyi*	
88.510.10	*Abies concolor - Calocedrus decurrens - Pseudotsuga macrocarpa - Pinus coulteri*	
88.500.29	*Abies concolor - Calocedrus decurrens - Quercus kelloggii*	
88.500.31	*Abies concolor - Calocedrus decurrens / Pyrola picta*	
88.500.30	*Abies concolor - Calocedrus decurrens / Symphoricarpos mollis*	
*88.500.37	*Abies concolor - Chrysolepis chrysophylla*	
88.500.35	*Abies concolor / (Rosa gymnocarpa) - Symphoricarpos mollis*	
88.500.60	*Abies concolor / Acer glabrum*	
88.500.12	*Abies concolor / Achlys triphylla*	
88.500.33	*Abies concolor / Amelanchier alnifolia*	
88.500.10	*Abies concolor / Arctostaphylos nevadensis*	
88.500.17	*Abies concolor / Arnica cordifolia*	
88.500.32	*Abies concolor / Chimaphila menziesii - Pyrola picta*	
88.500.11	*Abies concolor / Chimaphila umbellata*	
88.500.59	*Abies concolor / Goodyera oblongifolia*	
88.500.54	*Abies concolor / Mahonia nervosa*	
88.500.58	*Abies concolor / Prunus emarginata*	
88.500.61	*Abies concolor / Pseudostellaria jamesiana*	
88.500.57	*Abies concolor / Trillium ovatum*	
88.500.53	*Abies concolor / Vicia americana*	
88.510.00	***Abies concolor - Pinus lambertiana* (White fir - sugar pine forest) Alliance**	G4 S4
88.510.01	*Abies concolor - Pinus lambertiana*	
88.510.09	*Abies concolor - Pinus lambertiana - Calocedrus decurrens - Quercus chrysolepis*	
88.510.06	*Abies concolor - Pinus lambertiana - Calocedrus decurrens / Adenocaulon bicolor*	
88.510.07	*Abies concolor - Pinus lambertiana - Calocedrus decurrens / Chrysolepis sempervirens*	
88.510.05	*Abies concolor - Pinus lambertiana - Calocedrus decurrens / Cornus nuttallii / Corylus cornuta*	
88.510.08	*Abies concolor - Pinus lambertiana - Calocedrus decurrens / Symphoricarpos mollis / Kelloggia galioides*	
88.510.04	*Abies concolor - Pinus lambertiana - Pinus jeffreyi*	
88.510.17	*Abies concolor - Pinus lambertiana - Pinus ponderosa / Lithocarpus densiflorus var. echinoides*	
88.510.14	*Abies concolor - Pinus lambertiana - Pseudotsuga menziesii / Carex rossii*	
88.510.13	*Abies concolor - Pinus lambertiana / Ceanothus cordulatus*	
88.510.03	*Abies concolor - Pinus lambertiana / Maianthemum racemosa - Prosartes hookeri*	
88.510.16	*Abies concolor - Pinus ponderosa / Lithocarpus densiflorus var. echinoides*	
88.510.15	*Pinus ponderosa - Pinus lambertiana / Lithocarpus densiflorus var. echinoides*	
88.530.00	***Abies concolor - Pseudotsuga menziesii* (White fir - Douglas fir forest) Alliance**	G5 S4 (some associations are of high priority for inventory)
88.530.34	*Abies concolor - Pseudotsuga menziesii - (mixed conifer) / Acer circinatum - Chrysolepis sempervirens*	
*88.530.06	*Abies concolor - Pseudotsuga menziesii - (Quercus chrysolepis)*	
88.530.30	*Abies concolor - Pseudotsuga menziesii - Calocedrus decurrens*	
88.530.35	*Abies concolor - Pseudotsuga menziesii / Amelanchier utahensis*	
88.530.14	*Abies concolor - Pseudotsuga menziesii / Arnica cordifolia*	
88.530.36	*Abies concolor - Pseudotsuga menziesii / Cornus nuttallii*	
88.530.37	*Abies concolor - Pseudotsuga menziesii / Cornus nuttallii / Corylus cornuta*	

*88.530.15	*Abies concolor - Pseudotsuga menziesii / Corylus cornuta*	
88.530.32	*Abies concolor - Pseudotsuga menziesii / Corylus cornuta / Adenocaulon bicolor*	
88.530.16	*Abies concolor - Pseudotsuga menziesii / Melica subulata*	
88.530.29	*Abies concolor - Pseudotsuga menziesii / Pteridium aquilinum*	
88.530.17	*Abies concolor - Pseudotsuga menziesii / Quercus sadleriana*	
88.530.18	*Abies concolor - Pseudotsuga menziesii / Quercus sadleriana - Arctostaphylos nevadensis*	
88.530.19	*Abies concolor - Pseudotsuga menziesii / Quercus sadleriana - Quercus vacciniifolia*	
88.530.38	*Abies concolor - Pseudotsuga menziesii / Quercus sadleriana - Rhododendron macrophyllum*	
88.530.20	*Abies concolor - Pseudotsuga menziesii / Quercus vacciniifolia*	
*88.530.21	*Abies concolor - Pseudotsuga menziesii / Rhododendron macrophyllum - Quercus*	
88.530.23	*Abies concolor - Pseudotsuga menziesii / Rosa gymnocarpa - Linnaea borealis - Symphoricarpos mollis*	
88.530.24	*Abies concolor - Pseudotsuga menziesii / Rosa gymnocarpa - Symphoricarpos mollis*	
*88.530.25	*Abies concolor - Pseudotsuga menziesii / Rosa gymnocarpa / Linnaea borealis*	
88.530.31	*Abies concolor - Pseudotsuga menziesii / Rubus ameniacus*	
*88.530.26	*Abies concolor - Pseudotsuga menziesii / Rubus parviflorus*	
88.530.33	*Abies concolor - Pseudotsuga menziesii / Trientalis latifolia*	
88.530.28	*Abies concolor - Pseudotsuga menziesii / Xerophyllum tenax*	
*88.100.00	***Abies grandis* (Grand fir forest) Alliance**	G4 S2
*88.400.00	***Abies lasiocarpa* (Subalpine fir forest) Alliance**	G5 S2
*88.400.01	*Abies lasiocarpa*	
88.200.00	***Abies magnifica* (Red fir forest) Alliance**	G5 S4 (some associations are of high priority for inventory)
88.200.23	*Abies magnifica*	
88.200.30	*Abies magnifica - Pinus monticola*	
88.200.15	*Abies magnifica - Tsuga mertensiana / Orthilia secunda*	
88.200.14	*Abies magnifica - Picea breweriana / Quercus sadleriana - Vaccinium membranaceum*	
88.200.16	*Abies magnifica - Pinus contorta / Sphenosciadium capitellatum*	
88.200.24	*Abies magnifica - Pinus contorta ssp. murrayana / Hieracium albiflorum*	
88.200.29	*Abies magnifica - Pinus monticola - Pinus contorta ssp. murrayana*	
88.200.43	*Abies magnifica - Pinus monticola / Quercus vacciniifolia*	
*88.200.10	*Abies magnifica - (Calocedrus decurrens)*	
88.200.03	*Abies magnifica / Achlys triphylla*	
88.200.27	*Abies magnifica / Arctostaphylos nevadensis*	
88.200.05	*Abies magnifica / Chimaphila umbellata*	
88.200.35	*Abies magnifica / Leucothoe davisiae*	
88.200.37	*Abies magnifica / Linnaea borealis*	
88.200.41	*Abies magnifica / Lupinus albifrons*	
88.200.11	*Abies magnifica / Orthilia secunda*	
88.200.06	*Abies magnifica / Penstemon gracilentus*	
88.200.25	*Abies magnifica / Pinus contorta ssp. murrayana*	
88.200.28	*Abies magnifica / Pinus monticola / Arctostaphylos nevadensis*	
88.200.31	*Abies magnifica / Pinus monticola / Chrysolepis sempervirens*	
88.200.13	*Abies magnifica / Pyrola picta*	
88.200.01	*Abies magnifica / Quercus sadleriana*	
88.200.09	*Abies magnifica / Quercus sadleriana - Arctostaphylos nevadensis*	
88.200.36	*Abies magnifica / Quercus vacciniifolia*	
*88.200.12	*Abies magnifica / Rhododendron macrophyllum*	
*88.200.02	*Abies magnifica / Vaccinium membranaceum*	
88.200.26	*Abies magnifica / Wyethia mollis*	
88.520.00	***Abies magnifica - Abies concolor* (Red fir - white fir forest) Alliance**	G5 S4
88.520.01	*Abies magnifica - Abies concolor*	
88.520.09	*Abies magnifica - Abies concolor - Pinus jeffreyi*	
88.520.11	*Abies magnifica - Abies concolor / Acer glabrum*	
88.520.08	*Abies magnifica - Abies concolor / Achlys triphylla*	
88.520.16	*Abies magnifica - Abies concolor / Anemone deltoidea*	
88.520.07	*Abies magnifica - Abies concolor / Arctostaphylos nevadensis*	
88.520.12	*Abies magnifica - Abies concolor / Arctostaphylos nevadensis*	
88.520.03	*Abies magnifica - Abies concolor / Arnica cordifolia*	
88.520.13	*Abies magnifica - Abies concolor / Penstemon anguineus - Monardella odoratissima*	
88.520.10	*Abies magnifica - Abies concolor / Pinus lambertiana*	
88.520.02	*Abies magnifica - Abies concolor / Pteridium aquilinum*	
88.520.15	*Abies magnifica - Abies concolor / Pyrola picta*	
88.520.06	*Abies magnifica - Abies concolor / Quercus sadleriana*	
88.520.14	*Abies magnifica - Abies concolor / Quercus sadleriana*	
88.520.05	*Abies magnifica - Abies concolor / Symphoricarpos mollis - Rosa gymnocarpa*	
88.520.04	*Abies magnifica - Abies concolor / Symphoricarpos mollis / Pyrola picta*	
*61.450.00	***Acer macrophyllum* (Bigleaf maple forest) Alliance**	G4 S3
*61.450.01	*Acer macrophyllum*	
*61.450.02	*Acer macrophyllum - Pseudotsuga menziesii / Adenocaulon bicolor*	
*61.450.04	*Acer macrophyllum - Pseudotsuga menziesii / Corylus cornuta*	
*61.450.03	*Acer macrophyllum - Pseudotsuga menziesii / Dryopteris arguta*	
*61.450.05	*Acer macrophyllum - Pseudotsuga menziesii / Philadelphus lewisii*	
*61.450.06	*Acer macrophyllum - Pseudotsuga menziesii / Polystichum munitum*	
*61.440.00	***Acer negundo* (Box-elder forest) Alliance**	G5 S2
*61.440.01	*Acer negundo - Salix gooddingii*	
*75.100.00	***Aesculus californica* (California buckeye groves) Alliance**	G3 S3
*75.100.03	*Aesculus californica*	
*75.100.02	*Aesculus californica - Umbellularia californica / Diplacus aurantiacus*	
*75.100.06	*Aesculus californica - Umbellularia californica / Holodiscus discolor*	
*75.100.04	*Aesculus californica / Datisca glomerata*	
*75.100.05	*Aesculus californica / Lupinus albifrons*	
*75.100.01	*Aesculus californica / Toxicodendron diversilobum / moss*	
61.420.00	***Alnus rhombifolia* (White alder groves) Alliance**	G4 S4 (some associations are of high priority for inventory)
61.420.10	*Alnus rhombifolia*	
61.420.03	*Alnus rhombifolia - Acer macrophyllum*	
*61.420.11	*Alnus rhombifolia - Platanus racemosa*	
61.420.12	*Alnus rhombifolia - Platanus racemosa - Quercus chrysolepis*	
*61.420.15	*Alnus rhombifolia - Platanus racemosa - Salix laevigata*	
61.420.29	*Alnus rhombifolia - Pseudotsuga menziesii*	
61.420.31	*Alnus rhombifolia - Pseudotsuga menziesii - Calocedrus decurrens*	
61.420.30	*Alnus rhombifolia - Pseudotsuga menziesii / Darmera peltata*	
61.420.04	*Alnus rhombifolia - Pseudotsuga menziesii / Rubus armeniacus*	
61.420.22	*Alnus rhombifolia - Quercus chrysolepis*	
*61.420.13	*Alnus rhombifolia - Salix laevigata*	
61.420.02	*Alnus rhombifolia / Aruncus dioicus*	
61.420.09	*Alnus rhombifolia / Baccharis salicifolia*	
61.420.24	*Alnus rhombifolia / Carex nudata*	
61.420.23	*Alnus rhombifolia / Carex spp*	
*61.420.07	*Alnus rhombifolia / Cornus sericea*	
61.420.06	*Alnus rhombifolia / Cornus sessilis*	
*61.420.05	*Alnus rhombifolia / Darmera peltata*	
61.420.08	*Alnus rhombifolia / Galium trifolium*	
61.420.26	*Alnus rhombifolia / Galium trifolium - Stachys ajugoides*	
61.420.21	*Alnus rhombifolia / Leucothoe davisiae*	
*61.420.01	*Alnus rhombifolia / Polypodium californicum*	
61.420.27	*Alnus rhombifolia / Pteridium aquilinum*	
*61.420.17	*Alnus rhombifolia / Rhododendron occidentale*	
*61.420.18	*Alnus rhombifolia / Salix exigua - (Rosa californica)*	

61.410.00	***Alnus rubra* (Red alder forest) Alliance**	G5 S4 (some associations are of high priority for inventory)
*61.410.01	*Alnus rubra - Pseudotsuga menziesii / Acer circinatum / Claytonia sibirica*	
*61.410.02	*Alnus rubra / Gaultheria shallon*	
61.410.07	*Alnus rubra / Rubus spectabilis*	
*61.410.06	*Alnus rubra / Rubus spectabilis - Sambucus racemosa*	
*61.410.05	*Alnus rubra / Salix lasiolepis*	
*73.200.00	***Arbutus menziesii* (Madrone forest) Alliance**	G4 S3
*73.200.03	*Arbutus menziesii - Quercus agrifolia*	
*73.200.01	*Arbutus menziesii - Umbellularia californica - (Lithocarpus densiflorus)*	
*73.200.02	*Arbutus menziesii - Umbellularia californica - Quercus kelloggii*	
*33.120.00	***Bursera microphylla* (Elephant tree stands) Special Stands**	G4 S1
*81.606.00	***Callitropsis abramsiana* (Santa Cruz cypress groves) Special Stands**	G1 S1
*81.601.00	***Callitropsis bakeri* (Baker cypress stands) Alliance**	G2 S2
*81.601.01	*Callitropsis bakeri / Arctostaphylos patula*	
*81.607.00	***Callitropsis forbesii* (Tecate cypress stands) Alliance**	G2 S2
*81.603.00	***Callitropsis goveniana* (Monterey pygmy cypress stands) Special Stands**	G1 S1
*81.300.00	***Callitropsis macnabiana* (McNab cypress woodland) Alliance**	G3 S3
*81.300.02	*Callitropsis macnabiana / Arctostaphylos viscida*	
*81.604.00	***Callitropsis macrocarpa* (Monterey cypress stands) Special Stands**	G1 S1
*81.605.00	***Callitropsis nevadensis* (Piute cypress woodland) Alliance**	G2 S2
*81.605.01	*Callitropsis nevadensis*	
*81.200.00	***Callitropsis nootkatensis* (Alaska yellow-cedar stands) Alliance**	G4 S1
*81.400.00	***Callitropsis pigmaea* (Mendocino pygmy cypress woodland) Alliance**	G2 S2
*81.400.01	*Callitropsis pigmaea / Cladonia bellidiflora*	
*81.400.03	*Callitropsis pigmaea / Ramalina tharusta*	
*81.400.04	*Callitropsis pigmaea / Usnea subfloridana*	
*81.400.02	*Callitropsis pimaea / Cladina impexa*	
*81.500.00	***Callitropsis sargentii* (Sargent cypress woodland) Alliance**	G3 S3
*81.500.01	*Callitropsis sargentii*	
*81.500.03	*Callitropsis sargentii / Arctostaphylos montana*	
*81.500.02	*Callitropsis sargentii / riparian*	
*81.610.00	***Callitropsis stephensonii* (Cuyamaca cypress stands) Special Stands**	G1 S1
*85.100.00	***Calocedrus decurrens* (Incense cedar forest) Alliance**	G4 S3
*85.100.05	*Calocedrus decurrens - Abies concolor / Senecio triangularis*	
*85.100.03	*Calocedrus decurrens - Alnus rhombifolia*	
*85.100.04	*Calocedrus decurrens - Quercus chrysolepis - Quercus kelloggii*	
*85.100.01	*Calocedrus decurrens / Listera convallarioides*	
*81.100.00	***Chamaecyparis lawsoniana* (Port Orford cedar forest) Alliance**	G3 S3
*81.100.31	*Chamaecyparis lawsoniana - Abies concolor / Acer circinatum*	
*81.100.30	*Chamaecyparis lawsoniana - Abies concolor / Alnus viridis*	
*81.100.14	*Chamaecyparis lawsoniana - Abies concolor / Chrysolepis sempervirens (-Rhododendron occidentale - Leucothoe davisiae)*	
*81.100.08	*Chamaecyparis lawsoniana - Abies concolor / herb*	
*81.100.07	*Chamaecyparis lawsoniana - Abies concolor / Quercus sadleriana*	
*81.100.09	*Chamaecyparis lawsoniana - Abies concolor / Quercus vacciniifolia*	
*81.100.06	*Chamaecyparis lawsoniana - Abies concolor / Rhododendron occidentale*	
*81.100.32	*Chamaecyparis lawsoniana - Abies x shastensis - Picea breweri / Quercus sadleriana - Quercus vacciniifolia*	
*81.100.33	*Chamaecyparis lawsoniana - Abies x shastensis / Alnus viridis - Quercus sadleriana*	
*81.100.34	*Chamaecyparis lawsoniana - Abies x shastensis / Alnus viridis / Darlingtonia californica*	
*81.100.03	*Chamaecyparis lawsoniana - Abies x shastensis / Quercus sadleriana - Vaccinium membranaceum*	
*81.100.39	*Chamaecyparis lawsoniana - Calocedrus decurrens - Alnus rhombifolia*	
*81.100.40	*Chamaecyparis lawsoniana - Calocedrus decurrens / Quercus vacciniifolia*	
*81.100.16	*Chamaecyparis lawsoniana - Pinus monticola / Alnus viridis*	
*81.100.19	*Chamaecyparis lawsoniana - Pinus monticola / dry herb complex*	
*81.100.10	*Chamaecyparis lawsoniana - Pinus monticola / Quercus vacciniifolia*	
*81.100.15	*Chamaecyparis lawsoniana - Pinus monticola / Rhododendron neoglandulosum / Darlingtonia californica*	
*81.100.38	*Chamaecyparis lawsoniana - Pinus monticola / Rhododendron neoglandulosum / Darlingtonia californica*	
*81.100.37	*Chamaecyparis lawsoniana - Pinus monticola / Rhododendron occidentale - Lithocarpus densiflorus var. echinoides - Rhododendron neoglandulosum*	
*81.100.17	*Chamaecyparis lawsoniana - Pinus monticola / Vaccinium membranaceum*	
*81.100.18	*Chamaecyparis lawsoniana - Pinus monticola / wet herb complex*	
*81.100.25	*Chamaecyparis lawsoniana - Pseudotsuga menziesii - Lithocarpus densiflorus / Quercus vacciniifolia*	
*81.100.26	*Chamaecyparis lawsoniana - Pseudotsuga menziesii - Lithocarpus densiflorus / Rhododendron macrophyllum*	
*81.100.22	*Chamaecyparis lawsoniana - Pseudotsuga menziesii / Calycanthus occidentalis*	
*81.100.35	*Chamaecyparis lawsoniana - Pseudotsuga menziesii / Corylus cornuta*	
*81.100.02	*Chamaecyparis lawsoniana - Pseudotsuga menziesii / Quercus vacciniifolia*	
*81.100.20	*Chamaecyparis lawsoniana - Tsuga heterophylla / Chrysolepis sempervirens*	
*81.100.24	*Chamaecyparis lawsoniana - Tsuga heterophylla / Leucothoe davisiae*	
*81.100.21	*Chamaecyparis lawsoniana - Tsuga heterophylla / Rhododendron neoglandulosum*	
*81.100.05	*Chamaecyparis lawsoniana / Gaultheria shallon*	
*81.100.12	*Chamaecyparis lawsoniana / Quercus vacciniifolia - Rhododendron occidentale*	
*81.100.04	*Chamaecyparis lawsoniana / Rhododendron macrophyllum - Gaultheria shallon*	
*81.100.01	*Chamaecyparis lawsoniana / Rhododendron occidentale*	
*81.100.11	*Chamaecyparis lawsoniana / Rhododendron occidentale - Lithocarpus densiflorus var. echinoides*	
*61.550.00	***Chilopsis linearis* (Desert willow woodland) Alliance**	G4 S3
*61.550.01	*Chilopsis linearis*	
*61.550.02	*Chilopsis linearis / Ambrosia salsola*	
*61.550.08	*Chilopsis linearis / Atriplex polycarpa*	
*61.550.07	*Chilopsis linearis / Ericameria paniculata*	
*61.550.04	*Chilopsis linearis / Prunus fasciculata*	
*61.550.03	*Chilopsis linearis / Prunus fasciculata - Ambrosia salsola*	
*61.550.05	*Chilopsis linearis / Salvia dorrii*	
*61.550.06	*Chilopsis linearis / Viguiera parishii*	
79.100.00	***Eucalyptus (globulus, camaldulensis)* (Eucalyptus groves) Semi-natural Stands**	
*61.960.00	***Fraxinus latifolia* (Oregon ash groves) Alliance**	G4 S3
*61.960.04	*Fraxinus latifolia*	
*61.960.02	*Fraxinus latifolia - Alnus rhombifolia*	
*61.960.03	*Fraxinus latifolia / Cornus sericea*	
*61.960.01	*Fraxinus latifolia / Toxicodendron diversilobum*	
*72.100.00	***Juglans californica* (California walnut groves) Alliance**	G3 S3
*72.100.08	*Juglans californica - Quercus agrifolia*	
*72.100.03	*Juglans californica / annual herbaceous*	
*72.100.04	*Juglans californica / Artemisia californica / Leymus condensatus*	
*72.100.05	*Juglans californica / Ceanothus spinosus*	
*72.100.06	*Juglans californica / Heteromeles arbutifolia*	
*72.100.07	*Juglans californica / Malosma laurina*	

*61.810.00 **Juglans hindsii and Hybrids (Hinds's walnut and related stands) Special Stands** G1 S1

89.100.00 **Juniperus californica (California juniper woodland) Alliance** G4 S4 (some associations are of high priority for inventory)

- 89.100.08 *Juniperus californica - (Yucca schidigera) / Pleuraphis rigida*
- *89.100.01 *Juniperus californica - Adenostoma fasciculatum - Eriogonum fasciculatum*
- *89.100.04 *Juniperus californica - Coleogyne ramosissima*
- 89.100.06 *Juniperus californica - Coleogyne ramosissima - Yucca schidigera*
- *89.100.02 *Juniperus californica - Ericameria linearifolia / annual - perennial - herb*
- 89.100.12 *Juniperus californica - Eriogonum fasciculatum - Artemisia californica*
- *89.100.14 *Juniperus californica - Fraxinus dipetala - Ericameria linearifolia*
- 89.100.05 *Juniperus californica - Quercus cornelius - mulleri / Coleogyne ramosissima*
- 89.100.18 *Juniperus californica - Yucca schidigera*
- 89.100.03 *Juniperus californica / Agave deserti*
- *89.100.15 *Juniperus californica / annual herbaceous*
- 89.100.17 *Juniperus californica / Hesperostipa comata*
- 89.100.11 *Juniperus californica / Nolina parryi*
- 89.100.16 *Juniperus californica / Prunus ilicifolia / moss*

89.200.00 **Juniperus grandis (Mountain juniper woodland) Alliance** G4 S4 (some associations are of high priority for inventory)

- 89.200.01 *Juniperus grandis*
- *89.200.03 *Juniperus grandis - Cercocarpus ledifolius / Artemisia tridentata*
- 89.200.05 *Juniperus grandis / Arctostaphylos nevadensis*
- *89.200.02 *Juniperus grandis / Artemisia tridentata*
- 89.200.04 *Juniperus grandis / Holodiscus discolor*

89.400.00 **Juniperus occidentalis (Western juniper woodland) Alliance** G5 S4

- 89.400.02 *Juniperus occidentalis*
- 89.400.03 *Juniperus occidentalis - Pinus jeffreyi / (Purshia tridentata) - (Prunus virginiana*
- 89.400.04 *Juniperus occidentalis / Artemisia arbuscula*

*89.300.00 **Juniperus osteosperma (Utah juniper woodland) Alliance** G5 S3

- *89.300.01 *Juniperus osteosperma*
- *89.300.07 *Juniperus osteosperma / Ambrosia dumosa*
- *89.300.02 *Juniperus osteosperma / Artemisia tridentata - Ephedra viridis*
- *89.300.03 *Juniperus osteosperma / Artemisia tridentata - Purshia glandulosa - Ephedra nevadensis*
- *89.300.06 *Juniperus osteosperma / Atriplex confertifolia - (Tetradymia axillaris)*
- *89.300.08 *Juniperus osteosperma / Coleogyne ramosissima / (Achnatherum speciosum)*
- *89.300.09 *Juniperus osteosperma / Coleogyne ramosissima / Pleuraphis jamesii*
- *89.300.11 *Juniperus osteosperma / Ephedra nevadensis / Achnatherium speciosum*
- *89.300.04 *Juniperus osteosperma / Eriogonum fasciculatum*
- *89.300.05 *Juniperus osteosperma / Gutierrezia microcephala*
- *89.300.10 *Juniperus osteosperma / Yucca baccata*

*73.100.00 **Lithocarpus densiflorus (Tanoak forest) Alliance** G4 S3

- *73.100.10 *Lithocarpus densiflorus - Acer circinatum*
- *73.100.11 *Lithocarpus densiflorus - Acer macrophyllum*
- *73.100.03 *Lithocarpus densiflorus - Arbutus menziesii*
- *73.100.12 *Lithocarpus densiflorus - Calocedrus decurrens / Festuca californica*
- *73.100.13 *Lithocarpus densiflorus - Chamaecyparis lawsoniana*
- *73.100.14 *Lithocarpus densiflorus - Chrysolepis chrysophylla*
- *73.100.15 *Lithocarpus densiflorus - Cornus nuttallii*
- *73.100.16 *Lithocarpus densiflorus - Cornus nuttallii / Toxicodendron diversilobum*
- *73.100.01 *Lithocarpus densiflorus - Pinus lambertiana / Toxicodendron diversilobum*
- *73.100.17 *Lithocarpus densiflorus - Quercus chrysolepis*
- *73.100.18 *Lithocarpus densiflorus - Quercus kelloggii*
- *73.100.19 *Lithocarpus densiflorus - Umbellularia californica*
- *73.100.04 *Lithocarpus densiflorus / Corylus cornuta*
- *73.100.02 *Lithocarpus densiflorus / Frangula californica*
- *73.100.05 *Lithocarpus densiflorus / Gaultheria shallon*
- *73.100.06 *Lithocarpus densiflorus / Mahonia nervosa*
- *73.100.07 *Lithocarpus densiflorus / Quercus vacciniifolia - Rhododendron macrophyllum*
- *73.100.08 *Lithocarpus densiflorus / Toxicodendron diversilobum - Lonicera hispidula var. vacillens*
- *73.100.09 *Lithocarpus densiflorus / Vaccinium ovatum*

*77.000.00 **Lyonothamnus floribundus (Catalina ironwood groves) Special Stands** G2 S2

*61.545.00 **Parkinsonia florida - Olneya tesota (Blue palo verde - Ironwood woodland) Alliance** G4 S3

- *61.545.05 *Parkinsonia florida*
- *61.545.06 *Parkinsonia florida - Acacia greggii - Encelia frutescens Parkinsonia florida*
- *61.545.10 *Parkinsonia florida - Olneya tesota*
- *61.545.12 *Parkinsonia florida - Olneya tesota / Cylindropuntia munzii*
- *61.545.11 *Parkinsonia florida - Olneya tesota / Hyptis emoryi*
- *61.545.07 *Parkinsonia florida / Chilopsis linearis*
- *61.545.08 *Parkinsonia florida / Hyptis emoryi*
- *61.545.09 *Parkinsonia florida / Larrea tridentata - Peucephyllum schottii*
- *61.545.01 *Olneya tesota*
- *61.545.02 *Olneya tesota - Psorothamnus schottii*
- *61.545.04 *Olneya tesota / Hyptis emoryi*
- *61.545.03 *Olneya tesota / Larrea tridentata - Encelia farinosa*

*83.300.00 **Picea breweriana (Brewer spruce forest) Alliance** G3 S2

- *83.300.03 *Picea breweriana - Abies concolor / Chimaphila umbellata - Pyrola picta*

*83.100.00 **Picea engelmannii (Engelmann spruce forest) Alliance** G5 S2

*83.200.00 **Picea sitchensis (Sitka spruce forest) Alliance** G5 S2

- *83.200.04 *Picea sitchensis - Tsuga heterophylla*
- *83.200.01 *Picea sitchensis / Maianthemum dilatatum*
- *83.200.03 *Picea sitchensis / Polystichum munitum*
- *83.200.02 *Picea sitchensis / Rubus spectabilis*

87.180.00 **Pinus albicaulis (Whitebark pine forest) Alliance** G5 S4

- 87.180.07 *Pinus albicaulis - Tsuga mertensiana*
- 87.180.01 *Pinus albicaulis / Achnatherum californica*
- 87.180.03 *Pinus albicaulis / Arenaria aculeata*
- 87.180.08 *Pinus albicaulis / Carex filifolia*
- 87.180.09 *Pinus albicaulis / Carex rossii*
- 87.180.04 *Pinus albicaulis / Holodiscus discolor*
- 87.180.06 *Pinus albicaulis / Penstemon davidsonii*
- 87.180.02 *Pinus albicaulis / Penstemon gracilentus*
- 87.180.05 *Pinus albicaulis / Poa wheeleri*

87.100.00 **Pinus attenuata (Knobcone pine forest) Alliance** G4 S4

- 87.100.08 *Pinus attenuata - mixed oak / Arctostaphylos viscida*
- 87.100.04 *Pinus attenuata / Adenostoma fasciculatum*
- 87.100.01 *Pinus attenuata / Arctostaphylos columbiana*
- 87.100.06 *Pinus attenuata / Arctostaphylos glandulosa*
- 87.100.02 *Pinus attenuata / Arctostaphylos patula*
- 87.100.05 *Pinus attenuata / Arctostaphylos viscida*
- 87.100.07 *Pinus attenuata / Ceanothus lemmonii*
- 87.100.03 *Pinus attenuata / Quercus vacciniifolia*

*87.150.00 **Pinus balfouriana (Foxtail pine woodland) Alliance** G3 S3

- *87.150.01 *Pinus balfouriana*
- *87.150.04 *Pinus balfouriana - Abies magnifica*
- *87.150.05 *Pinus balfouriana - Pinus albicaulis*
- *87.150.07 *Pinus balfouriana - Pinus flexilis*
- *87.150.06 *Pinus balfouriana - Pinus monticola*
- *87.150.02 *Pinus balfouriana / Anemone drummondii*

*87.150.03	*Pinus balfouriana / Chrysolepis sempervirens*	
87.080.00	***Pinus contorta ssp. murrayana* (Lodgepole pine forest) Alliance**	G4 S4
87.080.01	*Pinus contorta ssp. murrayana*	
87.080.17	*Pinus contorta ssp. murrayana - Pinus albicaulis / Carex filifolia*	
87.080.11	*Pinus contorta ssp. murrayana - Pinus albicaulis / Carex rossii*	
87.080.02	*Pinus contorta ssp. murrayana / Artemisia tridentata*	
87.080.10	*Pinus contorta ssp. murrayana / Carex filifolia*	
87.080.06	*Pinus contorta ssp. murrayana / Carex rossii*	
87.080.13	*Pinus contorta ssp. murrayana / Carex spp.*	
87.080.05	*Pinus contorta ssp. murrayana / Cistanthe umbellata*	
87.080.03	*Pinus contorta ssp. murrayana / Ligusticum grayi*	
87.080.12	*Pinus contorta ssp. murrayana / Penstemon newberryi*	
87.080.08	*Pinus contorta ssp. murrayana / Rhododendron neoglandulosum*	
87.080.14	*Pinus contorta ssp. murrayana / Rhododendron neoglandulosum - Phyllodoce breweri*	
87.080.07	*Pinus contorta ssp. murrayana / Thalictrum fendleri*	
87.080.15	*Pinus contorta ssp. murrayana / Vaccinium caespitosum*	
87.080.09	*Pinus contorta ssp. murrayana / Vaccinium uliginosum*	
87.080.16	*Pinus contorta ssp. murrayana / Vaccinium uliginosum - Rhododendron neoglandulosum*	
*87.060.00	***Pinus contorta var. contorta* (Beach pine forest) Alliance**	G5 S3
*87.060.01	*Pinus contorta var. contorta*	
*87.060.02	*Pinus contorta ssp. contorta - Picea sitchensis*	
87.090.00	***Pinus coulteri* (Coulter pine woodland) Alliance**	G4 S4 (some associations are of high priority for inventory)
*87.090.01	*Pinus coulteri - Calocedrus decurrens - Pinus jeffreyi / Quercus durata*	
*87.092.03	*Pinus coulteri - Calocedrus decurrens / Frangula californica spp. tomentella / Aquilegia eximia*	
*87.090.02	*Pinus coulteri - Calocedrus decurrens / Quercus durata - Arctostaphylos glauca*	
*87.090.03	*Pinus coulteri - Pinus sabiniana / Quercus durata - Arctostaphylos pungens*	
87.090.04	*Pinus coulteri - Quercus chrysolepis*	
*87.090.06	*Pinus coulteri - Quercus chrysolepis / Arctostaphylos pringlei*	
87.092.08	*Pinus coulteri - Quercus kelloggii*	
87.092.05	*Pinus coulteri - Quercus wislizeni*	
87.092.07	*Pinus coulteri / Arctostaphylos glandulosa*	
87.092.01	*Pinus coulteri / Arctostaphylos glandulosa - Quercus wislizeni*	
87.092.02	*Pinus coulteri / Arctostaphylos glauca*	
*87.092.04	*Pinus coulteri / Quercus durata*	
*87.050.00	***Pinus edulis* (Two-needle pinyon stands) Special Stands**	G4 S2?
*87.160.00	***Pinus flexilis* (Limber pine woodland) Alliance**	G5 S3
*87.160.02	*Pinus flexilis - Pinus contorta / Chrysolepis sempervirens*	
*87.160.03	*Pinus flexilis - Pinus contorta ssp. murryana*	
*87.160.01	*Pinus flexilis / Cercocarpus ledifolius*	
87.020.00	***Pinus jeffreyi* (Jeffrey pine forest) Alliance**	G4 S4 (some associations are of high priority for inventory)
87.205.03	*Pinus jeffreyi - Abies concolor - Abies magnifica*	
87.020.30	*Pinus jeffreyi - Abies concolor / Chrysolepis sempervirens*	
87.205.06	*Pinus jeffreyi - Abies concolor / Iris innominata*	
87.205.05	*Pinus jeffreyi - Abies concolor / Quercus sadleriana*	
87.205.07	*Pinus jeffreyi - Abies concolor / Symphoricarpos rotundifolius / Elymus elymoides*	
87.020.39	*Pinus jeffreyi - Abies magnifica*	
87.020.04	*Pinus jeffreyi - Calocedrus decurrens / Ceanothus cuneatus*	
87.020.28	*Pinus jeffreyi - Calocedrus decurrens / Ceanothus pumila*	
87.020.37	*Pinus jeffreyi - Calocedrus decurrens / Quercus vacciniifolia*	
87.020.05	*Pinus jeffreyi - Calocedrus decurrens / Quercus vacciniifolia / Xerophyllum tenax*	
87.020.26	*Pinus jeffreyi - Pinus monophylla*	
87.200.08	*Pinus jeffreyi - Pinus ponderosa - Quercus kelloggii / Poa wheeleri / granite*	
87.200.09	*Pinus jeffreyi - Pinus ponderosa / Amelanchier alnifolia - Mahonia repens*	
*87.200.03	*Pinus jeffreyi - Pinus ponderosa / Purshia tridentata var. tridentata / Festuca idahoensis / Granite*	
*87.200.07	*Pinus jeffreyi - Pinus ponderosa / Symphoricarpos mollis / Wyethia mollis*	
*87.020.02	*Pinus jeffreyi - Pseudotsuga menziesii / Quercus vacciniifolia / Festuca californica*	
87.020.38	*Pinus jeffreyi - Quercus chrysolepis / Arctostaphylos viscida*	
87.020.25	*Pinus jeffreyi - Quercus kelloggii*	
*87.020.15	*Pinus jeffreyi - Quercus kelloggii / Poa secunda*	
*87.020.16	*Pinus jeffreyi - Quercus kelloggii / Rhus trilobata*	
87.020.24	*Pinus jeffreyi / Arctostaphylos nevadensis*	
87.020.09	*Pinus jeffreyi / Arctostaphylos patula*	
87.020.35	*Pinus jeffreyi / Arctostaphylos patula - Ceanothus velutinus*	
87.020.32	*Pinus jeffreyi / Artemisia tridentata / Penstemon centranthifolius*	
*87.020.19	*Pinus jeffreyi / Artemisia tridentata var. vaseyana / Festuca idahoensis*	
*87.020.23	*Pinus jeffreyi / Calamagrostis koelerioides*	
87.020.10	*Pinus jeffreyi / Ceanothus cordulatus*	
87.020.36	*Pinus jeffreyi / Ceanothus cordulatus - Artemisia tridentata*	
*87.020.17	*Pinus jeffreyi / Cercocarpus ledifolius*	
*87.020.20	*Pinus jeffreyi / Chrysolepis sempervirens*	
*87.020.22	*Pinus jeffreyi / Ericameria ophitidis*	
*87.020.03	*Pinus jeffreyi / Festuca idahoensis*	
87.020.11	*Pinus jeffreyi / Lupinus caudatus*	
*87.020.21	*Pinus jeffreyi / Purshia tridentata var. tridentata*	
*87.020.14	*Pinus jeffreyi / Purshia tridentata var. tridentata - Symphoricarpos longiflorus / Poa wheeleri*	
*87.020.13	*Pinus jeffreyi / Purshia tridentata var. tridentata / Cercocarpus ledifolius / Achnatherum occidentalis*	
*87.020.12	*Pinus jeffreyi / Purshia tridentata var. tridentata / Wyethia mollis*	
87.020.33	*Pinus jeffreyi / Quercus palmeri*	
87.020.01	*Pinus jeffreyi / Quercus sadleriana / Xerophyllum tenax*	
87.020.08	*Pinus jeffreyi / Quercus vacciniifolia*	
87.020.27	*Pinus jeffreyi / Quercus vacciniifolia - Arctostaphylos nevadensis / Festuca idahoensis*	
87.020.34	*Pinus jeffreyi / Quercus wislizeni*	
*87.020.18	*Pinus jeffreyi / Symphoricarpos longiflorus / Poa wheeleri*	
*87.206.00	***Pinus lambertiana* (Sugar pine forest) Alliance**	G4 S3
*87.206.01	*Pinus lambertiana - Chrysolepis chrysophylla / Quercus vacciniifolia - Quercus sadleriana*	
*87.206.02	*Pinus lambertiana - Pinus contorta ssp contorta / Quercus vacciniifolia - Lithocarpus densiflorus var. echinoides*	
*87.206.03	*Pinus lambertiana - Pinus contorta ssp. contorta / Lithocarpus densiflorus var. echinoides - Rhododendron macrophyllum*	
*87.206.04	*Pinus lambertiana - Pinus monticola / Quercus vacciniifolia - Garrya buxifolia*	
*87.140.00	***Pinus longaeva* (Bristlecone pine woodland) Alliance**	G4 S2
*87.140.01	*Pinus longaeva*	
*87.140.02	*Pinus longaeva / Cercocarpus intricatus*	
87.040.00	***Pinus monophylla* (Singleleaf pinyon woodlands) Alliance**	G5 S4
87.040.14	*Pinus monophylla - Juniperus californica / Achnatherum speciosum*	
87.040.18	*Pinus monophylla - Juniperus californica / Quercus cornelius-mulleri*	
87.040.16	*Pinus monophylla - Juniperus osteosperma / Artemisia tridentata*	
87.040.17	*Pinus monophylla - Juniperus osteosperma / Cercocarpus intricatus*	
87.040.02	*Pinus monophylla / Artemisia tridentata*	
87.040.15	*Pinus monophylla / Artemisia tridentata / Elymus elymoides*	
87.040.12	*Pinus monophylla / Cercocarpus ledifolius / Artemisia tridentata - Purshia tridentata*	
87.040.03	*Pinus monophylla / Ephedra viridis*	
87.040.05	*Pinus monophylla / Garrya flavescens*	
87.040.06	*Pinus monophylla / Juniperus californica / Artemisia tridentata - Coleogyne ramosissima*	
87.040.07	*Pinus monophylla / Juniperus osteosperma / Artemisia nova*	
87.040.13	*Pinus monophylla / Juniperus osteosperma / Purshia mexicana*	
87.040.10	*Pinus monophylla / Prunus fasciculata - Rhus trilobata*	
87.040.09	*Pinus monophylla / Quercus cornelius - mulleri / Nama californica*	
87.040.11	*Pinus monophylla / Ribes velutinum*	

87.040.04	*Pinus monophylla / Symphoricarpos rotundifolia - Ribes velutinum*	
87.170.00	***Pinus monticola* (Western white pine forest) Alliance**	G5 S4 (some associations are of high priority for inventory)
*87.170.01	*Pinus monticola - Pinus contorta ssp. contorta / Lithocarpus densiflorus var. echinoides*	
87.170.07	*Pinus monticola - Pinus contorta var. ssp. Murrayana*	
87.170.08	*Pinus monticola - Pseudotsuga menziesii / Quercus vacciniifolia - Lithocarpus densiflorus var. echinoides*	
87.170.06	*Pinus monticola / Achnatherum occidentalis*	
*87.170.04	*Pinus monticola / Angelica arguta*	
*87.170.02	*Pinus monticola / Holodiscus discolor*	
*87.170.03	*Pinus monticola / Xerophyllum tenax*	
*87.070.00	***Pinus muricata* (Bishop pine forest) Alliance**	G3 S3
*87.070.01	*Pinus muricata - (Arbutus menziesii) / Vaccinium ovatum*	
*87.070.10	*Pinus muricata - Callitropsis pigmaea*	
*87.070.02	*Pinus muricata - Pinus contorta ssp. bolanderi*	
*87.070.03	*Pinus muricata - Pinus contorta ssp. bolanderi / Arnica discoidea*	
*87.070.04	*Pinus muricata - Pseudotsuga menziesii*	
*87.070.07	*Pinus muricata / Arctostaphylos glandulosa*	
*87.070.09	*Pinus muricata / Xerophyllum tenax*	
87.010.00	***Pinus ponderosa* (Ponderosa pine forest) Alliance**	G5 S4 (some associations are of high priority for inventory)
87.010.45	*Pinus ponderosa - Abies concolor / Lithocarpus densiflorus var. echinoides*	
87.010.37	*Pinus ponderosa - Alnus rhombifolia*	
87.010.44	*Pinus ponderosa - Alnus rhombifolia*	
87.010.46	*Pinus ponderosa - Lithocarpus densiflorus*	
*87.010.23	*Pinus ponderosa - Pinus contorta ssp. murrayana / Amelanchier alnifolia*	
87.010.54	*Pinus ponderosa - Pinus jeffreyi / Achnatherum occidentalis*	
*87.010.25	*Pinus ponderosa - Pinus jeffreyi / Artemisia tridentata var. vaseyana - Purshia tridentata var. tridentata*	
87.010.55	*Pinus ponderosa - Pinus jeffreyi / Balsamorhiza sagittata*	
87.010.49	*Pinus ponderosa - Pinus jeffreyi / Cercocarpus ledifolius / Pseudoroegneria spicata*	
87.010.51	*Pinus ponderosa - Pinus jeffreyi / Frangula rubra / Poa secunda*	
87.010.50	*Pinus ponderosa - Pinus jeffreyi / Purshia tridentata var. tridentata / Senecio integerrimus / granite*	
87.010.53	*Pinus ponderosa - Pinus jeffreyi / Quercus vacciniifolia*	
87.010.52	*Pinus ponderosa - Pinus jeffreyi / Quercus vacciniifolia / Wyethia mollis*	
87.010.48	*Pinus ponderosa - Pinus lambertiana - Quercus chrysolepis / Lithocarpus densiflorus var. echinoides*	
87.010.47	*Pinus ponderosa - Pinus lambertiana / Arctostaphylos patula - Lithocarpus densiflorus var. echinoides*	
*87.010.18	*Pinus ponderosa / Achnatherum nelsonii*	
*87.010.27	*Pinus ponderosa / Amelanchier alnifolia - Mahonia repens / Arnica cordifolia*	
87.010.42	*Pinus ponderosa / Amelanchier alnifolia - Mahonia repens / Arnica cordifolia*	
*87.010.26	*Pinus ponderosa / Amelanchier alnifolia - Prunus virginiana*	
*87.010.03	*Pinus ponderosa / Arctostaphylos patula - Chamaebatia foliolosa*	
87.010.39	*Pinus ponderosa / Arctostaphylos viscida*	
*87.010.04	*Pinus ponderosa / Artemisia tridentata*	
*87.010.24	*Pinus ponderosa / Artemisia tridentata var. vaseyana / Festuca idahoensis*	
*87.010.06	*Pinus ponderosa / Bromus carinatus*	
*87.010.09	*Pinus ponderosa / Ceanothus cuneatus*	
*87.010.08	*Pinus ponderosa / Ceanothus prostratus*	
*87.010.28	*Pinus ponderosa / Ceanothus velutinus / Achnatherum nelsonii*	
*87.010.19	*Pinus ponderosa / Cercocarpus ledifolius - Purshia tridentata var. tridentata / Festuca idahoensis*	
*87.010.20	*Pinus ponderosa / Cercocarpus ledifolius / Pseudoroegneria spicata*	
*87.010.02	*Pinus ponderosa / Chamaebatia foliolosa*	
*87.010.07	*Pinus ponderosa / Galium angustifolium*	
87.010.43	*Pinus ponderosa / Lithocarpus densiflorus var. echinoides*	
*87.010.05	*Pinus ponderosa / Purshia tridentata var. tridentata*	
*87.010.13	*Pinus ponderosa / Purshia tridentata var. tridentata - Arctostaphylos patula / Achnatherum nelsonii*	
*87.010.14	*Pinus ponderosa / Purshia tridentata var. tridentata - Ceanothus velutinus*	
87.010.41	*Pinus ponderosa / Purshia tridentata var. tridentata - Prunus virginiana / Bromus orcuttianus*	
*87.010.16	*Pinus ponderosa / Purshia tridentata var. tridentata - Ribes cereum / Bromus orcuttianus*	
*87.010.12	*Pinus ponderosa / Purshia tridentata var. tridentata / Achnatherum nelsonii / pumice*	
*87.010.10	*Pinus ponderosa / Purshia tridentata var. tridentata / Balsamorhiza sagittata*	
87.010.40	*Pinus ponderosa / Purshia tridentata var. tridentata / Galium bolanderi*	
*87.010.15	*Pinus ponderosa / Purshia tridentata var. tridentata / Senecio integerrimus / granite*	
*87.010.29	*Pinus ponderosa / Symphoricarpos longiflorus*	
87.010.38	*Pinus ponderosa stream terrace*	
87.015.00	***Pinus ponderosa - Calocedrus decurrens* (Mixed conifer forest) Alliance**	G4 S4
87.015.02	*Pinus ponderosa - Calocedrus decurrens - Quercus kelloggii*	
87.015.04	*Pinus ponderosa - Calocedrus decurrens (mixed conifer) - Quercus chrysolepis / Chamaebatia foliosa*	
87.015.08	*Pinus ponderosa - Calocedrus decurrens (mixed conifer) / Arctostaphylos sp. - Chamaebatia foliolosa*	
87.015.01	*Pinus ponderosa - Calocedrus decurrens (mixed conifer) / Galium bolanderi - Polygala cornuta*	
87.015.10	*Pinus ponderosa - Calocedrus decurrens / Ceanothus prostratus*	
87.015.11	*Pinus ponderosa - Calocedrus decurrens / Chamaebatia foliolosa / Galium bolanderi*	
87.015.03	*Pinus ponderosa - Calocedrus decurrens / Chamaebatia foliosa*	
87.015.09	*Pinus ponderosa - Calocedrus decurrens / Mahonia nervosa*	
87.015.14	*Pinus ponderosa - Calocedrus decurrens / Purshia tridentata / Achnatherum occidentalis*	
87.015.13	*Pinus ponderosa - Calocedrus decurrens / Purshia tridentata var. tridentata / (Balsamorhiza sagittata - Achnatherum occidentalis)*	
87.015.12	*Pinus ponderosa - Calocedrus decurrens / Quercus chrysolepis var. nana - Quercus vacciniifolia*	
87.015.05	*Pinus ponderosa - Calocedrus decurrens / Quercus vaccinifolia (serpentine)*	
82.400.00	***Pinus ponderosa - Pseudotsuga menziesii* (Ponderosa pine - Douglas fir forest) Alliance**	G4 S4 (some associations are of high priority for inventory)
82.400.08	*Pinus ponderosa - Pseudotsuga menziesii - Lithocarpus densiflorus / Chamaebatia foliolosa*	
82.400.09	*Pinus ponderosa - Pseudotsuga menziesii - Quercus chrysolepis / Galium bolanderi*	
82.400.07	*Pinus ponderosa - Pseudotsuga menziesii / Antennaria rosea - Eriogonum nudum*	
82.400.06	*Pinus ponderosa - Pseudotsuga menziesii / Purshia tridentata var. tridentata / Wyethia*	
*82.400.04	*Pseudotsuga menziesii - Pinus ponderosa*	
*82.400.02	*Pseudotsuga menziesii - Pinus ponderosa - Calocedrus decurrens*	
*82.400.03	*Pseudotsuga menziesii - Pinus ponderosa - Pinus jeffreyi / Poa secunda*	
*87.030.00	***Pinus quadrifolia* (Parry pinyon woodland) Alliance**	G3 S2
*87.030.01	*Pinus quadrifolia / Quercus cornelius - mulleri*	
*87.110.00	***Pinus radiata* (Monterey pine forest) Alliance**	G1 S1
*87.110.03	*Pinus radiata - Pinus muricata / Arctostaphylos tomentosa - Arctostaphylos hookeri*	
*87.110.04	*Pinus radiata - Quercus agrifolia / Toxicodendron diversilobum*	
*87.110.01	*Pinus radiata / Arctostaphylos tomentosa - Vaccinium ovatum*	
*87.110.02	*Pinus radiata / Toxicodendron diversilobum*	
87.130.00	***Pinus sabiniana* (Ghost pine woodland) Alliance**	G4 S4 (some associations are of high priority for inventory)
87.130.02	*Pinus sabiniana - Juniperus californica / grass*	
87.130.12	*Pinus sabiniana - Quercus chrysolepis / Arctostaphylos viscida*	
87.130.11	*Pinus sabiniana - Quercus wislizeni / Adenostoma fasciculatum*	
87.130.04	*Pinus sabiniana - Quercus wislizeni / Ceanothus cuneatus*	
87.130.07	*Pinus sabiniana / Adenostoma fasciculatum*	
87.130.08	*Pinus sabiniana / Arctostaphylos viscida*	
87.130.06	*Pinus sabiniana / Artemisia californica - Ceanothus ferrisiae - Heteromeles arbutifolia*	
87.130.09	*Pinus sabiniana / Ceanothus cuneatus - Heteromeles arbutifolia*	
87.130.10	*Pinus sabiniana / Ceanothus cuneatus - Rhamnus illicifolia*	
*87.130.03	*Pinus sabiniana / Ceanothus cuneatus / Plantago erecta*	

87.130.13 *Pinus sabiniana / Frangula californica ssp. tomentella*

*87.190.00 ***Pinus torreyana* (Torrey pine stands) Special Stands** G1 S1

*87.190.01 *Pinus torreyana / Artemisia californica - Rhus integrifolia*

*87.120.00 ***Pinus washoensis* (Washoe pine woodland) Alliance** G2 S2

*87.120.03 *Pinus washoensis / Arctostaphylos nevadensis*
*87.120.01 *Pinus washoensis / Lupinus caudatus*
*87.120.02 *Pinus washoensis / Symphoricarpos longiflorus / Pseudostellaria jamesiana*

*61.310.00 ***Platanus racemosa* (California sycamore woodlands) Alliance** G3 S3

*61.314.01 *Platanus racemosa - Populus fremontii*
*61.314.03 *Platanus racemosa - Populus fremontii / Salix lasiolepis*
*61.314.02 *Platanus racemosa - Populus fremontii / Salix lasiolepis - Salix exigua / Scirpus americanus*
*61.312.01 *Platanus racemosa - Quercus agrifolia*
*61.312.06 *Platanus racemosa - Quercus agrifolia - Populus fremontii - Salix laevigata*
*61.312.03 *Platanus racemosa - Quercus agrifolia - Salix lasiolepis*
*61.312.04 *Platanus racemosa - Quercus agrifolia / Baccharis salicifolia / Artemisia douglasiana*
*61.312.07 *Platanus racemosa - Salix laevigata*
*61.312.05 *Platanus racemosa - Salix laevigata / Salix lasiolepis - Baccharis salicifolia*
*61.313.03 *Platanus racemosa / Adenostoma fasciculatum*
*61.311.03 *Platanus racemosa / annual grass*
*61.311.01 *Platanus racemosa / Avena barbata*
*61.313.01 *Platanus racemosa / Baccharis salicifolia*
*61.311.02 *Platanus racemosa / Bromus hordeaceus*
*61.313.02 *Platanus racemosa / Toxicodendron diversilobum*

*61.130.00 ***Populus fremontii* (Fremont cottonwood forest) Alliance** G4 S3

*61.130.06 *Populus fremontii*
*61.130.18 *Populus fremontii - Juglans californica*
*61.130.19 *Populus fremontii - Prosopis pubescens*
*61.130.20 *Populus fremontii - Quercus agrifolia*
*61.130.24 *Populus fremontii - Salix (laevigata, lasiolepis, lucida ssp. lasiandra)*
*61.130.14 *Populus fremontii - Salix gooddingii / Baccharis salicifolia*
*61.130.15 *Populus fremontii - Salix laevigata*
*61.130.22 *Populus fremontii - Salix laevigata / Salix lasiolepis - Baccharis salicifolia*
*61.130.21 *Populus fremontii - Salix laevigata / Salix lasiolepis / Vitis girdiana*
*61.130.23 *Populus fremontii - Salix lasiolepis*
*61.130.25 *Populus fremontii - Salix lucida ssp. lasiandra*
*61.130.26 *Populus fremontii - Sambucus nigra*
*61.130.07 *Populus fremontii / Acer negundo*
*61.130.08 *Populus fremontii / Acer negundo / Rubus armeniacus*
*61.130.09 *Populus fremontii / Artemisia douglasiana*
*61.130.16 *Populus fremontii / Baccharis salicifolia*
*61.130.10 *Populus fremontii / Galium aparine*
*61.130.11 *Populus fremontii / Rubus ursinus*
*61.130.17 *Populus fremontii / Salix exigua*
*61.130.13 *Populus fremontii / Vitis californica*

*61.111.00 ***Populus tremuloides* (Aspen groves) Alliance** G5 S3

*61.111.02 *Populus tremuloides*
*61.111.11 *Populus tremuloides - Pinus contorta / Artemisia tridentata / Poa pratensis*
*61.111.06 *Populus tremuloides / Artemisia tridentata*
*61.111.07 *Populus tremuloides / Artemisia tridentata / Monardella odoratissima - Kelloggia galioides*
*61.111.19 *Populus tremuloides / Bromus carinatus*
*61.111.18 *Populus tremuloides / dry graminoid*
*61.111.17 *Populus tremuloides / mesic forb*
*61.111.08 *Populus tremuloides / Monardella odoratissima*
*61.111.09 *Populus tremuloides / Pinus jeffreyi*
*61.111.20 *Populus tremuloides / Poa pratensis*
*61.111.14 *Populus tremuloides / Prunus*
*61.111.10 *Populus tremuloides / Rosa woodsii*
*61.111.15 *Populus tremuloides / Symphoricarpos albus*
*61.111.16 *Populus tremuloides / Symphoricarpos rotundifolius*
*61.111.05 *Populus tremuloides / Symphyotricum foliaceum*
*61.111.04 *Populus tremuloides / upland*
*61.111.03 *Populus tremuloides / Veratrum californicum*

*61.120.00 ***Populus trichocarpa* (Black cottonwood forest) Alliance** G5 S3

*61.120.01 *Populus trichocarpa*
*61.120.03 *Populus trichocarpa - Pinus jeffreyi*
*61.120.08 *Populus trichocarpa - Quercus agrifolia*
*61.120.09 *Populus trichocarpa - Salix laevigata*
*61.120.10 *Populus trichocarpa - Salix lasiolepis*
*61.120.11 *Populus trichocarpa - Salix lucida*
*61.120.04 *Populus trichocarpa / Artemisia tridentata ssp. vaseyana*
*61.120.07 *Populus trichocarpa / Rhododendron occidentalis*
*61.120.05 *Populus trichocarpa / Symphoricarpos rotundifolius*
*61.120.06 *Populus / Salix*

*61.512.00 ***Prosopis glandulosa* (Mesquite bosque, mesquite thicket) Alliance** G5 S3

*61.512.01 *Prosopis glandulosa*
*61.512.09 *Prosopis glandulosa - Salix exigua - Salix lasiolepis*
*61.512.02 *Prosopis glandulosa - Sambucus nigra*
*61.512.04 *Prosopis glandulosa / Atriplex canescens*
*61.512.03 *Prosopis glandulosa / Atriplex spp. (alkaline)*
*61.512.05 *Prosopis glandulosa / Bebbia juncea - Petalonyx thurberi (wash)*
*61.512.06 *Prosopis glandulosa / Pluchea sericea - Atriplex canescens (alkaline spring)*
*61.512.07 *Prosopis glandulosa / Rhus ovata (upper desert spring)*
*61.512.08 *Prosopis glandulosa / Suaeda moquinii*

*61.513.00 ***Prosopis pubescens* (Screwbean mesquite bosques) Alliance** G3 S2

*61.513.01 *Prosopis / Atriplex spp. (alkaline)*
*61.513.03 *Prosopis / Bebbia juncea - Petalonyx thurberi (wash)*
*61.513.02 *Prosopis / Pluchea sericea - Atriplex canescens (alkaline spring)*

*82.100.00 ***Pseudotsuga macrocarpa* (Bigcone Douglas fir forest) Alliance** G3 S3

*82.100.01 *Pseudotsuga macrocarpa - Quercus agrifolia*
*82.100.02 *Pseudotsuga macrocarpa - Quercus chrysolepis*

82.200.00 ***Pseudotsuga menziesii* (Douglas fir forest) Alliance** G5 S4 (some associations are of high priority for inventory)

82.200.77 *Pseudotsuga menziesii*
*82.200.12 *Pseudotsuga menziesii - Chrysolepis chrysophylla - Lithocarpus densiflorus*
*82.200.13 *Pseudotsuga menziesii - Chrysolepis chrysophylla - Lithocarpus densiflorus / Mahonia nervosa*
82.200.79 *Pseudotsuga menziesii - Chrysolepis chrysophylla / Rhododendron macrophyllum - Gaultheria shallon*
*82.200.10 *Pseudotsuga menziesii - Chrysolepis chrysophylla / Rhododendron macrophyllum - Mahonia nervosa*
*82.200.11 *Pseudotsuga menziesii - Chrysolepis chrysophylla / Rhododendron macrophyllum - Quercus sadleriana - Xerophyllum tenax*
*82.200.09 *Pseudotsuga menziesii - Chrysolepis chrysophylla / Xerophyllum tenax*
82.200.71 *Pseudotsuga menziesii - Quercus agrifolia*
*82.300.03 *Pseudotsuga menziesii - Quercus chrysolepis*
82.300.07 *Pseudotsuga menziesii - Quercus chrysolepis - Acer macrophyllum / Toxicodendron diversilobum*
*82.300.02 *Pseudotsuga menziesii - Quercus chrysolepis - Arbutus menziesii / Toxicodendron diversilobum*
*82.300.05 *Pseudotsuga menziesii - Quercus chrysolepis - Lithocarpus densiflorus*
*82.300.01 *Pseudotsuga menziesii - Quercus chrysolepis - mixed conifer / Polystichum munitum*
82.300.06 *Pseudotsuga menziesii - Quercus chrysolepis / Arctostaphylos manzanita*
*82.200.19 *Pseudotsuga menziesii - Quercus garryana var. garryana / grass*

*82.200.60 *Pseudotsuga menziesii - Quercus kelloggii*
82.200.80 *Pseudotsuga menziesii - Quercus kelloggii*
*82.200.66 *Pseudotsuga menziesii - Umbellularia californica*
82.200.70 *Pseudotsuga menziesii - Umbellularia californica / Frangula californica*
82.200.81 *Pseudotsuga menziesii - Umbellularia californica / Holodiscus discolor*
82.200.69 *Pseudotsuga menziesii - Umbellularia californica / Polystichum munitum*
*82.200.05 *Pseudotsuga menziesii - Umbellularia californica / Toxicodendron diversilobum*
*82.200.20 *Pseudotsuga menziesii / Acer circinatum - Mahonia nervosa*
*82.200.49 *Pseudotsuga menziesii / Achlys triphylla*
*82.200.50 *Pseudotsuga menziesii / Arbutus menziesii*
82.200.53 *Pseudotsuga menziesii / Arctostaphylos patula*
82.200.72 *Pseudotsuga menziesii / Baccharis pilularis*
*82.200.54 *Pseudotsuga menziesii / Chimaphila umbellata*
*82.200.56 *Pseudotsuga menziesii / Corylus cornuta*
*82.200.04 *Pseudotsuga menziesii / Corylus cornuta / Adenocaulon bicolor*
*82.200.59 *Pseudotsuga menziesii / Gaultheria shallon*
*82.200.55 *Pseudotsuga menziesii / Linnaea borealis*
82.200.78 *Pseudotsuga menziesii / Lithocarpus densiflorus var. echinoides / Iris douglasii*
*82.200.64 *Pseudotsuga menziesii / Mahonia nervosa*
*82.200.15 *Pseudotsuga menziesii / Quercus vacciniifolia*
*82.200.16 *Pseudotsuga menziesii / Quercus vacciniifolia - Lithocarpus densiflorus var. echinoides*
*82.200.74 *Pseudotsuga menziesii / Quercus vacciniifolia - Rhododendron macrophyllum*
*82.200.58 *Pseudotsuga menziesii / Rhododendron spp.*
*82.200.57 *Pseudotsuga menziesii / Vancouveria planipetala*

*82.600.00 ***Pseudotsuga menziesii - Calocedrus decurrens* (Douglas fir - Incense cedar forest) Alliance** G3 S3

*82.600.15 *Pseudotsuga menziesii - Calocedrus decurrens - (Pinus jeffreyi) / Nassella pulchra*
*82.600.14 *Pseudotsuga menziesii - Calocedrus decurrens - (Quercus kellogii) / Nassella pulchra*
*82.600.12 *Pseudotsuga menziesii - Calocedrus decurrens - Pinus jeffreyi*
*82.600.13 *Pseudotsuga menziesii - Calocedrus decurrens - Pinus jeffreyi / Festuca californica*
*82.600.01 *Pseudotsuga menziesii - Calocedrus decurrens - Umbellularia californica / Toxicodendron diversilobum*
*82.600.02 *Pseudotsuga menziesii - Calocedrus decurrens / Festuca californica*
*82.600.04 *Pseudotsuga menziesii - Calocedrus decurrens / Quercus vacciniifolia*

82.500.00 ***Pseudotsuga menziesii - Lithocarpus densiflorus* (Douglas fir - tanoak forest) Alliance** G4 S4

82.500.48 *Pseudotsuga menziesii - Lithocarpus densiflorus*
82.500.02 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Acer macrophyllum) / Polystichum munitum*
82.500.50 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Acer macrophyllum) / Polystichum munitum*
82.500.22 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Calocedrus decurrens) / Festuca californica*
82.500.31 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chamaecyparis lawsoniana - Alnus rubra) / riparian*
82.500.24 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chamaecyparis lawsoniana - Umbellularia californica) / Vaccinium ovatum*
82.500.25 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chamaecyparis lawsoniana) / Mahonia nervosa / Linnaea borealis*
82.500.30 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chamaecyparis lawsoniana) / Acer circinatum*
82.500.29 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chamaecyparis lawsoniana) / Gaultheria shallon*
82.500.26 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chamaecyparis lawsoniana) / Vaccinium ovatum*
82.500.27 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chamaecyparis lawsoniana) / Vaccinium ovatum - Rhododendron occidentalis*
82.500.28 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chamaecyparis lawsoniana) / Vaccinium parvifolium*
82.500.16 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chrysolepis chrysophylla) / Gaultheria shallon*
82.500.12 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chrysolepis chrysophylla) / Pteridium aquilinum*
82.500.15 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Chrysolepis chrysophylla) / Rhododendron macrophyllum - Gaultheria shallon*
82.500.39 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Pinus lambertiana)*
82.500.13 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Quercus chrysolepis) / Mahonia nervosa*
82.500.06 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Quercus chrysolepis) / Mahonia nervosa - Gaultheria shallon*
82.500.11 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Quercus chrysolepis) / rockpile*
82.500.10 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Quercus chrysolepis) / Toxicodendron diversilobum*
82.500.08 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Quercus chrysolepis) / Vaccinium ovatum*
82.500.05 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Quercus chrysolepis, Quercus kelloggii) / Toxicodendron diversilobum*
82.500.03 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Quercus kelloggii) / Rosa gymnocarpa*
82.500.04 *Pseudotsuga menziesii - Lithocarpus densiflorus - (Umbellularia californica) / Toxicodendron diversilobum*
82.500.44 *Pseudotsuga menziesii - Lithocarpus densiflorus / Iris*
82.500.51 *Pseudotsuga menziesii - Lithocarpus densiflorus - Thuja plicata / Vaccinium ovatum - Gaultheria shallon*
82.500.36 *Pseudotsuga menziesii - Lithocarpus densiflorus / Acer circinatum*
82.500.40 *Pseudotsuga menziesii - Lithocarpus densiflorus / Achlys triphylla*
82.500.01 *Pseudotsuga menziesii - Lithocarpus densiflorus / Chimaphila umbellata*
82.500.43 *Pseudotsuga menziesii - Lithocarpus densiflorus / Cornus nuttallii*
82.500.21 *Pseudotsuga menziesii - Lithocarpus densiflorus / Corylus cornuta*
82.500.35 *Pseudotsuga menziesii - Lithocarpus densiflorus / Gaultheria shallon*
82.500.07 *Pseudotsuga menziesii - Lithocarpus densiflorus / Mahonia nervosa*
82.500.46 *Pseudotsuga menziesii - Lithocarpus densiflorus / Quercus vacciniifolia - Holodiscus*
82.500.49 *Pseudotsuga menziesii - Lithocarpus densiflorus / Rhododendron macrophyllum*
82.500.38 *Pseudotsuga menziesii - Lithocarpus densiflorus / Taxus brevifolia*
82.500.23 *Pseudotsuga menziesii - Lithocarpus densiflorus / Toxicodendron diversilobum - (Lonicera hispidula)*
82.500.19 *Pseudotsuga menziesii - Lithocarpus densiflorus / Vaccinium ovatum*
82.500.20 *Pseudotsuga menziesii - Lithocarpus densiflorus / Vaccinium ovatum - (Gaultheria shallon)*
82.500.47 *Pseudotsuga menziesii - Lithocarpus densiflorus / Whipplea modesta*

*61.570.00 ***Psorothamnus spinosus* (Smoke tree woodland) Alliance** G4 S3

*61.570.01 *Psorothamnus spinosus*
*61.570.06 *Psorothamnus spinosus - Acacia greggii - Chrysothamnus sp*
*61.570.02 *Psorothamnus spinosus / Ambrosia salsola - Bebbia juncea*
*61.570.03 *Psorothamnus spinosus / Ephedra californica - Ambrosia salsola*
*61.570.04 *Psorothamnus spinosus / Hyptis emoryi - Acacia greggii*

71.100.00 ***Quercus (agrifolia, douglasii, garryana, kelloggii, lobata, wislizeni)* (Mixed oak forest) Alliance** G4 S4

71.100.05 *Mixed oak - Aesculus californica / grass*
71.100.07 *Mixed oak - Pinus sabiniana / grass*
71.100.06 *Mixed oak - Quercus agrifolia / Toxicodendron diversilobum*
71.100.04 *Mixed oak - Quercus kelloggii / grass*
71.100.10 *Mixed oak / Baccharis pilularis - Toxicodendron diversilobum*
71.100.08 *Mixed oak / grass*
71.100.14 *Quercus douglasii - Quercus lobata - Quercus agrifolia / Toxicodendron diversilobum*

71.060.00 ***Quercus agrifolia* (Coast live oak woodland) Alliance** G5 S4 (some associations are of high priority for inventory)

71.060.02 *Quercus agrifolia*
71.060.03 *Quercus agrifolia - Acer macrophyllum / Frangula californica - Holodiscus discolor*
71.060.52 *Quercus agrifolia - Aesculus californica*
71.060.40 *Quercus agrifolia - Arbutus menziesii*
71.060.41 *Quercus agrifolia - Arbutus menziesii - Toxicodendron diversilobum*
71.060.26 *Quercus agrifolia - Arbutus menziesii - Umbellularia californica*

71.060.10 *Quercus agrifolia - Arbutus menziesii / Corylus cornuta - Rubus spp.*
71.060.27 *Quercus agrifolia - Juglans californica*
71.060.23 *Quercus agrifolia - Pinus coulteri*
71.060.43 *Quercus agrifolia - Platanus racemosa - Salix laevigata*
71.060.42 *Quercus agrifolia - Platanus racemosa / Toxicodendron diversilobum*
71.060.01 *Quercus agrifolia - Quercus douglasii*
71.060.45 *Quercus agrifolia - Quercus engelmannii / Eriogonum fasciculatum*
*71.060.18 *Quercus agrifolia - Quercus kelloggii*
71.060.47 *Quercus agrifolia - Salix lasiolepis*
71.060.48 *Quercus agrifolia - Umbellularia californica*
71.060.51 *Quercus agrifolia - Umbellularia californica / Arctostaphylos glauca - Toxicodendron diversilobum*
71.060.49 *Quercus agrifolia - Umbellularia californica / Ceanothus oliganthus*
71.060.05 *Quercus agrifolia - Umbellularia californica / Heteromeles arbutifolia - Quercus berberidifolia*
71.060.50 *Quercus agrifolia - Umbellularia californica / Toxicodendron diversilobum*
71.060.07 *Quercus agrifolia / Adenostoma fasciculatum (- Salvia mellifera)*
71.060.08 *Quercus agrifolia / Artemisia californica*
71.060.16 *Quercus agrifolia / Ceanothus oliganthus*
71.060.34 *Quercus agrifolia / Ceanothus spinosus*
71.060.29 *Quercus agrifolia / chaparral*
71.060.28 *Quercus agrifolia / coastal sage scrub*
71.060.35 *Quercus agrifolia / Equisetum hymale*
71.060.22 *Quercus agrifolia / Eriogonum wrightii*
71.060.06 *Quercus agrifolia / Frangula californica - Heteromeles arbutifolia*
71.060.36 *Quercus agrifolia / Frangula californica ssp. tomentella / Stachys pycnantha*
71.060.09 *Quercus agrifolia / grass*
71.060.14 *Quercus agrifolia / Heteromeles arbutifolia*
71.060.15 *Quercus agrifolia / Heteromeles arbutifolia - Toxicodendron diversilobum*
71.060.11 *Quercus agrifolia / Holodiscus discolor - Symphoricarpos albus*
71.060.37 *Quercus agrifolia / Quercus berberidifolia*
71.060.04 *Quercus agrifolia / Rubus spp. / Pteridium aquilinum*
71.060.38 *Quercus agrifolia / Salvia leucophylla - Artemisia californica*
71.060.17 *Quercus agrifolia / Symphoricarpos albus*
71.060.13 *Quercus agrifolia / Toxicodendron diversilobum*
71.060.25 *Quercus agrifolia / Toxicodendron diversilobum - (Corylus cornuta)*
71.060.12 *Quercus agrifolia / Toxicodendron diversilobum / grass*
71.060.39 *Quercus agrifolia / Toxicodendron diversilobum riparian*

71.050.00 ***Quercus chrysolepis* (Canyon live oak forest) Alliance** G5 S5 (some associations are of high priority for inventory)

71.050.31 *Pinus ponderosa - Quercus chrysolepis / Arctostaphylos viscida*
71.050.04 *Quercus chrysolepis*
71.050.01 *Quercus chrysolepis - Arbutus menziesii - Lithocarpus densiflorus var. densiflorus*
71.050.19 *Quercus chrysolepis - Calocedrus decurrens*
*71.050.03 *Quercus chrysolepis - Ceanothus integerrimus*
71.050.32 *Quercus chrysolepis - Pinus jeffreyi*
*71.050.02 *Quercus chrysolepis - Pinus lambertiana*
*71.050.18 *Quercus chrysolepis - Pinus ponderosa*
71.050.16 *Quercus chrysolepis - Pinus sabiniana*
*71.050.07 *Quercus chrysolepis - Quercus garryana var. garryana / Pentagramma triangularis*
*71.050.27 *Quercus chrysolepis - Quercus kelloggii - Acer macrophyllum*
71.050.26 *Quercus chrysolepis - Quercus kelloggii / (Toxicodendron diversilobum)*
*71.050.28 *Quercus chrysolepis - Quercus lobata / Vitis californica*
71.050.29 *Quercus chrysolepis - Quercus wislizeni*
71.050.13 *Quercus chrysolepis - Umbellularia californica*
*71.050.30 *Quercus chrysolepis - Umbellularia californica / Vitis californica*
71.050.09 *Quercus chrysolepis / Arctostaphylos mewukka*
71.050.15 *Quercus chrysolepis / Arctostaphylos patula*
71.050.14 *Quercus chrysolepis / Arctostaphylos viscida*
71.050.17 *Quercus chrysolepis / Dryopteris arguta*
71.050.25 *Quercus chrysolepis / Lithocarpus densiflorus var. echinoides*
71.050.08 *Quercus chrysolepis / Polystichum imbricans*
71.050.33 *Querecus chrysolepis / Rhamnus ilicifolia*
71.050.21 *Quercus chrysolepis / Toxicodendron diversilobum*

71.020.00 ***Quercus douglasii* (Blue oak woodland) Alliance** G4 S4 (some associations are of high priority for inventory)

71.020.44 *Quercus douglasii - Aesculus californica / Asclepias fascicularis*
71.020.24 *Quercus douglasii - Aesculus californicus / grass*
71.020.02 *Quercus douglasii - Pinus sabiniana*
71.020.04 *Quercus douglasii - Pinus sabiniana / Arctostaphylos viscida*
71.020.03 *Quercus douglasii - Pinus sabiniana / Ceanothus cuneatus - Cercocapus montanus*
71.020.25 *Quercus douglasii - Pinus sabiniana / Cercocarpus montanus*
71.020.01 *Quercus douglasii - Quercus agrifolia*
*71.020.11 *Quercus douglasii - Quercus lobata*
71.020.06 *Quercus douglasii - Quercus wislizeni*
71.020.18 *Quercus douglasii - Quercus wislizeni - Pinus sabiniana*
71.020.17 *Quercus douglasii - Quercus wislizeni / Bromus spp. - Daucus pusillus*
71.020.07 *Quercus douglasii - Quercus wislizeni / Ceanothus cuneatus*
71.020.46 *Quercus douglasii - Quercus wislizeni / Lithophragma cymbalaria*
71.020.42 *Quercus douglasii / Juniperus californica - Cercocarpus montanus*
71.020.43 *Quercus douglasii / Achnatherum lemmonii*
71.020.27 *Quercus douglasii / Amsinckia intermedia - Plagiobothrys nothofulvus*
71.020.22 *Quercus douglasii / Arctostaphylos manzanita / herbaceous*
71.020.28 *Quercus douglasii / Brachypodium distachyon*
71.020.30 *Quercus douglasii / Bromus hordeaceus - Lolium multiflorum*
71.020.29 *Quercus douglasii / Bromus hordeaceus - Madia gracilis*
71.020.31 *Quercus douglasii / Bromus hordeaceus - Triteleia laxa*
71.020.16 *Quercus douglasii / Bromus spp. - Daucus pusillus*
71.020.12 *Quercus douglasii / Ceanothus cuneatus*
*71.020.14 *Quercus douglasii / Cercocarpus montanus / Bowlesia incana - Lithophragma affine*
71.020.32 *Quercus douglasii / Collinsia sparsiflora - Rigiopappus leptocladus*
71.020.33 *Quercus douglasii / Delphinium parryi - Phacelia imbricata*
71.020.08 *Quercus douglasii / Ericameria linearifolia*
71.020.19 *Quercus douglasii / Ericameria linearifolia - Juniperus californica*
71.020.34 *Quercus douglasii / Eriogonum elongatum / Lotus subpinnatus - Plantago erecta*
71.020.20 *Quercus douglasii / Eriogonum fasciculatum / herbaceous*
71.020.35 *Quercus douglasii / Erodium moschatum - Hordeum leporinum*
71.020.36 *Quercus douglasii / Euphorbia spathulata - Pentagramma triangularis*
71.020.37 *Quercus douglasii / Galium andrewsii - Lupinus concinnus*
71.020.05 *Quercus douglasii / grass*
71.020.38 *Quercus douglasii / Hordeum leporinum - Viola pedunculata*
71.020.26 *Quercus douglasii / Juniperus californica*
*71.020.23 *Quercus douglasii / Juniperus californica - Ceanothus cuneatus*
71.020.41 *Quercus douglasii / Juniperus californica - Quercus john-tuckeri*
71.020.40 *Quercus douglasii / Lotus subpinnatus - Nassella pulchra*
71.020.39 *Quercus douglasii / Lupinus concinnus - Trifolium ciliolatum*
71.020.15 *Quercus douglasii / Ribes californica / Bromus diandrus*
*71.020.21 *Quercus douglasii / Selaginella hansenii - Navarretia pubescens*
71.020.45 *Quercus douglasii / Toxicodendron diversilobum / grass*
71.020.09 *Quercus douglasii / understory oak*

*71.070.00 ***Quercus engelmannii* (Engelmann oak woodland) Alliance** G3 S3

*71.070.02 *Quercus engelmannii - Quercus agrifolia / Artemisia californica*
*71.070.03 *Quercus engelmannii - Quercus agrifolia / chaparral (Adenostoma fasciculatum - Quercus berberidifolia - Rhamnus ilicifolia)*
*71.070.04 *Quercus engelmannii - Quercus agrifolia / Toxicodendron diversilobum / annual grass*
*71.070.05 *Quercus engelmannii / Adenostoma fasciculatum - Arctostaphylos glauca*
*71.070.06 *Quercus engelmannii / annual grass - herb*
*71.070.07 *Quercus engelmannii / Quercus berberidifolia*
*71.070.08 *Quercus engelmannii / Salvia apiana / grass - herb*
*71.070.09 *Quercus engelmannii / Toxicodendron diversilobum / grass*

*71.030.00	***Quercus garryana* (Oregon white oak woodland) Alliance**	G4 S3
*71.030.03	*Quercus garryana - Pseudotsuga menziesii / Festuca californica*	
*71.030.01	*Quercus garryana - Quercus kelloggii / Arrhenatherum elatius*	
*71.030.15	*Quercus garryana - Quercus kelloggii / Dichelostemma ida-maia*	
*71.030.14	*Quercus garryana - Quercus kelloggii / Toxicodendron diversilobum*	
*71.030.02	*Quercus garryana var. garryana - Quercus garryana var. breweri / Festuca californica*	
*71.030.11	*Quercus garryana / Bromus carinatus*	
*71.030.06	*Quercus garryana / Cynosurus cristatus*	
*71.030.10	*Quercus garryana / Dactylis glomerata*	
*71.030.09	*Quercus garryana / Delphinium trolliifolium*	
*71.030.13	*Quercus garryana / Melica subulata*	
*71.030.08	*Quercus garryana / Philadelphus lewisii*	
*71.030.07	*Quercus garryana / Ribes roezlii*	
*71.030.05	*Quercus garryana / Symphoricarpos albus*	
*71.030.04	*Quercus garryana / Toxicodendron diversilobum*	
71.010.00	***Quercus kelloggii* (California black oak forest) Alliance**	G4 S4 (some associations are of high priority for inventory)
71.010.18	*Quercus kelloggii*	
71.010.22	*Quercus kelloggii - Arbutus menziesii - Quercus agrifolia*	
71.010.21	*Quercus kelloggii - Calocedrus decurrens*	
71.010.32	*Quercus kelloggii - Pinus coulteri*	
71.010.33	*Quercus kelloggii - Pinus coulteri / Arctostaphylos glandulosa*	
71.010.34	*Quercus kelloggii - Pinus coulteri / Arctostaphylos pringlei*	
71.010.26	*Quercus kelloggii - Pinus ponderosa*	
71.010.27	*Quercus kelloggii - Pinus ponderosa / Arctostaphylos viscida*	
71.010.28	*Quercus kelloggii - Pinus ponderosa / Ceanothus integerrimus*	
71.010.35	*Quercus kelloggii - Pinus sabiniana / Styrax officinalis - Toxicodendron diversilobum*	
*71.010.17	*Quercus kelloggii - Pseudotsuga menziesii*	
71.010.16	*Quercus kelloggii - Pseudotsuga menziesii - Acer macrophyllum*	
*71.010.29	*Quercus kelloggii - Pseudotsuga menziesii - Umbellularia californica*	
*71.010.02	*Quercus kelloggii - Quercus agrifolia - pine / Holodiscus discolor*	
71.010.12	*Quercus kelloggii - Quercus chrysolepis*	
71.010.01	*Quercus kelloggii - Quercus chrysolepis / Toxicodendron diversilobum*	
71.010.23	*Quercus kelloggii - Quercus chrysolepis / Toxicodendron diversilobum*	
*71.010.11	*Quercus kelloggii - Quercus lobata / grass*	
71.010.30	*Quercus kelloggii / annual grass - herb*	
71.010.20	*Quercus kelloggii / Arctostaphylos mewukka / Chamaebatia foliosa*	
71.010.06	*Quercus kelloggii / Arctostaphylos patula*	
71.010.24	*Quercus kelloggii / Arctostaphylos viscida*	
71.010.03	*Quercus kelloggii / Ceanothus integerrimus*	
71.010.04	*Quercus kelloggii / Ceanothus integerrimus - Toxicodendron diversilobum / Pteridium*	
71.010.31	*Quercus kelloggii / Heteromeles arbutifolia - Toxicodendron diversilobum*	
71.010.08	*Quercus kelloggii / Toxicodendron diversilobum*	
*71.010.10	*Quercus kelloggii / Toxicodendron diversilobum - Styrax officinalis / Triteleia laxa*	
71.010.25	*Quercus kelloggii / Toxicodendron diversilobum / grass*	
71.010.05	*Quercus kelloggii/ Triteleia spp.*	
*71.040.00	***Quercus lobata* (Valley oak woodland) Alliance**	G3 S3 (some associations are of high priority for inventory)
*71.040.15	*Quercus lobata - Acer negundo*	
*71.040.11	*Quercus lobata - Alnus rhombifolia*	
*71.040.16	*Quercus lobata - Fraxinus latifolia / Vitis californica*	
*71.040.06	*Quercus lobata - Quercus agrifolia / grass*	
*71.040.17	*Quercus lobata - Quercus agrifolia / Toxicodendron diversilobum*	
*71.040.18	*Quercus lobata - Quercus douglasii*	
*71.040.19	*Quercus lobata - Quercus kelloggii*	
*71.040.12	*Quercus lobata - Quercus wislizeni*	
*71.040.20	*Quercus lobata - Salix lasiolepis*	
*71.040.14	*Quercus lobata (Sacramento River)*	
*71.040.05	*Quercus lobata / grass*	
*71.040.13	*Quercus lobata / herbaceous semi-riparian*	
*71.040.09	*Quercus lobata / Rhus trilobata*	
*71.040.10	*Quercus lobata / Rubus armeniacus*	
*71.085.00	***Quercus parvula var. shrevei* (Shreve oak forests) Provisional Alliance**	G2 S2
*71.090.00	***Quercus tomentella* (Island oak groves) Special Stands**	G3 S3
71.080.00	***Quercus wislizeni* (Interior live oak woodland) Alliance**	G4 S4
71.080.14	*Quercus wislizeni - Aesculus californica*	
71.080.37	*Quercus wislizeni - Aesculus californica / Toxicodendron diversilobum*	
71.080.03	*Quercus wislizeni - Arbutus menziesii / Toxicodendron diversilobum*	
*71.080.15	*Quercus wislizeni - Pinus ponderosa*	
71.080.42	*Quercus wislizeni - Pinus sabiniana / annual grass - herb*	
*71.080.02	*Quercus wislizeni - Pinus sabiniana / Arctostaphylos manzanita*	
71.080.08	*Quercus wislizeni - Pinus sabiniana / Arctostaphylos viscida*	
71.080.39	*Quercus wislizeni - Quercus chrysolepis - Pinus coulteri*	
71.080.38	*Quercus wislizeni - Quercus chrysolepis tree*	
71.080.43	*Quercus wislizeni - Quercus douglasii - Aesculus californica*	
71.080.01	*Quercus wislizeni - Quercus douglasii - Pinus sabiniana / (grass)*	
71.080.41	*Quercus wislizeni - Quercus douglasii - Pinus sabiniana / Toxicodendron diversilobum*	
71.080.44	*Quercus wislizeni - Quercus douglasii / herbaceous*	
71.080.46	*Quercus wislizeni - Quercus douglasii / Toxicodendron diversilobum*	
71.080.45	*Quercus wislizeni - Quercus kelloggii*	
71.080.47	*Quercus wislizeni - Quercus kelloggii / Heteromeles arbutifolia - Toxicodendron*	
*71.080.13	*Quercus wislizeni - Salix laevigata / Frangula californica*	
71.080.04	*Quercus wislizeni / Arctostaphylos viscida*	
71.080.05	*Quercus wislizeni / Eriodictyon californicum*	
71.080.40	*Quercus wislizeni / Heteromeles arbutifolia*	
71.080.48	*Quercus wislizeni / Toxicodendron diversilobum*	
71.080.16	*Quercus wislizeni / Toxicodendron diversilobum / Centaurea solstitialis*	
*61.211.00	***Salix gooddingii* (Black willow thickets) Alliance**	G4 S3
*61.211.01	*Salix gooddingii*	
*61.211.04	*Salix gooddingi - Populus fremontii*	
*61.211.06	*Salix gooddingii - Quercus lobata / wetland herb*	
*61.211.05	*Salix gooddingii - Salix laevigata*	
*61.211.08	*Salix gooddingii - Salix lucida - Populus fremontii*	
*61.211.02	*Salix gooddingii / Baccharis salicifolia*	
*61.211.03	*Salix gooddingii / Lepidium latifolium*	
*61.211.07	*Salix gooddingii / Rubus armeniacus*	
*61.205.00	***Salix laevigata* (Red willow thickets) Alliance**	G3 S3
*61.205.01	*Salix laevigata*	
*61.205.05	*Salix laevigata - Cornus sericea / Scirpus microcarpus*	
*61.205.02	*Salix laevigata - Salix lasiolepis*	
*61.205.03	*Salix laevigata - Salix lasiolepis / Artemisia douglasiana - Rubus ursinus*	
*61.205.07	*Salix laevigata - Salix lasiolepis / Baccharis salicifolia*	
*61.205.04	*Salix laevigata / Rosa californica*	
*61.205.06	*Salix laevigata / Salix lasiolepis / Artemisia douglasiana*	
*61.204.00	***Salix lucida* (Shining willow groves) Alliance**	G4 S3
*61.204.02	*Salix lucida / Poa pratensis*	
*61.204.03	*Salix lucida ssp. lasiandra*	
*61.204.04	*Salix lucida ssp. lasiandra / Cornus sericea*	
*61.204.05	*Salix lucida ssp. lasiandra / Equisetum arvense*	
*61.204.06	*Salix lucida ssp. lasiandra / Trifolium longipes*	

79.200.00 ***Schinus (molle, terebinthifolius) - Myoporum laetum* (Pepper tree or Myoporum groves) Semi-natural Stands**

79.200.01 *Myoporum laetum / Arundo donax*
79.200.02 *Schinus molle*
79.200.03 *Schinus molle / Lepidospartum squamatum*

*86.100.00 ***Sequoia sempervirens* (Redwood forest) Alliance** G3 S3

*86.100.04 *Sequoia sempervirens*
*86.100.14 *Sequoia sempervirens - Acer macrophyllum - Umbellularia californica*
*86.100.01 *Sequoia sempervirens - Acer macrophyllum / Polypodium californicum*
*86.100.29 *Sequoia sempervirens - Alnus rubra / Rubus spectabilis*
*86.100.15 *Sequoia sempervirens - Arbutus menziesii / Vaccinium ovatum*
*86.100.18 *Sequoia sempervirens - Chrysolepis chrysophylla / Arctostaphylos glandulosa*
*86.100.06 *Sequoia sempervirens - Lithocarpus densiflorus / Carex globosa - Iris douglasiana*
*86.100.16 *Sequoia sempervirens - Lithocarpus densiflorus / Vaccinium ovatum*
*86.100.23 *Sequoia sempervirens - Pseudotsuga menziesii - Lithocarpus densiflorus - Chamaecyparis lawsoniana / Vaccinium ovatum*
*86.100.20 *Sequoia sempervirens - Pseudotsuga menziesii - Umbellularia californica*
*86.100.10 *Sequoia sempervirens - Pseudotsuga menziesii / Arbutus menziesii*
*86.100.11 *Sequoia sempervirens - Pseudotsuga menziesii / Gaultheria shallon*
*86.100.26 *Sequoia sempervirens - Pseudotsuga menziesii / Rhododendron macrophyllum*
*86.100.12 *Sequoia sempervirens - Pseudotsuga menziesii / Vaccinium ovatum*
*86.100.28 *Sequoia sempervirens - Tsuga heterophylla / Polystichum munitum*
*86.100.30 *Sequoia sempervirens - Tsuga heterophylla / Rubus spectabilis*
*86.100.27 *Sequoia sempervirens - Tsuga heterophylla / Vaccinium ovatum*
*86.100.21 *Sequoia sempervirens - Umbellularia californica*
*86.100.02 *Sequoia sempervirens / (Pteridium aquilinum) - Woodwardia fimbriata*
*86.100.09 *Sequoia sempervirens / Arbutus menziesii*
*86.100.07 *Sequoia sempervirens / Blechnum spicant*
*86.100.08 *Sequoia sempervirens / Mahonia nervosa*
*86.100.05 *Sequoia sempervirens / Marah fabaceus - Vicia angustifolia*
*86.100.13 *Sequoia sempervirens / Oxalis oregana*
*86.100.25 *Sequoia sempervirens / Polystichum munitum*
*86.100.24 *Sequoia sempervirens / Pteridium aquilinum*
*86.100.03 *Sequoia sempervirens / Pteridium aquilinum - Trillium ovatum*

*86.200.00 ***Sequoiadendron giganteum* (Giant sequoia forest) Alliance** G3 S3

*86.200.01 *Sequoiadendron giganteum - Pinus lambertiana / Cornus nuttallii*

*84.200.00 ***Tsuga heterophylla* (Western hemlock forest) Alliance** G5 S2

*84.200.01 *Tsuga heterophylla - Pseudotsuga menziesii - Chamaecyparis lawsoniana*

84.100.00 ***Tsuga mertensiana* (Mountain hemlock forest) Alliance** G5 S4

84.100.04 *Tsuga mertensiana*
84.100.15 *Tsuga mertensiana - Pinus contorta ssp. murrayana*
84.100.11 *Tsuga mertensiana - Pinus contorta var. murrayana - Pinus monticola*
84.100.10 *Tsuga mertensiana - Pinus monticola*
84.100.09 *Tsuga mertensiana / Arnica cordifolia*
84.100.02 *Tsuga mertensiana / Juncus parryi*
84.100.01 *Tsuga mertensiana / Phyllodoce empetriformis*
84.100.08 *Tsuga mertensiana / Pyrola picta*
84.100.03 *Tsuga mertensiana / Quercus sadleriana*
84.100.07 *Tsuga mertensiana / Quercus vacciniifolia*
84.100.14 *Tsuga mertensiana / steep*

*74.100.00 ***Umbellularia californica* (California bay forest) Alliance** G4 S3

*74.100.01 *Umbellularia californica*
*74.100.10 *Umbellularia californica - Acer macrophyllum*
*74.100.06 *Umbellularia californica - Aesculus californica / Holodiscus discolor*
*74.100.16 *Umbellularia californica - Alnus rhombifolia*
*74.100.03 *Umbellularia californica - Arbutus menziesii*
*74.100.11 *Umbellularia californica - Juglans californica / Ceanothus spinosus*
*74.100.12 *Umbellularia californica - Lithocarpus densiflorus*
*74.100.13 *Umbellularia californica - Platanus racemosa*
*74.100.17 *Umbellularia californica - Pseudotsuga menziesii / Rhododendron occidentale*
*74.100.15 *Umbellularia californica - Quercus agrifolia / (Genista monspessulana)*
*74.100.19 *Umbellularia californica - Quercus agrifolia / Heteromeles arbutifolia - Toxicodendron diversilobum / Melica torreyana*
*74.100.05 *Umbellularia californica - Quercus agrifolia / Toxicodendron diversilobum (Corylus cornuta)*
*74.100.20 *Umbellularia californica - Quercus chrysolepis*
*74.100.18 *Umbellularia californica - Quercus wislizeni*
*74.100.07 *Umbellularia californica / Ceanothus oliganthus*
*74.100.08 *Umbellularia californica / Polystichum munitum*
*74.100.09 *Umbellularia californica / Toxicodendron diversilobum*

*61.520.00 ***Washingtonia filifera* (California fan palm oasis) Alliance** G3 S3

*61.520.04 *Washingtonia filifera - Platanus racemosa / Salix spp*
*61.520.03 *Washingtonia filifera / spring (Atriplex - Baccharis - Pluchea)*

*33.170.00 ***Yucca brevifolia* (Joshua tree woodland) Alliance** G4 S3

*33.170.01 *Yucca brevifolia*
*33.170.20 *Yucca brevifolia / Ephedra nevadensis*
*33.170.18 *Yucca brevifolia / Yucca baccata / Pleuraphis jamesii*
*33.170.04 *Yucca brevifolia / Artemisia tridentata - Atriplex confertifolia*
*33.170.02 *Yucca brevifolia / Coleogyne ramosissima*
*33.170.06 *Yucca brevifolia / Cylindropuntia acanthocarpa*
*33.170.14 *Yucca brevifolia / Gutierrezia microcephala / Pleuraphis rigida*
*33.170.03 *Yucca brevifolia / Juniperus californica / Coleogyne ramosissima*
*33.170.19 *Yucca brevifolia / Juniperus californica / Ephedra nevadensis*
*33.170.10 *Yucca brevifolia / Larrea tridentata - Yucca schidigera*
*33.170.11 *Yucca brevifolia / Larrea tridentata - Ambrosia dumosa - Eriogonum fasciculatum*
*33.170.15 *Yucca brevifolia / Larrea tridentata - Pleuraphis rigida*
*33.170.08 *Yucca brevifolia / Lycium andersonii*
*33.170.07 *Yucca brevifolia / Pleuraphis (rigida, jamesii)*
*33.170.16 *Yucca brevifolia / Pleuraphis rigida*
*33.170.17 *Yucca brevifolia / Pleuraphis rigida - Muhlenbergia porteri*
*33.170.13 *Yucca brevifolia / Prunus fasciculata*
*33.170.09 *Yucca brevifolia / Salazaria mexicana*

Shrubland Alliances and Stands — Global & State Rank

33.040.00 ***Acacia greggii* (Catclaw acacia thorn scrub) Alliance** G5 S4 (some associations are of high priority for inventory)

*33.040.08 *Acacia greggii - Ambrosia eriocentra*
33.040.05 *Acacia greggii - Ambrosia salsola*
33.040.02 *Acacia greggii - annual herbs (Bromus rubens)*
33.040.10 *Acacia greggii - Bebbia juncea*
33.040.12 *Acacia greggii - Encelia virginensis*
33.040.13 *Acacia greggii - Eriogonum fasciculatum*
33.040.03 *Acacia greggii - Hyptis emoryi*
33.040.07 *Acacia greggii - Prunus fasciculata*
33.040.09 *Acacia greggii - Salvia dorrii*
33.040.06 *Acacia greggii - Viguiera parishii*
*33.040.11 *Acacia greggii / Eriogonum nudum var. pauciflorum*
33.040.01 *Acacia greggii wash (Justicia californica)*

*61.430.00 ***Acer glabrum* (Rocky Mountain maple thickets) Provisional Alliance** G5 S3?

37.101.00	***Adenostoma fasciculatum* (Chamise chaparral) Alliance**	G5 S5 (some associations are of high priority for inventory)
37.101.16	*Adenostoma fasciculatum*	
37.101.07	*Adenostoma fasciculatum - (Arctostaphylos glandulosa)*	
*37.101.19	*Adenostoma fasciculatum - (Arctostaphylos manzanita)*	
37.101.26	*Adenostoma fasciculatum - (Arctostaphylos pungens)*	
37.101.27	*Adenostoma fasciculatum - (Arctostaphylos viscida)*	
37.101.08	*Adenostoma fasciculatum - (Ceanothus crassifolius)*	
37.101.10	*Adenostoma fasciculatum - (Ceanothus cuneatus)*	
*37.101.06	*Adenostoma fasciculatum - (Ceanothus greggii / mafic)*	
37.101.11	*Adenostoma fasciculatum - (Ceanothus tomentosus)*	
37.101.32	*Adenostoma fasciculatum - Arctostaphylos glandulosa - Ceanothus jepsonii / Calamagrostis ophitidis*	
37.101.22	*Adenostoma fasciculatum - Arctostaphylos pringlei*	
*37.101.12	*Adenostoma fasciculatum - Diplacus aurantiacus*	
37.101.31	*Adenostoma fasciculatum - Eriodictyon californicum (Lotus scoparius)*	
37.101.14	*Adenostoma fasciculatum - Eriogonum fasciculatum*	
37.103.03	*Adenostoma fasciculatum - Eriogonum fasciculatum - Salvia apiana*	
37.101.04	*Adenostoma fasciculatum - Hesperoyucca whipplei*	
37.101.28	*Adenostoma fasciculatum - Heteromeles arbutifolia / Melica torreyana*	
37.101.21	*Adenostoma fasciculatum - Malosma laurina*	
37.101.33	*Adenostoma fasciculatum - Malosma laurina - Eriodictyon crassifolium*	
37.101.24	*Adenostoma fasciculatum / annual grass - forb*	
37.101.29	*Adenostoma fasciculatum / Castilleja pruinosa*	
37.101.25	*Adenostoma fasciculatum / mixed herb - moss*	
37.101.30	*Adenostoma fasciculatum / Selaginella bigelovii*	
37.101.17	*Adenostoma fasciculatum disturbance*	
*37.101.15	*Adenostoma fasciculatum serpentine*	
*37.103.00	***Adenostoma fasciculatum - Salvia apiana* (Chamise - white sage chaparral) Alliance**	G3 S3
*37.103.01	*Adenostoma fasciculatum - Salvia apiana*	
*37.103.02	*Adenostoma fasciculatum - Salvia apiana - Artemisia californica*	
*37.101.23	*Adenostoma fasciculatum - Salvia leucophylla*	
37.102.00	***Adenostoma fasciculatum - Salvia mellifera* (Chamise - black sage chaparral) Alliance**	G5 S5 (some associations are of high priority for inventory)
37.102.04	*Adenostoma fasciculatum - Salvia mellifera - Artemisia californica*	
37.102.05	*Adenostoma fasciculatum - Salvia mellifera - Ceanothus crassifolius*	
37.102.06	*Adenostoma fasciculatum - Salvia mellifera - Malosma laurina*	
37.102.07	*Adenostoma fasciculatum - Salvia mellifera - Rhus ovata*	
37.102.02	*Adenostoma fasciculatum - Salvia mellifera / (herbaceous)*	
*37.102.03	*Adenostoma fasciculatum - Salvia mellifera / mixed shrub*	
*37.109.00	***Adenostoma fasciculatum - Xylococcus bicolor* (Chamise-mission manzanita chaparral) Alliance**	G4 S3
*37.109.01	*Adenostoma fasciculatum - Xylococcus bicolor*	
*37.109.05	*Adenostoma fasciculatum - Xylococcus bicolor - Ceanothus crassifolius*	
*37.109.14	*Adenostoma fasciculatum - Xylococcus bicolor - Ceanothus crassifolius - Malosma laurina*	
*37.109.02	*Adenostoma fasciculatum - Xylococcus bicolor - Ceanothus tomentosus*	
*37.109.08	*Adenostoma fasciculatum - Xylococcus bicolor - Ceanothus verrucosus*	
*37.109.09	*Adenostoma fasciculatum - Xylococcus bicolor - Cneoridium dumosum*	
*37.109.10	*Adenostoma fasciculatum - Xylococcus bicolor - Eriogonum fasciculatum*	
*37.109.12	*Adenostoma fasciculatum - Xylococcus bicolor - Quercus berberidifolia*	
*37.109.11	*Adenostoma fasciculatum - Xylococcus bicolor - Rhus integrifolia*	
*37.109.13	*Adenostoma fasciculatum - Xylococcus bicolor - Salvia mellifera - Malosma laurina*	
37.501.00	***Adenostoma sparsifolium* (Redshank chaparral) Alliance**	G4 S4 (some associations are of high priority for inventory)
*37.501.01	*Adenostoma sparsifolium*	
37.503.05	*Adenostoma sparsifolium - Adenostoma fasciculatum - Arctostaphylos glauca*	
*37.503.03	*Adenostoma sparsifolium - Adenostoma fasciculatum - Arctostaphylos pungens*	
37.503.04	*Adenostoma sparsifolium - Adenostoma fasciculatum - Ceanothus crassifolius*	
*37.503.02	*Adenostoma sparsifolium - Adenostoma fasciculatum - Ceanothus greggii*	
*37.503.01	*Adenostoma sparsifolium - Adenostoma fasciculatum - Cercocarpus montanus*	
37.503.06	*Adenostoma sparsifolium - Adenostoma fasciculatum - Opuntia parryi*	
37.501.02	*Adenostoma sparsifolium - Artemisia tridentata*	
37.501.03	*Adenostoma sparsifolium - Ceanothus crassifolius*	
37.501.04	*Adenostoma sparsifolium - Ceanothus cuneatus*	
37.502.01	*Adenostoma sparsifolium - Cercocarpus montanus*	
37.501.06	*Adenostoma sparsifolium - Ericameria linearifolia - Eriogonum fasciculatum - Opuntia basilaris*	
37.501.07	*Adenostoma sparsifolium - Eriogonum fasciculatum - Lotus scoparius*	
*33.075.00	***Agave deserti* (Desert agave scrub) Alliance**	G3 S3
*33.075.01	*Agave deserti - Ambroia salsola (wash and terrace)*	
*33.075.02	*Agave deserti - Yucca schidigera*	
*36.120.00	***Allenrolfea occidentalis* (Iodine bush scrub) Alliance**	G4 S3
*36.120.04	*Allenrolfea occidentalis*	
*36.120.03	*Allenrolfea occidentalis - Sporobolus airoides*	
*36.120.02	*Allenrolfea occidentalis - Suaeda moquinii*	
*63.210.00	***Alnus incana* (Mountain alder thicket) Alliance**	G4 S3
*63.210.01	*Alnus incana*	
*63.210.02	*Alnus incana / Glyceria elata*	
*63.210.03	*Alnus incana / bench*	
*63.220.00	***Alnus viridis* (Sitka alder thickets) Provisional Alliance**	G5 S3?
33.060.00	***Ambrosia dumosa* (White bursage scrub) Alliance**	G5 S4 (some associations are of high priority for inventory)
*33.060.02	*Ambrosia dumosa*	
*33.060.01	*Ambrosia dumosa - Acamptopappus sphaerocephalus*	
33.060.03	*Ambrosia dumosa - Atriplex hymenolytra*	
33.060.06	*Ambrosia dumosa - Encelia farinosa*	
33.060.07	*Ambrosia dumosa - Ephedra californica / sandy*	
33.060.09	*Ambrosia dumosa - Olneya tesota - Calliandra eriophylla*	
*33.060.04	*Ambrosia dumosa / Pleuraphis rigida*	
33.200.00	***Ambrosia salsola* (Cheesebush scrub) Alliance**	G5 S4 (some associations are of high priority for inventory)
33.200.01	*Ambrosia salsola*	
*33.200.06	*Ambrosia salsola - Ambrosia eriocentra*	
33.200.04	*Ambrosia salsola - Atriplex confertifolia*	
33.200.05	*Ambrosia salsola - Bebbia juncea*	
33.200.07	*Ambrosia salsola - Brickellia incana*	
33.200.02	*Ambrosia salsola - Eriogonum fasciculatum*	
33.200.10	*Ambrosia salsola - Larrea tridentata*	
33.200.09	*Ambrosia salsola - Psorothamnus schottii*	
33.200.08	*Ambrosia salsola - Senna armata*	
33.200.11	*Ambrosia salsola -Petalonyx thurberi*	
*37.308.00	***Arctostaphylos (crustacea, tomentosa)* (Brittle leaf-Woolly leaf manzanita chaparral)**	G2 S2
*37.306.00	***Arctostaphylos (nummularia, sensitiva)* (Glossy leaf manzanita chaparral) Alliance**	G2 S2
*37.322.00	***Arctostaphylos (purissima, rudis)* (Burton Mesa chaparral) Provisional Alliance**	G1 S1
*37.317.00	***Arctostaphylos bakeri* (Stands of Baker manzanita) Special Stands**	G1 S1

*37.311.00	***Arctostaphylos canescens* (Hoary manzanita chaparral) Provisional Alliance**	G3? S3?
*37.311.01	*Arctostaphylos canescens - Arctostaphylos glandulosa - Adenostoma fasciculatum*	
*37.308.03	*Arctostaphylos crustacea*	
*37.308.04	*Arctostaphylos crustacea - Adenostoma fasciculatum - Ceanothus (cuneatus, papillosus)*	
*37.308.05	*Arctostaphylos crustacea - Arctostaphylos gabilanensis*	
37.302.00	***Arctostaphylos glandulosa* (Eastwood manzanita chaparral) Alliance**	G4 S4 (some associations are of high priority for inventory)
37.302.01	*Arctostaphylos glandulosa*	
37.106.13	*Arctostaphylos glandulosa - Adenostoma fasciculatum*	
37.106.12	*Arctostaphylos glandulosa - Adenostoma fasciculatum - Arctostaphylos glauca*	
37.106.04	*Arctostaphylos glandulosa - Adenostoma fasciculatum - Ceanothus crassifolius*	
37.106.07	*Arctostaphylos glandulosa - Adenostoma fasciculatum - Ceanothus cuneatus*	
37.106.02	*Arctostaphylos glandulosa - Adenostoma fasciculatum - Ceanothus leucodermis*	
37.106.01	*Arctostaphylos glandulosa - Adenostoma fasciculatum - Cercocarpus montanus*	
37.106.11	*Arctostaphylos glandulosa - Adenostoma fasciculatum - Quercus berberidifolia*	
37.106.10	*Arctostaphylos glandulosa - Adenostoma fasciculatum - Quercus wislizeni*	
*37.106.05	*Arctostaphylos glandulosa - Adenostoma fasciculatum / mafic soils*	
37.106.03	*Arctostaphylos glandulosa - Adenostoma fasciculatum -Ceanothus greggii*	
*37.302.07	*Arctostaphylos glandulosa - Arctostaphylos pringlei*	
37.302.03	*Arctostaphylos glandulosa - Cercocarpus montanus*	
37.302.04	*Arctostaphylos glandulosa - Quercus wislizeni*	
*37.302.02	*Arctostaphylos glandulosa ssp. adamsii*	
37.301.00	***Arctostaphylos glauca* (Bigberry manzanita chaparral) Alliance**	G4 S4 (some associations are of high priority for inventory)
37.301.01	*Arctostaphylos glauca*	
37.104.01	*Arctostaphylos glauca - Adenostoma fasciculatum*	
37.104.05	*Arctostaphylos glauca - Adenostoma fasciculatum - Ceanothus crassifolius*	
37.104.07	*Arctostaphylos glauca - Adenostoma fasciculatum - Ceanothus cuneatus*	
37.104.04	*Arctostaphylos glauca - Adenostoma fasciculatum - Ceanothus greggii*	
37.104.02	*Arctostaphylos glauca - Adenostoma fasciculatum - Ceanothus leucodermis*	
37.104.08	*Arctostaphylos glauca - Adenostoma fasciculatum - Diplacus aurantiacus*	
37.104.03	*Arctostaphylos glauca - Adenostoma fasciculatum - Hesperoyucca whipplei*	
37.104.06	*Arctostaphylos glauca - Adenostoma fasciculatum - Quercus berberidifolia*	
37.104.09	*Arctostaphylos glauca - Adenostoma fasciculatum - Rhus ovata*	
37.104.10	*Arctostaphylos glauca - Adenostoma fasciculatum - Salvia mellifera*	
37.104.11	*Arctostaphylos glauca - Adenostoma fasciculatum on serpentine*	
37.301.03	*Arctostaphylos glauca - Artemisia californica - Salvia mellifera*	
37.301.05	*Arctostaphylos glauca - Cercocarpus montanus*	
*37.301.04	*Arctostaphylos glauca - Quercus durata / Pinus sabiniana*	
*37.301.02	*Arctostaphylos glauca / Melica torreyana*	
*37.321.00	***Arctostaphylos hookeri* (Hooker's manzanita chaparral) Provisional Alliance**	G2 S2
*37.312.00	***Arctostaphylos hooveri* (Hoover's manzanita chaparral) Alliance**	G2 S2
*37.312.01	*Arctostaphylos hooveri*	
*37.313.00	***Arctostaphylos manzanita* (Spiny menodora scrub) Provisional Alliance**	G3? S3?
*37.307.00	***Arctostaphylos montana* (Mount Tamalpais manzanita chaparral) Alliance**	G2 S2
*37.307.01	*Arctostaphylos montana*	
*37.307.02	*Arctostaphylos montana - Adenostoma fasciculatum*	
*37.314.00	***Arctostaphylos montereyensis* (Monterey manzanita chaparral) Provisional Alliance**	G1 S1
*37.315.00	***Arctostaphylos morroensis* (Morro manzanita chaparral) Alliance**	G1 S1
*37.304.00	***Arctostaphylos myrtifolia* (Ione manzanita chaparral) Alliance**	G1 S1
*37.304.01	*Arctostaphylos myrtifolia*	

*37.316.00	***Arctostaphylos pajaroensis* (Pajaro manzanita chaparral) Alliance**	G1 S1
*37.316.01	*Arctostaphylos pajaroensis*	
37.303.00	***Arctostaphylos patula* (Green leaf manzanita chaparral) Alliance**	G5 S4
37.303.01	*Arctostaphylos patula*	
37.303.02	*Arctostaphylos patula - Quercus vacciniifolia*	
*37.310.00	***Arctostaphylos pringlei ssp. drupacea* (Pink-bract manzanita chaparral) Alliance**	G3 S3
*37.310.02	*Arctostaphylos pringlei ssp. drupacea*	
*37.310.01	*Arctostaphylos pringlei ssp. drupacea - Arctostaphylos pungens*	
*37.318.00	***Arctostaphylos pumila* (Sandmat manzanita chaparral) Provisional Alliance**	G1 S1
*37.306.01	*Arctostaphylos sensitiva - Vaccinium ovatum - Chrysolepis chrysophylla var. minor*	
*37.306.02	*Arctostaphylos sensitiva - Arctostaphylos glandulosa*	
*37.320.00	***Arctostaphylos silvicola* (Silverleaf manzanita chaparral) Provisional Alliance**	G1 S1
*37.319.00	***Arctostaphylos stanfordiana* (Stanford manzanita chaparral) Provisional Alliance**	G3 S3?
37.305.00	***Arctostaphylos viscida* (White leaf manzanita chaparral) Alliance**	G4 S4 (some associations are of high priority for inventory)
37.305.01	*Arctostaphylos viscida*	
37.305.05	*Arctostaphylos viscida - Heteromeles arbutifolia - Toxicodendron diversilobum*	
37.305.07	*Arctostaphylos viscida - Quercus wislizeni*	
*37.305.03	*Arctostaphylos viscida / Salvia sonomensis*	
37.305.06	*Arctostaphylos viscida ssp. pulchella*	
37.305.02	*Arctostaphylos viscida - Adenostoma fasciculatum*	
*37.305.04	*(Arctostaphylos viscida - Adenostoma fasciculatum) / Salvia sonomensis*	
35.120.00	***Artemisia arbuscula ssp. arbuscula* (Little sagebrush scrub) Alliance**	G5 S4 (some associations are of high priority for inventory)
35.120.07	*Artemisia arbuscula*	
*35.120.05	*Artemisia arbuscula - Eriogonum microthecum*	
35.120.06	*Artemisia arbuscula / Carex exserta*	
35.120.08	*Artemisia arbuscula / Castilleja applegatei*	
35.120.09	*Artemisia arbuscula / Castilleja schizotrichia*	
35.120.10	*Artemisia arbuscula / Eriogonum nudum - Monardella odoratissima*	
*35.120.03	*Artemisia arbuscula / Festuca idahoensis*	
35.120.04	*Artemisia arbuscula / Leptodactylon pungens*	
35.120.02	*Artemisia arbuscula / Stenotus acaulis - Geum canescens*	
35.120.11	*Artemisia arbuscula / Stenotus acaulis - Linanthus pungens*	
35.120.12	*Artemisia arbuscula / Stenotus acaulis - Tetradymia canescens*	
*35.120.01	*Artemisia arbuscula / Trifolium andersonii ssp. monoense*	
35.121.00	***Artemisia arbuscula ssp. longicaulis* (Lahontan sagebrush scrub) Provisional Alliance**	G5 S4?
32.010.00	***Artemisia californica* (California sagebrush scrub) Alliance**	G5 S5
32.010.01	*Artemisia californica*	
45.455.02	*Artemisia californica - Malosma laurina*	
32.010.15	*Artemisia californica - Baccharis pilularis / Leymus condensatus*	
32.010.08	*Artemisia californica - Ceanothus ferrisiae*	
32.010.11	*Artemisia californica - Diplacus aurantiacus*	
32.010.07	*Artemisia californica - Eriogonum cinereum*	
32.010.03	*Artemisia californica - Keckiella cordifolia*	
32.010.09	*Artemisia californica - Lepidospartum squamatum*	
32.010.02	*Artemisia californica - Lotus scoparius*	
32.010.10	*Artemisia californica - Malosma laurina*	
32.010.04	*Artemisia californica - Salvia leucophylla*	

32.110.00	***Artemisia californica - Eriogonum fasciculatum* (California sagebrush - California buckwheat scrub) Alliance**	G4 S4
32.110.05	*Artemisia californica - Eriogonum fasciculatum*	
32.110.07	*Artemisia californica - Eriogonum fasciculatum - Ephedra californica*	
32.110.06	*Artemisia californica - Eriogonum fasciculatum - Malosma laurina*	
32.110.01	*Artemisia californica - Eriogonum fasciculatum - Rhus ovata*	
32.110.02	*Artemisia californica - Eriogonum fasciculatum - Salvia apiana*	
32.110.03	*Artemisia californica - Eriogonum fasciculatum - Salvia leucophylla*	
32.110.04	*Artemisia californica - Eriogonum fasciculatum - Salvia mellifera*	
32.120.00	***Artemisia californica - Salvia mellifera* (California sagebrush - black sage scrub) Alliance**	G4 S4
32.120.01	*Artemisia californica - Salvia mellifera*	
32.120.03	*Artemisia californica - Salvia mellifera - Baccharis sarothroides*	
32.010.12	*Artemisia californica / Amsinckia menziesii*	
32.010.13	*Artemisia californica / Eschscholzia californica*	
32.010.14	*Artemisia californica / Leymus condensatus*	
*35.150.00	***Artemisia cana* (Silver sagebrush scrub) Alliance**	G5 S3
*35.150.06	*Artemisia cana - Muhlenbergia richardsonis*	
*35.150.01	*Artemisia cana / cold*	
*35.150.02	*Artemisia cana / dry graminoid*	
*35.150.05	*Artemisia cana / Iris missouriensis - Juncus arcticus var. balticus*	
*35.150.04	*Artemisia cana / Juncus arcticus var. balticus*	
*35.150.07	*Artemisia cana / mesic (Poa secunda - Poa cusickii)*	
*35.150.03	*Artemisia cana / warm*	
*35.130.00	***Artemisia nova* (Black sagebrush scrub) Alliance**	G4 S3
*35.130.01	*Artemisia nova*	
*35.130.03	*Artemisia nova - Ambrosia salsola*	
*35.130.02	*Artemisia nova - Echinocereus engelmannii*	
*35.140.00	***Artemisia rothrockii* (Rothrock's sagebrush) Alliance**	G3 S3
*35.140.02	*Artemisia rothrockii / Monardella odoratissima*	
*35.140.01	*Artemisia rothrockii / Penstemon heterodoxus*	
35.110.00	***Artemisia tridentata* (Big sagebrush) Alliance**	G5 S5
35.110.02	*Artemisia tridentata*	
35.110.11	*Artemisia tridentata - Artemisia nova*	
35.110.12	*Artemisia tridentata - Chrysothamnus viscidiflorus*	
35.110.05	*Artemisia tridentata - Coleogyne ramosissima*	
35.110.06	*Artemisia tridentata - Encelia virginensis*	
35.110.13	*Artemisia tridentata - Ephedra nevadensis*	
35.110.01	*Artemisia tridentata - Ericameria nauseosa*	
35.110.14	*Artemisia tridentata - Ericameria teretifolia*	
35.110.09	*Artemisia tridentata - Eriogonum fasciculatum*	
35.110.10	*Artemisia tridentata - Eriogonum wrightii*	
35.110.07	*Artemisia tridentata - Purshia tridentata*	
35.110.15	*Artemisia tridentata - Purshia tridentata / Hesperostipa comata*	
35.110.04	*Artemisia tridentata - Symphoricarpos longiflorus*	
35.111.00	***Artemisia tridentata ssp. vaseyana* (Mountain big sagebrush) Alliance**	G5 S5
35.111.02	*Artemisia tridentata ssp. vaseyana*	
35.111.03	*Artemisia tridentata ssp. vaseyana - Purshia tridentata / Festuca idahoensis*	
35.111.01	*Artemisia tridentata ssp. vaseyana / Carex exserta*	
35.111.04	*Artemisia tridentata ssp. vaseyana / Monardella odoratissima*	
36.310.00	***Atriplex canescens* (Fourwing saltbush scrub) Alliance**	G5 S4
36.310.01	*Atriplex canescens*	
36.310.02	*Atriplex canescens - Krascheninnikovia lanata*	
36.320.00	***Atriplex confertifolia* (Shadscale scrub) Alliance**	G5 S4
36.320.10	*Atriplex confertifolia*	
36.320.09	*Atriplex confertifolia - Grayia spinosa - Encelia virginensis var. actoni*	
36.320.03	*Atriplex confertifolia - Ambrosia dumosa*	
36.320.06	*Atriplex confertifolia - Atriplex canescens*	
36.320.04	*Atriplex confertifolia - Coleogyne ramosissima*	
36.320.02	*Atriplex confertifolia - Ephedra nevadensis*	
36.320.05	*Atriplex confertifolia - Gutierrezia microcephala - Tetradymia axillaris*	
36.320.08	*Atriplex confertifolia - Krascheninnikovia lanata*	
36.320.07	*Atriplex confertifolia - Lycium andersonii*	
36.320.11	*Atriplex confertifolia / cryptogramic crust*	
36.330.00	***Atriplex hymenelytra* (Desert holly scrub) Alliance**	G5 S4
36.330.01	*Atriplex hymenelytra*	
36.330.02	*Atriplex hymenelytra - Ambrosia dumosa*	
36.330.06	*Atriplex hymenelytra - Encelia farinosa*	
36.330.03	*Atriplex hymenelytra - Larrea tridentata - Ambrosia dumosa*	
36.330.04	*Atriplex hymenelytra - Tidestromea oblongifolia*	
36.330.05	*Atriplex hymenelytra / rock*	
36.370.00	***Atriplex lentiformis* (Quailbush scrub) Alliance**	G4 S4
36.370.01	*Atriplex lentiformis*	
36.340.00	***Atriplex polycarpa* (Allscale scrub) Alliance**	G5 S4
36.340.04	*Atriplex polycarpa*	
36.340.01	*Atriplex polycarpa - Atriplex confertifolia*	
36.340.05	*Atriplex polycarpa sparse playa*	
*36.350.00	***Atriplex spinifera* (Spinescale scrub) Alliance**	G3 S3
*36.350.01	*Atriplex spinifera*	
*36.350.03	*Atriplex spinifera - Picrothamnus desertorum*	
*36.350.02	*Atriplex spinifera / annual herb*	
*63.520.00	***Baccharis emoryi* (Emory's baccharis thickets) Provisional Alliance**	G3 S2?
32.060.00	***Baccharis pilularis* (Coyote brush scrub) Alliance**	G5 S5 (some associations are of high priority for inventory)
32.060.23	*Baccharis pilularis*	
32.060.06	*Baccharis pilularis - Lupinus arboreus*	
32.060.05	*Baccharis pilularis - Artemisia californica*	
32.060.19	*Baccharis pilularis - Artemisia californica - Heteromeles arbutifolia*	
32.060.18	*Baccharis pilularis - Artemisia californica - Toxicodendron / Monardella villosa*	
32.060.14	*Baccharis pilularis - Ceanothus thyrsiflorus*	
32.060.25	*Baccharis pilularis - Corylus cornuta*	
32.060.16	*Baccharis pilularis - Frangula californica - Rubus parviflorus*	
*32.060.12	*Baccharis pilularis - Holodiscus discolor*	
32.060.29	*Baccharis pilularis - Lotus scoparius*	
32.060.26	*Baccharis pilularis - Prunus ilicifolia*	
32.060.15	*Baccharis pilularis - Rubus ursinus / weedy herb*	
32.060.27	*Baccharis pilularis - Salvia mellifera*	
32.060.17	*Baccharis pilularis - Toxicodendron diversilobum*	
32.060.07	*Baccharis pilularis / Ammophila arenaria*	
32.060.20	*Baccharis pilularis / Annual Grass - Herb*	
*32.060.13	*Baccharis pilularis / Carex obnupta - Juncus patens*	
*32.060.11	*Baccharis pilularis / Danthonia californica*	
*32.060.02	*Baccharis pilularis / Deschampsia caespitosa*	
32.060.24	*Baccharis pilularis / Dudleya farinosa*	
*32.060.01	*Baccharis pilularis / Eriophyllum staechadifolium*	
*32.060.03	*Baccharis pilularis / Leymus triticoides*	
*32.060.10	*Baccharis pilularis / Nassella pulchra*	
32.060.21	*Baccharis pilularis / Native Grass (Mixed)*	

*32.060.04	*Baccharis pilularis / Polystichum munitum*	
32.060.08	*Baccharis pilularis / Scrophularia californica*	
32.060.28	*Gaultheria shallon - Baccharis pilularis - Ceanothus thyrsiflorus*	
63.510.00	***Baccharis salicifolia* (Mulefat thickets) Alliance**	G5 S4
63.510.01	*Baccharis salicifolia*	
63.510.05	*Baccharis salicifolia - Arundo donax*	
63.510.02	*Baccharis salicifolia - Lepidospartum squamatum - Hazardia squarrosa*	
63.510.06	*Baccharis salicifolia - Pluchea sericea*	
63.510.03	*Baccharis salicifolia - Sambucus mexicana*	
63.510.07	*Baccharis salicifolia - Tamarix ramosissima*	
63.510.04	*Baccharis salicifolia / Stachys albens*	
*63.530.00	***Baccharis sergiloides* (Broom baccharis thickets) Alliance**	G4 S3
*63.530.01	*Baccharis sergiloides - Prunus fasciculata*	
*63.530.02	*Baccharis sergiloides - Prunus fasciculata - Rhus trilobata*	
*63.530.03	*Baccharis sergiloides / Muhlenbergia rigens*	
*63.620.00	***Betula glandulosa* (Resin birch thickets) Provisional Alliance**	G5 S2?
*63.610.00	***Betula occidentalis* (Water birch thicket) Alliance**	G4 S2
*63.610.01	*Betula occidentalis / Salix spp.*	
32.180.00	***Broom (Cytisus scoparius and Others)* (Broom patches) Semi-natural Stands**	
32.180.01	*Genista monspessulana*	
*32.180.02	*Spartium junceum*	
*91.126.00	***Cassiope mertensiana* (White mountain heather heath) Provisional Alliance**	G5 S3?
*33.110.00	***Castela emoryi* (Crucifixion thorn stands) Special Stands**	G2 S1
37.209.00	***Ceanothus cordulatus* (Mountain white thorn chaparral) Alliance**	G4 S4
37.209.01	*Ceanothus cordulatus*	
37.208.00	***Ceanothus crassifolius* (Hoary leaf ceanothus chaparral) Alliance**	G4 S4
37.208.01	*Ceanothus crassifolius*	
37.208.02	*Ceanothus crassifolius - Adenostoma fasciculatum*	
37.208.04	*Ceanothus crassifolius - Adenostoma fasciculatum - Rhus ovata*	
37.208.05	*Ceanothus crassifolius - Adenostoma fasciculatum - Salvia mellifera*	
37.208.03	*Ceanothus crassifolius - Adenostoma fasciculatum - Malosma Laurina*	
37.208.06	*Ceanothus crassifolius - Adenostoma fasciculatum - Xylococcus bicolor*	
37.208.07	*Ceanothus crassifolius - Cercocarpus montanus*	
37.208.08	*Ceanothus crassifolius - Malosma laurina*	
37.211.00	***Ceanothus cuneatus* (Wedge leaf ceanothus chaparral, Buck brush chaparral) Alliance**	G4 S4
37.211.01	*Ceanothus cuneatus*	
37.211.06	*Ceanothus cuneatus - Adenostoma fasciculatum*	
37.211.10	*Ceanothus cuneatus - Adenostoma fasciculatum - Salvia mellifera - Malosma laurina*	
37.211.08	*Ceanothus cuneatus - Eriodictyon californicum - (Fremontodendron californicum)*	
37.211.09	*Ceanothus cuneatus - Frangula californica - Arctostaphylos pungens*	
37.211.02	*Ceanothus cuneatus / Calocedrus decurrens*	
37.211.03	*Ceanothus cuneatus / Elymus elymoides*	
37.211.11	*Ceanothus cuneatus / Eriophyllum lanatum*	
*37.211.05	*Ceanothus cuneatus / Plantago erecta*	
*37.212.00	***Ceanothus greggii* (Cup leaf ceanothus chaparral) Alliance**	G4 S3
*37.212.01	*Ceanothus greggii*	
*37.212.03	*Ceanothus greggii - Adenostoma fasciculatum*	
37.206.00	***Ceanothus integerrimus* (Deer brush chaparral) Alliance**	G4 S4 (some associations are of high priority for inventory)
37.206.01	*Ceanothus integerrimus*	
37.206.04	*Ceanothus integerrimus - Arctostaphylos viscida*	
*37.206.05	*Ceanothus integerrimus - Quercus garryana var. fruticosa*	
37.206.03	*Ceanothus integerrimus / Lithocarpus densiflorus - Arbutus menziesii*	
37.206.02	*Ceanothus integerrimus / Quercus chrysolepis / Elymus glaucus*	
37.205.00	***Ceanothus leucodermis* (Chaparral white thorn chaparral) Alliance**	G4 S4
37.205.01	*Ceanothus leucodermis*	
37.205.02	*Ceanothus leucodermis / Toxicodendron diversilobum*	
37.201.00	***Ceanothus megacarpus* (Big pod ceanothus chaparral) Alliance**	G4 S4
37.201.01	*Ceanothus megacarpus*	
37.201.02	*Ceanothus megacarpus - Adenostoma fasciculatum*	
37.201.04	*Ceanothus megacarpus - Adenostoma sparsifolium*	
37.201.05	*Ceanothus megacarpus - Cercocarpus montanus*	
37.201.06	*Ceanothus megacarpus - Malosma laurina*	
37.201.09	*Ceanothus megacarpus - Prunus ilicifolia*	
37.203.01	*Ceanothus megacarpus - Rhamnus ilicifolia*	
37.201.08	*Ceanothus megacarpus - Salvia mellifera*	
*37.207.00	***Ceanothus oliganthus* (Hairy leaf ceanothus chaparral) Alliance**	G3 S3
*37.207.01	*Ceanothus oliganthus*	
*37.207.02	*Ceanothus oliganthus - Adenostoma fasciculatum*	
*37.207.03	*Ceanothus oliganthus - Adenostoma fasciculatum - Xylococcus bicolor*	
*37.207.04	*Ceanothus oliganthus - Adenostoma sparsifolium*	
*37.207.05	*Ceanothus oliganthus - Arctostaphylos glandulosa*	
*37.207.06	*Ceanothus oliganthus - Eriodictyon crassifolium*	
*37.207.07	*Ceanothus oliganthus - Heteromeles arbutifolia - Rhus ovata*	
*37.207.08	*Ceanothus oliganthus - Quercus berberidifolia*	
*37.215.00	***Ceanothus papillosus* (Wart leaf ceanothus chaparral) Alliance**	G3 S3
*37.215.01	*Ceanothus papillosus - Adenostoma fasciculata*	
37.214.00	***Ceanothus spinosus* (Greenbark ceanothus chaparral) Alliance**	G4 S4
37.214.01	*Ceanothus spinosus*	
37.214.02	*Ceanothus spinosus - Ceanothus megacarpus*	
37.204.00	***Ceanothus thyrsiflorus* (Blue blossom chaparral) Alliance**	G4 S4
37.204.01	*Ceanothus thyrsiflorus - Baccharis pilularis - Toxicodendron diversilobum*	
37.204.02	*Ceanothus thyrsiflorus - Rubus ursinus*	
37.204.03	*Ceanothus thyrsiflorus - Vaccinium ovatum - Rubus parviflorus*	
37.210.00	***Ceanothus velutinus* (Tobacco brush or snow bush chaparral) Alliance**	G5 S4
37.210.01	*Ceanothus velutinus*	
37.210.02	*Ceanothus velutinus - Prunus emarginata - Artemisia tridentata*	
*37.216.00	***Ceanothus verrucosus* (Wart-stemmed ceanothus chaparral) Provisional Alliance**	G2 S2
*63.300.00	***Cephalanthus occidentalis* (Button willow thickets) Alliance**	G5 S2
*63.300.01	*Cephalanthus occidentalis*	
*76.300.00	***Cercocarpus intricatus* (Small leaf mountain mahogany scrub) Provisional Alliance**	G4 S3?
*76.300.01	*Cerocarpus intricatus*	
76.200.00	***Cercocarpus ledifolius* (Curl leaf mountain mahogany scrub) Alliance**	G5 S4
76.200.03	*Cercocarpus ledifolius*	
76.200.01	*Cercocarpus ledifolius - Artemisia tridentata*	
76.200.02	*Cercocarpus ledifolius / Symphoricarpos rotundifolia*	

76.100.00	***Cercocarpus montanus*** **(Birch leaf mountain mahogany chaparral) Alliance**	G5 S4
76.100.06	*Cercocarpus montanus - Adenostoma fasciculatum*	
76.100.17	*Cercocarpus montanus - Adenostoma fasciculatum - Diplacus aurantiacus*	
76.100.04	*Cercocarpus montanus - Arctostaphylos glauca*	
76.100.16	*Cercocarpus montanus - Ceanothus cuneatus*	
76.100.15	*Cercocarpus montanus - Ceanothus cuneatus - Fraxinus dipetala*	
76.100.09	*Cercocarpus montanus - Ceanothus cuneatus - Quercus john-tuckeri*	
76.100.05	*Cercocarpus montanus - Ceanothus spinosus*	
37.600.01	*Cercocarpus montanus - Eriogonum fasciculatum*	
37.600.02	*Cercocarpus montanus - Eriogonum fasciculatum - Eriogonum wrightii*	
76.100.10	*Cercocarpus montanus - Fremontodendron californicum*	
76.100.11	*Cercocarpus montanus - Juniperus californica*	
76.100.12	*Cercocarpus montanus - Malosma laurina - Artemisia californica*	
76.100.14	*Cercocarpus montanus - Prunus ilicifolia*	
76.100.13	*Cercocarpus montanus - Prunus ilicifolia - Adenostoma sparsifolium*	
76.100.03	*Cercocarpus montanus var. glaber*	
37.610.01	*Cercocarpus montanus var. macrourus*	
37.610.02	*Cercocarpus montanus var. minutiflorus*	
*37.417.00	***Chrysolepis chrysophylla*** **(Golden chinquapin thickets) Alliance**	G2 S2
*37.417.02	*Chrysolepis chrysophylla - Arctostaphylos glandulosa*	
*37.417.01	*Chrysolepis chrysophylla / Vaccinium ovatum*	
*37.700.00	***Chrysolepis sempervirens*** **(Bush chinquapin chaparral) Alliance**	G4 S3
*37.700.01	*Chrysolepis sempervirens*	
33.020.00	***Coleogyne ramosissima*** **(Black brush scrub) Alliance**	G5 S4 (some associations are of high priority for inventory)
*33.020.01	*Coleogyne ramosissima*	
33.020.02	*Coleogyne ramosissima - Atriplex confertifolia*	
33.020.10	*Coleogyne ramosissima - Atriplex hymenelytra - Tetradymia axillaris*	
33.020.03	*Coleogyne ramosissima - Ephedra nevadensis*	
33.020.05	*Coleogyne ramosissima - Eriogonum fasciculatum*	
33.020.06	*Coleogyne ramosissima - Eriogonum fasciculatum - Larrea tridentata*	
33.020.11	*Coleogyne ramosissima - Grayia spinosa*	
33.020.12	*Coleogyne ramosissima - Guiterrezia microcephala*	
33.020.07	*Coleogyne ramosissima - Larrea tridentata - Ambrosia dumosa*	
33.020.08	*Coleogyne ramosissima - Lycium andersonii*	
33.020.09	*Coleogyne ramosissima - Salazaria mexicana*	
*43.100.00	***Coreopsis gigantea*** **(Giant coreopsis scrub) Alliance**	G3 S3?
*43.100.01	*Coreopsis gigantea - Artemisia californica - Eriogonum cinereum*	
*43.100.02	*Coreopsis gigantea - Ericameria ericoides - Encelia californica*	
*80.100.00	***Cornus sericea*** **(Red osier thickets) Alliance**	G4 S3?
*80.100.02	*Cornus sericea*	
*80.100.03	*Cornus sericea - Salix exigua*	
*80.100.04	*Cornus sericea - Salix lasiolepis*	
*80.100.01	*Cornus sericea / Senecio triangularis*	
*37.950.00	***Corylus cornuta var. californica*** **(Hazelnut scrub) Alliance**	G3 S2?
*37.950.01	*Corylus cornuta / Polystichum munitum*	
*33.050.00	***Cylindropuntia bigelovii*** **(Teddy bear cholla patches) Alliance**	G4 S3
*33.050.01	*Cylindropuntia bigelovii*	
*38.110.00	***Dasiphora fruticosa*** **(Shrubby cinquefoil scrub) Alliance**	G5 S3?
*38.110.01	*Dasiphora fruticosa*	
*38.110.02	*Dasiphora fruticosa / Danthonia intermedia*	
*38.110.04	*Dasiphora fruticosa / Danthonia unispicata*	
*38.110.03	*Dasiphora fruticosa / Potentilla breweri*	
*38.110.05	*Dasiphora fruticosa / Veratrum californicum*	
*43.110.00	***Deinandra clementina - Eriogonum giganteum*** **(Island buckwheat - Island tar plant scrub) Provisional Alliance**	G3? S3?
37.750.00	***Dendromecon rigida*** **(Bush poppy scrub) Alliance**	G4 S4
37.750.01	*Dendromecon rigida*	
*32.082.00	***Diplacus aurantiacus*** **(Bush monkeyflower scrub) Alliance**	G3 S3?
*32.082.01	*Diplacus aurantiacus*	
*32.050.00	***Encelia californica*** **(California brittle bush scrub) Alliance**	G4 S3
*32.050.02	*Encelia californica*	
*32.050.01	*Encelia californica - Artemisia californica*	
*32.050.03	*Encelia californica - Artemisia californica - Salvia mellifera - Baccharis pilularis*	
*32.050.04	*Encelia californica - Eriogonum cinereum*	
*32.050.05	*Encelia californica - Malosma laurina - Salvia mellifera*	
*32.050.06	*Encelia californica - Rhus integrifolia*	
33.030.00	***Encelia farinosa*** **(Brittle bush scrub) Alliance**	G5 S4 (some associations are of high priority for inventory)
33.030.05	*Encelia farinosa - coastal sage scrub*	
33.030.01	*Encelia farinosa - warm desert*	
33.030.07	*Encelia farinosa - Ambrosia dumosa - Fouquieria splendens*	
33.030.08	*Encelia farinosa - Ambrosia dumosa - Salvia greatae*	
33.030.09	*Encelia farinosa - Ambrosia dumosa - Senna armata*	
33.030.04	*Encelia farinosa - Artemisia californica*	
*33.030.03	*Encelia farinosa - Eriogonum fasciculatum - Agave deserti*	
33.030.06	*Encelia farinosa - Mirabilis californica*	
*33.030.02	*Encelia farinosa - Peucephyllum schottii*	
*33.025.00	***Encelia virginensis*** **(Virgin River brittle brush scrub) Alliance**	G4 S3
*33.025.01	*Encelia virginensis*	
*33.025.02	*Encelia virginensis - Salvia dorrii*	
*33.270.00	***Ephedra californica*** **(California joint fir scrub) Alliance**	G3 S3
*33.270.01	*Ephedra californica*	
*33.270.02	*Ephedra californica - Ambrosia salsola*	
*33.270.04	*Ephedra californica - Gutierrezia californica / Eriastrum pluriflorum*	
*33.270.03	*Ephedra californica / annual - perennial herb*	
*33.275.00	***Ephedra funerea*** **(Death Valley joint fir scrub) Provisional Alliance**	G3? S2?
33.280.00	***Ephedra nevadensis*** **(Nevada joint fir scrub) Alliance**	G4 S4
33.280.01	*Ephedra nevadensis*	
33.280.02	*Ephedra nevadensis - Atriplex confertifolia*	
33.280.05	*Ephedra nevadensis - Ericameria cooperi*	
33.280.04	*Ephedra nevadensis - Lycium andersonii*	
33.280.03	*Ephedra nevadensis - Salazaria mexicana*	
33.285.00	***Ephedra viridis*** **(Mormon tea scrub) Alliance**	G4 S4
33.285.01	*Ephedra viridis - Artemisia tridentata*	
*38.125.00	***Ericameria linearifolia*** **(Narrowleaf goldenbush scrub) Provisional Alliance**	G3 S3?
35.310.00	***Ericameria nauseosa*** **(Rubber rabbitbrush scrub) Alliance**	G5 S5
35.310.01	*Ericameria nauseosa - Juniperus californica / annual to perennial herb*	
35.310.02	*Ericameria nauseosa / Sporobolus airoides*	
*38.130.00	***Ericameria palmeri*** **(Palmer's goldenbush scrub) Provisional Alliance**	G3 S3?

*35.340.00	***Ericameria paniculata* (Black-stem rabbitbrush scrub) Alliance**	G4 S3
*35.340.01	*Ericameria paniculata*	
*35.340.03	*Ericameria paniculata - Ambrosia eriocentra*	
*35.340.02	*Ericameria paniculata - Ambrosia salsola*	
*35.320.00	***Ericameria parryi* (Parry's rabbitbrush scrub) Alliance**	G4 S3
*35.320.01	*Ericameria parryi / Gayophytum diffusum*	
35.330.00	***Ericameria teretifolia* (Needleleaf rabbitbrush scrub) Alliance**	G4 S4
35.330.01	*Ericameria teretifolia*	
37.080.00	***Eriodictyon californicum* (California yerba santa scrub) Alliance**	G4 S4
35.080.01	*Eriodictyon californicum / herbaceous*	
*37.090.00	***Eriodictyon crassifolium* (Thick leaf yerba santa scrub) Provisional Alliance**	G3 S3
*32.035.00	***Eriogonum cinereum* (Ashy buckwheat scrub) Alliance**	G3 S3
*32.035.01	*Eriogonum cinereum*	
32.040.00	***Eriogonum fasciculatum* (California buckwheat scrub) Alliance**	G5 S5 (some associations are of high priority for inventory)
32.040.02	*Eriogonum fasciculatum*	
*32.070.01	*Eriogonum fasciculatum - (Lepidospartum squamatum) alluvial fan*	
32.040.05	*Eriogonum fasciculatum - Ambrosia dumosa*	
*32.040.03	*Eriogonum fasciculatum - Artemisia tridentata*	
32.040.08	*Eriogonum fasciculatum - Bebbia juncea*	
32.040.10	*Eriogonum fasciculatum - Cylindropuntia californica*	
32.040.18	*Eriogonum fasciculatum - Encelia farinosa*	
32.040.09	*Eriogonum fasciculatum - Gutierrezia sarothrae*	
32.040.19	*Eriogonum fasciculatum - Lotus scoparius*	
32.040.11	*Eriogonum fasciculatum - Rhus ovata*	
32.040.06	*Eriogonum fasciculatum - Salazaria mexicana*	
32.100.00	***Eriogonum fasciculatum - Salvia apiana* (California buckwheat - white sage scrub) Alliance**	G4 S4 (some associations are of high priority for inventory)
*32.100.01	*Eriogonum fasciculatum - Salvia apiana*	
32.040.17	*Eriogonum fasciculatum - Salvia mellifera*	
32.040.07	*Eriogonum fasciculatum - Salvia mellifera - Malosma laurina*	
32.040.01	*Eriogonum fasciculatum - Scrophularia californica - Phacelia ramosissima*	
32.040.12	*Eriogonum fasciculatum - Simmondsia chinensis - Cylindropuntia californica*	
32.040.16	*Eriogonum fasciculatum var. foliolosum - Hesperoyucca whipplei*	
32.040.13	*Eriogonum fasciculatum var. foliolosum - Juniperus californica*	
32.040.15	*Eriogonum fasciculatum var. polifolium / Eriastrum pluriflorum*	
*32.045.00	***Eriogonum heermannii* (Heermann's buckwheat patches) Provisional Alliance**	G2 S2?
*32.041.00	***Eriogonum wrightii* (Wright's buckwheat patches) Alliance**	G3 S3
*32.041.01	*Eriogonum wrightii - Eriophyllum confertiflorum / Monardella antonina ssp. benitensis*	
*32.041.02	*Eriogonum wrightii - Juniperus californica*	
*32.041.03	*Eriogonum wrightii - Lessingia filaginifolia*	
*61.580.00	***Forestiera pubescens* (Desert olive patches) Alliance**	G3 S2
*61.580.01	*Forestiera pubescens*	
*61.580.02	*Forestiera pubescens - Sambucus nigra*	
37.920.00	***Frangula californica* (California coffee berry scrub) Alliance**	G4 S4 (some associations are of high priority for inventory)
*37.920.04	*Frangula californica spp. tomentella / Hoita macrostachya*	
37.920.02	*Frangula californica ssp. tomentella*	
37.920.03	*Frangula californica ssp. tomentella / Cirsium fontinale var. campylon - Mimulus guttatus*	
*37.920.01	*Frangula californica - Baccharis pilularis / Scrophularia californica*	

*39.040.00	***Garrya elliptica* (Coastal silk tassel scrub) Provisional Alliance**	G3? S3?
*33.180.00	***Grayia spinosa* (Spiny hop sage scrub) Alliance**	G5 S3
*33.180.02	*Grayia spinosa - Atriplex confertifolia*	
*33.180.06	*Grayia spinosa - Ephedra viridis*	
*33.180.03	*Grayia spinosa - Larrea tridentata*	
*33.180.04	*Grayia spinosa - Lycium andersonii*	
*33.180.07	*Grayia spinosa - Picrothamnus desertorum / Achnatherum hymenoides*	
*33.180.05	*Grayia spinosa / Eriogonum ovalifolium*	
*32.042.00	***Gutierrezia californica* (California match weed patches) Provisional Alliance**	G3? S3?
*32.042.01	*Gutierrezia californica / Annual - perennial grass - herb*	
*32.043.00	***Gutierrezia sarothrae* (Broom snake weed scrub) Provisional Alliance**	G3 S3
*32.055.00	***Hazardia squarrosa* (Sawtooth golden bush scrub) Alliance**	G3 S3
*32.055.02	*Hazardia squarrosa - Artemisia californica*	
*32.055.01	*Hazardia squarrosa / Nassella pulchra - Deinandra fasciculata*	
*37.911.00	***Heteromeles arbutifolia* (Toyon chaparral) Alliance**	G5 S3
*37.911.02	*Heteromeles arbutifolia - Artemisia californica*	
*37.911.03	*Heteromeles arbutifolia - Malosma laurina*	
*37.911.04	*Heteromeles arbutifolia - Quercus berberidifolia - Cercocarpus montanus - Fraxinus dipetala*	
*37.911.01	*Heteromeles arbutifolia / serpentine*	
*39.100.00	***Holodiscus discolor* (Ocean spray brush) Alliance**	G4 S3
*39.100.03	*Holodiscus discolor - Arctostaphylos patula*	
*39.100.04	*Holodiscus discolor - Keckiella corymbosa*	
*39.100.06	*Holodiscus discolor - Sambucus racemosa*	
*39.100.02	*Holodiscus discolor / Achnatherum occidentalis - Eriogonum nudum*	
*39.100.01	*Holodiscus discolor / Mimulus suksdorfii*	
*39.100.05	*Holodiscus discolor / Sedum obsusatum ssp. boreale - Cryptogramma acrostichoides*	
*33.190.00	***Hyptis emoryi* (Desert lavender scrub) Alliance**	G4 S3
*33.190.01	*Hyptis emoryi*	
*33.190.02	*Hyptis emoryi - Psorothamnus schottii*	
32.044.00	***Isocoma menziesii* (Menzies's golden bush scrub) Alliance**	G4? S4? (some associations are of high priority for inventory)
32.044.03	*Isocoma menziesii - Lupinus albifrons*	
*32.044.01	*Isocoma menziesii / Astragalus miguelensis - Atriplex californica - Lasthenia californica*	
32.044.02	*Isocoma menziesii / Distichlis spicata - Paraphalis incurva*	
*33.340.00	***Justicia californica* (Chuparosa patches) Provisional Alliance**	G2 S2?
*45.406.00	***Kalmia microphylla* (Alpine laurel heath) Provisional Alliance**	G4 S3?
*32.065.00	***Keckiella antirrhinoides* (Bush penstemon scrub) Alliance**	G3 S3
*32.065.01	*Keckellia antirrhinoides*	
*32.065.02	*Keckellia antirrhinoides - Artemisia californica*	
*32.065.03	*Keckellia antirhinoides - Eriogonum fasciculatum*	
*32.065.04	*Keckiella antirrhinoides - Mixed Chaparral*	
*33.100.00	***Koeberlinia spinosa* (Crown-of-thorns stands) Special Stands**	G2 S1
*36.500.00	***Krascheninnikovia lanata* (Winterfat scrubland) Alliance**	G4 S2
*36.500.01	*Krascheninnikovia lanata*	

33.010.00	***Larrea tridentata* (Creosote bush scrub) Alliance**	G5 S5 (some associations are of high priority for inventory)
33.140.04	*Larrea tridentata*	
33.010.08	*Larrea tridentata - Ambrosia salsola*	
33.010.17	*Larrea tridentata - Atriplex confertifolia*	
33.010.16	*Larrea tridentata - Atriplex hymenelytra*	
33.010.12	*Larrea tridentata - Atriplex polycarpa*	
33.010.10	*Larrea tridentata - Ephedra nevadensis*	
*33.010.07	*Larrea tridentata - Krameria grayi - Pleuraphis rigida*	
*33.010.13	*Larrea tridentata - Pleuraphis rigida*	
*33.010.14	*Larrea tridentata - Pleuraphis rigida - Lycium andersonii*	
33.010.19	*Larrea tridentata / cryptogamic crust*	
33.010.09	*Larrea tridentata / Eriogonum inflatum*	
33.010.06	*Larrea tridentata / wash*	
33.140.00	***Larrea tridentata - Ambrosia dumosa* (Creosote bush - white burr sage scrub) Alliance**	G5 S5 (some associations are of high priority for inventory)
33.140.42	*Larrea tridentata - Ambrosia dumosa*	
33.140.09	*Larrea tridentata - Ambrosia dumosa - / Atriplex hymenelytra*	
33.140.40	*Larrea tridentata - Ambrosia dumosa - Amphipappus fremontii*	
33.140.37	*Larrea tridentata - Ambrosia dumosa - Atriplex canescens*	
33.140.39	*Larrea tridentata - Ambrosia dumosa - Atriplex confertifolia*	
33.140.45	*Larrea tridentata - Ambrosia dumosa - Atriplex confertifolia - Psorothamnus arborescens*	
33.140.38	*Larrea tridentata - Ambrosia dumosa - Atriplex polycarpa*	
33.140.36	*Larrea tridentata - Ambrosia dumosa - Bebbia juncea*	
33.140.46	*Larrea tridentata - Ambrosia dumosa - Cylindropuntia acanthocarpa*	
33.140.18	*Larrea tridentata - Ambrosia dumosa - Cylindropuntia ramosissima*	
*33.140.33	*Larrea tridentata - Ambrosia dumosa - Echinocactus polycephalus*	
33.140.32	*Larrea tridentata - Ambrosia dumosa - Encelia farinosa*	
*33.140.31	*Larrea tridentata - Ambrosia dumosa - Encelia virginensis*	
*33.140.30	*Larrea tridentata - Ambrosia dumosa - Ephedra californica*	
*33.140.29	*Larrea tridentata - Ambrosia dumosa - Ephedra funerea*	
33.140.20	*Larrea tridentata - Ambrosia dumosa - Ephedra nevadensis*	
33.140.47	*Larrea tridentata - Ambrosia dumosa - Ephedra viridis*	
33.140.48	*Larrea tridentata - Ambrosia dumosa - Ericameria cooperi*	
33.140.28	*Larrea tridentata - Ambrosia dumosa - Eriogonum fasciculatum*	
33.140.27	*Larrea tridentata - Ambrosia dumosa - Eriogonum inflatum*	
33.140.44	*Larrea tridentata - Ambrosia dumosa - Fouquieria splendens*	
*33.140.10	*Larrea tridentata - Ambrosia dumosa - Galium angustifolium - Lyrocarpa coulteri*	
33.140.26	*Larrea tridentata - Ambrosia dumosa - Grayia spinosa*	
33.140.25	*Larrea tridentata - Ambrosia dumosa - Gutierrezia sarothrae*	
33.140.23	*Larrea tridentata - Ambrosia dumosa - Krameria erecta*	
33.140.22	*Larrea tridentata - Ambrosia dumosa - Krameria grayii*	
33.140.21	*Larrea tridentata - Ambrosia dumosa - Lepidium fremontii*	
33.140.19	*Larrea tridentata - Ambrosia dumosa - Lycium andersonii*	
33.140.49	*Larrea tridentata - Ambrosia dumosa - Olneya tesota*	
33.140.43	*Larrea tridentata - Ambrosia dumosa - Opuntia basilaris*	
*33.140.24	*Larrea tridentata - Ambrosia dumosa - Petalonyx thurberi*	
*33.140.17	*Larrea tridentata - Ambrosia dumosa - Pleuraphis rigida*	
33.140.15	*Larrea tridentata - Ambrosia dumosa - Psorothamnus arborescens*	
*33.140.08	*Larrea tridentata - Ambrosia dumosa - Psorothamnus emoryi - sandy*	
33.140.16	*Larrea tridentata - Ambrosia dumosa - Psorothamnus fremontii*	
*33.140.07	*Larrea tridentata - Ambrosia dumosa - Psorothamnus schottii*	
33.140.50	*Larrea tridentata - Ambrosia dumosa - Psorothamnus spinosus*	
33.140.14	*Larrea tridentata - Ambrosia dumosa - Salazaria mexicana*	
33.140.13	*Larrea tridentata - Ambrosia dumosa - Senna armata*	
33.140.12	*Larrea tridentata - Ambrosia dumosa - Viguiera parishii*	
33.140.11	*Larrea tridentata - Ambrosia dumosa - Yucca schidigera*	
*33.140.35	*Larrea tridentata - Ambrosia dumosa / Crytogrammic crust*	
*33.140.34	*Larrea tridentata - Ambrosia dumosa / Dalea mollissima*	

33.027.00	***Larrea tridentata - Encelia farinosa* (Creosote bush - brittle bush scrub) Alliance**	G5 S4
33.027.05	*Larrea tridentata - Encelia farinosa*	
33.027.03	*Larrea tridentata - Encelia farinosa - Ambrosia dumosa*	
33.027.02	*Larrea tridentata - Encelia farinosa - Bebbia juncea*	
33.027.04	*Larrea tridentata - Encelia farinosa - Fouquieria splendens*	
33.027.06	*Larrea tridentata - Encelia farinosa - Peucephyllum schottii*	
33.027.07	*Larrea tridentata - Encelia farinosa - Pleurocoronis pluriseta*	
*32.070.00	***Lepidospartum squamatum* (Scale broom scrub) Alliance**	G3 S3
*32.070.09	*Lepidospartum squamatum - Artemisia californica*	
*32.070.04	*Lepidospartum squamatum - Atriplex canescens*	
*32.070.05	*Lepidospartum squamatum - Baccharis salicifolia*	
*32.070.02	*Lepidospartum squamatum - Eriodictyon crassifolium - Hesperoyucca whipplei*	
*32.070.08	*Lepidospartum squamatum - Eriodictyon trichocalyx - Hesperoyucca whipplei*	
*32.070.06	*Lepidospartum squamatum - Eriogonum fasciculatum*	
*32.070.07	*Lepidospartum squamatum / Amsinckia menziesii*	
*32.070.03	*Lepidospartum squamatum / ephemeral annuals*	
*73.110.00	***Lithocarpus densiflorus var. echinoides* (Shrub tanoak chaparral) Alliance**	G3 S3
*73.110.01	*Lithocarpus densiflorus var. echinoides / Arctostaphylos nevadensis*	
*73.110.02	*Lithocarpus densiflorus var. echinoides / Pteridium aquilinum*	
52.240.00	***Lotus scoparius* (Deer weed scrub) Alliance**	G5 S5
52.240.01	*Lotus scoparius*	
32.081.00	***Lupinus albifrons* (Silver bush lupine scrub) Alliance**	G4 S4
32.081.01	*Lupinus albifrons*	
32.081.03	*Lupinus albifrons - Senecio flaccidus var. douglasii*	
32.081.02	*Lupinus albifrons coastal*	
32.080.00	***Lupinus arboreus* (Yellow bush lupine scrub) Alliance**	G4 S4 (within native range), some associations are of high priority for inventory
32.080.02	*Lupinus arboreus*	
*32.080.03	*Lupinus arboreus - Ericameria ericoides*	
32.080.04	*Lupinus arboreus / Anthoxanthum odoratum*	
32.080.01	*Lupinus arboreus / Bromus diandrus*	
32.080.05	*Lupinus arboreus / Scrophularia californica*	
*32.160.00	***Lupinus chamissonis - Ericameria ericoides* (Silver dune lupine - mock heather scrub) Alliance**	G3 S3
*32.160.01	*Ericameria ericoides*	
*32.160.02	*Lupinus chamissonis*	
*32.160.03	*Lupinus chamissonis - Ericameria ericoides*	
*33.360.00	***Lycium andersonii* (Anderson's boxthorn scrub) Alliance**	G4 S3
*33.360.02	*Lycium andersonii*	
*33.360.01	*Lycium andersonii - Simmondsia chinensis - Pleuraphis rigida*	
*33.365.00	***Lycium californicum* (California desert-thorn) Provisional Alliance**	G2? S2?
45.450.00	***Malacothamnus fasciculatus* (Bush mallow scrub) Alliance**	G4 S4
45.450.01	*Malacothamnus fasciculatus*	
45.450.02	*Malacothamnus fasciculatus - Ceanothus megacarpus*	
45.450.03	*Malacothamnus fasciculatus - Ceanothus spinosus*	
45.450.04	*Malacothamnus fasciculatus - Malosma laurina*	
45.450.05	*Malacothamnus fasciculatus - Salvia leucophylla*	
45.450.06	*Malacothamnus fasciculatus - Salvia mellifera*	

45.455.00	***Malosma laurina* (Laurel sumac scrub) Alliance**	G4 S4
45.455.01	*Malosma laurina*	
45.455.03	*Malosma laurina - Eriogonum cinereum*	
45.455.04	*Malosma laurina - Eriogonum fasciculatum*	
45.455.06	*Malosma laurina - Eriogonum fasciculatum - Salvia apiana*	
45.455.07	*Malosma laurina - Eriogonum fasciculatum - Salvia mellifera*	
45.455.08	*Malosma laurina - Rhus ovata - Ceanothus megacarpus*	
45.455.09	*Malosma laurina - Salvia mellifera*	
45.455.10	*Malosma laurina - Tetracoccus dioicus*	
*33.290.00	***Menodora spinescens* (Spiny menodora scrub) Alliance**	G4 S3
*33.290.01	*Menodora spinescens - Atriplex confertifolia*	
*33.290.02	*Menodora spinescens - Ephedra nevadensis*	
*37.930.00	***Morella californica* (Wax myrtle scrub) Alliance**	G3 S3
*37.930.01	*Morella californica*	
*33.080.00	***Nolina (bigelovii, parryi)* (Nolina scrub) Alliance**	G3 S2
*33.080.02	*Nolina bigelovii*	
*33.080.01	*Nolina parryi*	
*32.150.00	***Opuntia littoralis* (Coast prickly pear scrub) Alliance**	G4 S3
*32.150.01	*Opuntia littoralis - Eriogonum fasciculatum - Malosma laurina*	
*32.150.02	*Opuntia littoralis - mixed coastal sage scrub*	
*33.150.00	***Parkinsonia microphylla* (Foothill palo verde desert scrub) Alliance**	G4 S1
45.402.00	***Phyllodoce breweri* (Mountain heather mats) Alliance**	G4 S4?
45.402.02	*Phyllodoce breweri - Cassiope mertensiana - Juncus parryi*	
45.402.01	*Phyllodoce breweri - Juncus parryi*	
45.405.01	*Phyllodoce breweri - Vaccinium caespitosum*	
*45.404.00	***Phyllodoce empetriformis* (Mountain heather mats) Provisional Alliance**	G5 S2?
*63.710.00	***Pluchea sericea* (Arrow weed thickets) Alliance**	G3 S3
*63.710.01	*Pluchea sericea*	
*63.710.02	*Pluchea sericea - Allenrolfea occidentalis*	
*63.710.03	*Pluchea sericea - Atriplex canescens*	
37.900.00	***Prunus emarginata* (Bitter cherry thickets) Provisional Alliance**	G4 S4
*33.300.00	***Prunus fasciculata* (Desert almond scrub) Alliance**	G4 S3
*33.300.01	*Prunus fasciculata*	
*33.300.06	*Prunus fasciculata - (Viguiera reticulata - Mortonia utahensis) limestone*	
*33.300.05	*Prunus fasciculata - Ambrosia eriocentra*	
*33.300.04	*Prunus fasciculata - Purshia stansburiana*	
*33.300.03	*Prunus fasciculata - Rhus trilobata*	
*33.300.02	*Prunus fasciculata - Salazaria mexicana*	
*33.220.00	***Prunus fremontii* (Desert apricot scrub) Alliance**	G4 S3
*33.220.01	*Prunus fremontii*	
*37.910.00	***Prunus ilicifolia* (Holly leaf cherry chaparral) Alliance**	G3 S3 (some associations are of high priority for inventory)
*37.910.03	*Prunus ilicifolia ssp. ilicifolia*	
*37.910.05	*Prunus ilicifolia ssp. ilicifolia - Ceanothus cuneatus*	
*37.910.06	*Prunus ilicifolia ssp. ilicifolia - Fraxinus dipetala*	
*37.910.02	*Prunus ilicifolia ssp. ilicifolia - Heteromeles arbutifolia*	
*37.910.07	*Prunus ilicifolia ssp. ilicifolia - Toxicodendron diversilobum / grass*	
*37.910.01	*Prunus ilicifolia ssp. Ilicifolia / Sanicula crassicaulis*	
*37.910.04	*Prunus ilicifolia ssp. lyonii*	

*37.905.00	***Prunus virginiana* (Choke cherry thickets) Provisional Alliance**	G4 S2?
*33.240.00	***Purshia stansburiana* (Stansbury cliff rose scrub) Alliance**	G3 S3
*33.240.01	*Purshia stansburiana*	
*35.200.00	***Purshia tridentata* (Bitter brush scrub) Alliance**	G4 S3
*35.200.03	*Purshia tridentata - Artemisia tridentata - Symphoricarpos rotundifolia*	
*35.200.01	*Purshia tridentata - Artemisia tridentata - Tetradymia canescens*	
*35.200.02	*Purshia tridentata - Artemisia tridentata / Achnatherum hymenoides*	
*35.200.04	*Purshia tridentata / Achnatherum nelsonii*	
*35.200.05	*Purshia tridentata / Eriogonum umbellatum*	
37.407.00	***Quercus berberidifolia* (Scrub oak chaparral) Alliance**	G4 S4 (some associations are of high priority for inventory)
37.407.02	*Quercus berberidifolia*	
37.406.01	*Quercus berberidifolia - Arctostaphylos glauca*	
37.406.05	*Quercus berberidifolia - Ceanothus cuneatus*	
37.406.02	*Quercus berberidifolia - Ceanothus integerrimus*	
37.407.05	*Quercus berberidifolia - Ceanothus leucodermis*	
*37.406.03	*Quercus berberidifolia - Ceanothus oliganthus*	
37.407.07	*Quercus berberidifolia - Ceanothus spinosus*	
37.406.06	*Quercus berberidifolia - Ceanothus tomentosus*	
37.407.06	*Quercus berberidifolia - Cercocarpus montanus*	
37.407.09	*Quercus berberidifolia - Fraxinus dipetela - Heteromeles arbutifolia*	
37.407.04	*Quercus berberidifolia - Heteromeles arbutifolia*	
37.407.08	*Quercus berberidifolia - southern mixed chaparral*	
37.407.01	*Quercus berberidifolia / Aesculus californica*	
37.409.00	***Quercus berberidifolia - Adenostoma fasciculatum* (Scrub oak - chamise chaparral)**	G4 S4
37.409.03	*Quercus berberidifolia - Adenostoma fasciculatum*	
37.407.03	*Quercus berberidifolia - Adenostoma fasciculatum - Arctostaphylos glandulosa*	
37.409.01	*Quercus berberidifolia - Adenostoma fasciculatum - Ceanothus crassifolius*	
37.409.02	*Quercus berberidifolia - Adenostoma fasciculatum - Ceanothus greggii*	
*37.413.00	***Quercus chrysolepis* (Canyon live oak chaparral) Alliance**	G3 S3
*37.413.01	*Quercus chrysolepis*	
37.415.00	***Quercus cornelius-mulleri* (Muller oak chaparral) Alliance**	G4 S4
37.415.04	*Quercus cornelius-mulleri - Adenostoma sparsifolium - Ceanothus greggii*	
37.415.05	*Quercus cornelius-mulleri - Adenostoma sparsifolium - Cercocapus montanus*	
37.415.03	*Quercus cornelius-mulleri - Cercocapus montanus*	
37.415.02	*Quercus cornelius-mulleri - Eriogonum fasciculatum - Ericameria linearifolia*	
37.415.01	*Quercus cornelius-mulleri - Rhus ovata*	
37.415.06	*Quercus cornelius-mulleri -Coleogyne ramosissima*	
37.405.00	***Quercus durata* (Leather oak chaparral) Alliance**	G4 S4 (some associations are of high priority for inventory)
37.405.02	*Quercus durata*	
37.405.03	*Quercus durata - Adenostoma fasciculatum - Quercus wislizeni*	
*37.405.14	*Quercus durata - Adenostoma fasciculatum / Salvia sonomensis*	
*37.405.01	*Quercus durata - Arctostaphylos glandulosa*	
*37.405.06	*Quercus durata - Arctostaphylos glauca - Artemisia californica / Grass*	
*37.405.07	*Quercus durata - Arctostaphylos glauca - Garrya congdonii / Melica torreyana*	
37.405.04	*Quercus durata - Arctostaphylos glauca / Pinus sabiniana*	
*37.405.08	*Quercus durata - Arctostaphylos pungens / Pinus sabiniana*	
37.405.10	*Quercus durata - Cercocarpus montanus*	
*37.405.12	*Quercus durata - Frangula californica - Arctostaphylos glauca*	
37.405.11	*Quercus durata - Heteromeles arbutifolia - Umbellularia californica*	
*37.405.13	*Quercus durata / Allium falcifolium - Streptanthus batrachopus*	
37.405.09	*Quercus durata / Pinus sabiniana*	

37.411.00	***Quercus garryana* (Brewer oak scrub) *Alliance***	G4 S4
37.411.03	*Quercus garryana shrub*	
37.411.04	*Quercus garryana / Festuca californica*	
37.411.05	*Quercus garryana - Arctostaphylos patula*	
37.411.06	*Quercus garryana - Cercocarpus montanus*	
37.418.00	***Quercus john-tuckeri* (Tucker oak chaparral) Alliance**	G4 S4
37.418.04	*Quercus john-tuckeri*	
37.418.01	*Quercus john-tuckeri - Adenostoma fasciculatum*	
37.418.05	*Quercus john-tuckeri - Juniperus californica - Ericameria linearifolia*	
37.418.02	*Quercus john-tuckeri - Juniperus californica - Fraxinus dipetala*	
37.418.03	*Quercus john-tuckeri - Quercus wislizeni - Garrya flavescens*	
*37.416.00	***Quercus pacifica* (Island scrub oak chaparral) Alliance**	G3 S3
*37.416.01	*Quercus pacifica*	
*37.419.00	***Quercus palmeri* (Palmer oak chaparral) Alliance**	G3 S2?
*37.419.01	*Quercus palmeri - Eriogonum fasciculatum*	
*37.419.02	*Quercus palmeri - Eriogonum wrightii*	
*37.412.00	***Quercus sadleriana* (Sadler oak or deer oak brush fields) Alliance**	G3 S3
*37.412.01	*Quercus sadleriana*	
*71.095.00	***Quercus turbinella* (Sonoran live oak scrub) Alliance**	G4 S1
*71.095.02	*Quercus turbinella - Baccharis sergiloides*	
*71.095.01	*Quercus turbinella / Pinus monophylla*	
37.414.00	***Quercus vacciniifolia* (Huckleberry oak chaparral) Alliance**	G4 S4
37.414.01	*Quercus vacciniifolia*	
37.414.03	*Quercus vacciniifolia - Arctostaphylos patula*	
37.414.02	*Quercus vacciniifolia - Chrysolepis sempervirens*	
37.420.00	***Quercus wislizeni* (Interior live oak chaparral) *Alliance***	G4 S4
37.420.05	*Quercus wislizen - Cercocarpus montanus - Arctostaphylos glandulosa*	
37.420.01	*Quercus wislizeni*	
37.420.02	*Quercus wislizeni - Arctostaphylos glandulosa*	
37.403.01	*Quercus wislizeni - Ceanothus leucodermis*	
37.403.02	*Quercus wislizeni - Ceanothus leucodermis - Arctostaphylos glandulosa*	
37.403.03	*Quercus wislizeni - Ceanothus leucodermis / Pinus coulteri*	
37.420.03	*Quercus wislizeni - Cercocarpus montanus*	
37.420.04	*Quercus wislizeni - Cercocarpus montanus - Adenostoma sparsifolium*	
37.404.01	*Quercus wislizeni - Quercus berberidifolia*	
37.404.02	*Quercus wislizeni - Quercus berberidifolia - Fraxinus dipetala*	
37.402.01	*Quercus wislizeni - Quercus chrysolepis shrub*	
*63.425.00	***Rhododendron neoglandulosum* (Western Labrador-tea thickets) Alliance**	G4 S2?
*63.425.01	*Rhododendron neoglandulosum*	
*63.425.02	*Rhododendron neoglandulosum - Kalmia microphylla / Pinus contorta*	
*63.310.00	***Rhododendron occidentale* (Western azalea patches) Provisional Alliance**	G3 S2?
*37.803.00	***Rhus integrifolia* (Lemonade berry scrub) Alliance**	G3 S3
*37.803.01	*Rhus integrifolia*	
*37.803.02	*Rhus integrifolia - Adenostoma fasciculatum - Artemisia californica*	
*37.803.03	*Rhus integrifolia - Artemisia californica - Eriogonum cinereum*	
*37.803.04	*Rhus integrifolia - Opuntia spp - Eriogonum cinereum*	
*37.803.05	*Rhus integrifolia - Salvia mellifera - Artemisia californica*	

37.801.00	***Rhus ovata* (Sugarbush chaparral) Alliance**	G4 S4 (some associations are of high priority for inventory)
37.801.01	*Rhus ovata*	
37.801.02	*Rhus ovata - Salvia leucophylla - Artemisia californica*	
*37.801.03	*Rhus ovata - Ziziphus parryi*	
*37.802.00	***Rhus trilobata* (Basket bush thickets) Provisional Alliance**	G4 S3?
*37.960.00	***Ribes quercetorum* (Oak gooseberry thickets) Provisional Alliance**	G2 S2?
*63.907.00	***Rosa californica* (California rose briar patches) Alliance**	G3 S3
*63.907.02	*Rosa californica*	
*63.907.01	*Rosa californica - Baccharis pilularis*	
*63.907.03	*Rosa californica / Schoenoplectus spp.*	
*63.320.00	***Rosa woodsii* (Interior rose thickets) Provisional Alliance**	G5 S3
*63.901.00	***Rubus (parviflorus, spectabilis, ursinus)* (Coastal brambles) Alliance**	G4 S3
*63.901.01	*Gaultheria shallon - Rubus spectabiis - Rubus parviflorus*	
*63.901.03	*Rubus parviflorus*	
*63.901.02	*Rubus parviflorus - Rubus spectabilis - Rubus ursinus*	
*63.901.04	*Rubus spectabilis*	
*63.901.05	*Rubus ursinus*	
63.906.00	***Rubus armeniacus* (Himalayan black berry brambles) Semi-natural Stands**	
63.906.01	*Rubus armeniacus*	
63.906.02	*Rubus armeniacus - Rubus ursinus*	
33.310.00	***Salazaria mexicana* (Bladder sage scrub) Alliance**	G4 S4
33.310.01	*Salazaria mexicana*	
33.310.03	*Salazaria mexicana - Ambrosia salsola - Eriogonum fasciculatum*	
33.310.02	*Salazaria mexicana - Viguieria reticulata - Atriplex confertifolia*	
*61.213.00	***Salix bebbiana* (Bebb's willow thickets) Alliance**	G4 S2?
*61.213.01	*Salix bebbiana / mesic forb type*	
*61.215.00	***Salix breweri* (Brewer willow thickets) Alliance**	G2 S2
*61.215.01	*Salix breweri / Muhlenbergia asperifolia*	
*61.112.00	***Salix eastwoodiae* (Sierran willow thickets) Alliance**	G3 S3
*61.112.01	*Salix eastwoodiae*	
*61.112.02	*Salix eastwoodiae / Carex scopulorum*	
*61.112.03	*Salix eastwoodiae / Oreostemma alpigenum*	
*63.160.02	*Salix eastwoodiae / Senecio triangularis*	
61.209.00	***Salix exigua* (Sandbar willow thickets) Alliance**	G5 S4 (some associations are of high priority for inventory)
61.209.01	*Salix exigua*	
61.209.07	*Salix exigua - (Saix lasiolepis) - Rubus discolor*	
61.209.02	*Salix exigua - Arundo donax*	
*61.209.06	*Salix exigua - Brickellia californica*	
61.209.03	*Salix exigua - Salix melanopsis*	
61.209.04	*Salix exigua / Baccharis sergiloides*	
61.209.05	*Salix exigua / Juncus spp.*	
*61.212.00	***Salix geyeriana* (Geyer willow thickets) Alliance**	G4 S2?
*61.212.01	*Salix geyeriana / grass*	
*61.212.02	*Salix geyeriana / mesic graminoid*	

*61.203.00	***Salix hookeriana* (Coastal dune willow thickets) Alliance**	G4 S3
*61.203.01	*Salix hookeriana*	
*61.203.02	*Salix hookeriana / Rubus ursinus*	
*61.118.00	***Salix jepsonii* (Jepson willow thickets) Alliance**	G3 S3
*61.118.01	*Salix jepsonii*	
*61.118.04	*Salix jepsonii - Cornus sericea*	
*61.118.03	*Salix jepsonii - Paxistima myrsinites*	
*61.118.02	*Salix jepsonii / Senecio triangularis*	
61.201.00	***Salix lasiolepis* (Arroyo willow thickets) Alliance**	G4 S4 (some associations are of high priority for inventory)
*61.201.01	*Salix lasiolepis*	
61.201.04	*Salix lasiolepis - Salix lucida*	
61.201.02	*Salix lasiolepis / Artemisia douglasiana*	
61.201.05	*Salix lasiolepis / Baccharis pilularis - Rubus ursinus*	
61.201.06	*Salix lasiolepis / Baccharis salicifolia*	
61.201.07	*Salix lasiolepis / Malosma laurina*	
61.201.08	*Salix lasiolepis / Rosa californica*	
61.201.03	*Salix lasiolepis / Rubus spp.*	
*61.113.00	***Salix lemmonii* (Lemmon's willow thickets) Alliance**	G4 S3
*61.113.01	*Salix lemmonii*	
*61.113.02	*Salix lemmonii / Carex spp.*	
*61.113.04	*Salix lemmonii / mesic forb*	
*61.113.03	*Salix lemmonii / mesic graminoid*	
*61.204.01	*Salix lucida ssp. lasiandra / Urtica urens - Urtica dioica*	
*61.210.00	***Salix lutea* (Yellow willow thickets) Alliance**	G4 S3?
*61.210.01	*Salix lutea / mesic forbs*	
*61.210.02	*Salix lutea / mesic graminoids*	
*61.210.03	*Salix lutea / Poa pratensis*	
*61.210.04	*Salix lutea/ Rosa woodsii*	
*91.127.00	***Salix nivalis* (Snow willow mats) Provisional Alliance**	G4 S1?
61.115.00	***Salix orestera* (Sierra gray willow thickets) Alliance**	G4 S4 (some associations are of high priority for inventory)
*63.160.03	*Salix orestera / Allium validum*	
61.115.01	*Salix orestera / Calamagrostis muiriana*	
61.115.02	*Salix orestera / Senecio triangularis*	
61.115.03	*Salix orestera / tall forb*	
*61.116.00	***Salix petrophila* (Alpine willow turf) Alliance**	G5 S3
*61.116.01	*Salix petrophila*	
*61.116.03	*Salix petrophila - Calamagrostis muiriana*	
*61.116.02	*Salix petrophila - Calamagrostis muriana - Vaccinium caespitosum - Antennaria media*	
*61.119.00	***Salix planifolia* (Tea-leaved willow thickets) Provisional Alliance**	G4 S2?
*61.119.01	*Salix planifolia*	
*61.206.00	***Salix sitchensis* (Sitka willow thickets) Provisional Alliance**	G4 S3?
*32.030.00	***Salvia apiana* (White sage scrub) Alliance**	G4 S3
*32.030.01	*Salvia apiana - Artemisia californica*	
*32.030.02	*Salvia apiana - Encelia farinosa*	
*32.030.03	*Salvia apiana - Hesperoyucca whipplei*	
*33.320.00	***Salvia dorrii* (Desert purple sage scrub) Alliance**	G3 S2
*33.320.01	*Salvia dorrii*	

32.090.00	***Salvia leucophylla* (Purple sage scrub) Alliance**	G4 S4
32.090.03	*Salvia leucophylla*	
32.090.01	*Salvia leucophylla - Artemisia californica*	
32.090.04	*Salvia leucophylla - Artemisia californica - Eriogonum cinereum / Nassella spp.*	
32.090.05	*Salvia leucophylla - Eriogonum cinereum / annual herb*	
32.090.02	*Salvia leucophylla - Malosma laurina*	
32.020.00	***Salvia mellifera* (Black sage scrub) Alliance**	G4 S4 (some associations are of high priority for inventory)
32.020.03	*Salvia mellifera*	
32.020.04	*Salvia mellifera - Encelia californica*	
*32.020.08	*Salvia mellifera - Eriogonum cinereum*	
32.020.06	*Salvia mellifera - Eriogonum fasciculatum / Bromus rubens*	
32.020.07	*Salvia mellifera - Eriogonum fasciculatum var. foliolosum - Eriodictyon tomentosum*	
32.020.09	*Salvia mellifera - Lotus scoparius*	
32.020.01	*Salvia mellifera - Malosma laurina*	
*32.020.05	*Salvia mellifera - Opuntia littoralis*	
32.020.11	*Salvia mellifera - Rhus ovata*	
*63.410.00	***Sambucus nigra* (Blue elderberry stands) Alliance**	G3 S3
*63.410.01	*Sambucus nigra*	
*63.410.03	*Sambucus nigra - Heteromeles arbutifolia*	
*63.410.02	*Sambucus nigra / Leymus condensatus*	
*36.400.00	***Sarcobatus vermiculatus* (Greasewood scrub) Alliance**	G5 S4 (some associations are of high priority for inventory)
36.400.01	*Sarcobatus vermiculatus*	
*36.400.02	*Sarcobatus vermiculatus - Atriplex confertifolia*	
*33.005.00	***Simmondsia chinensis* (Jojoba scrub) Provisional Alliance**	G4 S3?
*33.005.01	*Simmondsia chinensis - Eriogonum fasciculatum - Opuntia parryi*	
*36.200.00	***Suaeda moquinii* (Bush seepweed scrub) Alliance**	G5 S3
*36.200.01	*Suaeda moquinii*	
*36.200.02	*Suaeda moquinii - Allenrolfea occidentalis*	
*36.200.03	*Suaeda moquinii - Atriplex canescens*	
63.810.00	***Tamarix spp.* (Tamarisk thickets) Semi-natural Stands**	
*33.350.00	***Tetracoccus hallii* (Hall's shrubby-spurge patches) Provisional Alliance**	G2 S1
*33.330.00	***Tidestromia oblongifolia* (Arizona honey sweet sparse scrub) Provisional Alliance**	G3 S3
37.940.00	***Toxicodendron diversilobum* (Poison oak scrub) Alliance**	G4 S4
37.940.02	*Toxicodendron diversilobum - Artemisia californica / Leymus condensatus*	
37.940.01	*Toxicodendron diversilobum - Baccharis pilularis - Rubus parviflorus*	
37.940.03	*Toxicodendron diversilobum - Diplacus aurantiacus*	
37.940.04	*Toxicodendron diversilobum - Philadelphus lewisii*	
37.940.05	*Toxicodendron diversilobum / Bromus hordeaceus - Micropus californicus*	
37.940.06	*Toxicodendron diversilobum / Bromus hordeaceus - Vicia villosa - Madia gracilis*	
37.940.08	*Toxicodendron diversilobum / herbaceous*	
37.940.07	*Toxicodendron diversilobum / Pteridium aquilinum*	
*45.405.00	***Vaccinium cespitosum* (Dwarf bilberry meadows and mats) Alliance**	G4? S3?
*45.405.03	*Vaccinium cespitosum - Calamagrostis muiriana*	
*45.405.04	*Vaccinium cespitosum - Carex filifolia*	
*45.405.00	*Vaccinium cespitosum - Carex nigricans*	
*45.405.02	*Vaccinium cespitosum - Kalmia microphylla*	
*45.410.00	***Vaccinium uliginosum* (Bog blue berry wet meadows) Alliance**	G4 S3
*45.410.01	*Vaccinium uliginosum*	

*45.410.03	*Vaccinium uliginosum / Aulacomnium palustre*	
*45.410.04	*Vaccinium uliginosum / Sphagnum teres*	
*45.410.02	*Vaccinium uliginosum ssp. occidentale / Bistorta bistortoides*	
*39.030.00	***Venegasia carpesioides* (Canyon sunflower scrub) Alliance**	G3 S3
*39.030.01	*Venegasia carpesioides*	
33.032.00	***Viguiera parishii* (Parish's goldeneye scrub) Alliance**	G4 S4 (some associations are of high priority for inventory)
33.032.03	*Viguiera parishii*	
*33.032.01	*Viguiera parishii - Agave deserti*	
33.032.04	*Viguiera parishii - Encelia farinosa*	
33.032.02	*Viguiera parishii - Eriogonum fasciculatum*	
*33.032.05	*Viguiera parishii - Salvia dorrii*	
*33.033.00	***Viguiera reticulata* (Net-veined goldeneye scrub) Alliance**	G3 S3?
*33.033.01	*Viguiera reticulata*	
33.070.00	***Yucca schidigera* (Mojave yucca scrub) Alliance**	G4 S4 (some associations are of high priority for inventory)
33.070.01	*Yucca schidigera*	
33.070.03	*Yucca schidigera - Ambrosia dumosa*	
33.070.04	*Yucca schidigera - Coleogyne ramosissima*	
*33.070.08	*Yucca schidigera - Cylindropuntia acanthocarpa*	
33.070.02	*Yucca schidigera - Ephedra nevadensis*	
33.070.07	*Yucca schidigera - Eriogonum fasciculatum*	
*33.070.11	*Yucca schidigera - Larrea tridentata - Agave deserti*	
33.070.05	*Yucca schidigera - Larrea tridentata - Ambrosia dumosa*	
33.070.06	*Yucca schidigera - Larrea tridentata - Ephedra nevadensis*	
*33.070.10	*Yucca schidigera - Larrea tridentata - Simmondsia chinensis*	
33.070.09	*Yucca schidigera - Viguiera parishii*	
33.070.12	*Yucca schidigera / Pleuraphis rigida*	
*33.225.00	***Ziziphus obtusifolia* (Graythorn patches) Special Stands**	G2 S2?

Herbaceous Alliances and Stands		Global & State Rank
*21.100.00	***Abronia latifolia - Ambrosia chamissonis* (Dune mat) Alliance**	G3 S3
*21.101.01	*Abronia latifolia - Erigeron glaucus*	
*21.101.02	*Abronia latifolia - Leymus mollis*	
*21.102.02	*Ambrosia chamissonis - Abronia maritima - Cakile maritima*	
*21.102.01	*Ambrosia chamissonis - Abronia umbellata*	
*21.100.03	*Ambrosia chamissonis - Eriophyllum staechadifolium (- Lupinus arboreus)*	
*21.102.03	*Ambrosia chamissonis - Malacothrix incana - Carpobrotus chilensis - Poa douglasii*	
*21.100.01	*Artemisia pycnocephala - Calystegia soldanella*	
*21.110.01	*Artemisia pycnocephala - Cardionema ramosissimum*	
*21.110.03	*Artemisia pycnocephala - Ericameria ericoides*	
*21.110.04	*Artemisia pycnocephala - Poa douglasii*	
21.110.02	*Artemisia pycnocephala - Polygonum paronychia*	
21.125.01	*Cakile maritima - Abronia maritima*	
21.102.04	*Cakile maritima - Ambrosia chamissonis - Carpobrotus edulis*	
*21.100.06	*Poa douglasii - Lathyrus littoralis*	
33.065.00	***Ambrosia psilostachya* (Western ragweed meadows) Provisional Alliance**	G4 S4?
*41.120.00	***Achnatherum hymenoides* (Indian rice grass grassland) Alliance**	G4 S1
*41.120.01	*Achnatherum hymenoides - Leptodactylon pungens*	
*41.120.02	*Achnatherum hymenoides - Sphaeralcea ambigua*	

*41.090.00	***Achnatherum speciosum* (Desert needlegrass grassland) Alliance**	G4 S2
*41.090.01	*Achnatherum speciosum*	
42.003.00	***Aegilops triuncialis* (Barbed goatgrass patches) Provisional Semi-natural Stands**	
42.003.01	*Aegilops triuncialis - Hemizonia congesta*	
42.030.00	***Agropyron cristatum* (Crested wheatgrass rangelands) Semi-natural Stands**	
45.106.00	***Agrostis (gigantea, stolonifera) - Festuca arundinacea* (Bent grass - tall fescue meadows) Semi-natural Stands**	
45.106.01	*Agrostis gigantea*	
45.106.02	*Agrostis stolonifera*	
45.106.03	*Agrostis stolonifera - Festuca arundinacea*	
*42.006.00	***Alopecurus geniculatus* (Water foxtail meadows) Provisional Alliance**	G3? S3?
42.010.00	***Ammophila arenaria* (European beach grass swards) Semi-natural Stands**	
42.010.02	*Ammophila arenaria*	
42.010.03	*Ammophila arenaria - Cardionema ramosissimum*	
42.010.01	*Ammophila arenaria - Erechtites minima*	
42.010.04	*Ammophila arenaria - Lupinus variicolor*	
42.110.00	***Amsinckia (menziesii, tessellata)* (Fiddleneck fields) Alliance**	G4 S4
42.110.01	*Amsinckia menziesii - Erodium spp.*	
42.110.02	*Amsinckia menziesii - Vulpia bromoides - Plagiobothrys canescens*	
*52.214.00	***Anemopsis californica* (Yerba mansa meadows) Alliance**	G3 S2?
*52.214.01	*Anemopsis californica - Juncus arcticus var. mexicanus*	
*38.140.00	***Argentina egedii* (Pacific silverweed marshes) Alliance**	G4 S2
*38.140.01	*Argentina egedii*	
*38.140.03	*Argentina egedii - Eleocharis macrostachya*	
*38.140.02	*Argentina egedii - Alopecurus aequalis*	
*38.140.04	*Argentina egedii - Lotus uliginosus*	
*45.425.00	***Aristida purpurea* (Purple three-awn meadows) Provisional Alliance**	G4 S3?
35.160.00	***Artemisia dracunculus* (Wild tarragon patches) Alliance**	G4 S4
35.160.01	*Artemisia dracunculus*	
35.160.02	*Artemisia dracunculus - Pseudognaphalium canescens*	
*52.212.00	***Arthrocnemum subterminale* (Parish's glasswort patches) Alliance**	G4 S2
*52.212.01	*Arthrocnemum subterminale*	
*52.212.03	*Arthrocnemum subterminale - Monanthocloe littoralis*	
*52.212.02	*Arthrocnemum subterminale - Sarcocornia pacifica*	
42.080.00	***Arundo donax (Giant reed breaks)* Semi-natural Stands**	
42.080.01	*Arundo donax*	
42.080.02	*Arundo donax - Salix exigua*	
52.211.00	***Atriplex prostrata - Cotula coronopifolia* (Fields of fat hen and brass buttons) Semi-natural Stands**	
52.211.01	*Atriplex prostrata*	
52.211.02	*Atriplex prostrata / annual grasses*	
52.211.03	*Atriplex prostrata / Distichlis spicata*	
52.211.04	*Atriplex prostrata / Schoenoplectus maritimus*	
52.211.05	*Atriplex prostrata / Sesuvium verrucosum*	
52.211.06	*Cotula coronopifolia*	
44.150.00	***Avena (barbata, fatua) (Wild oats grasslands)* Semi-natural Stands**	
44.150.01	*Avena barbata*	

44.150.02	*Avena barbata - Avena fatua*	
44.150.03	*Avena barbata - Bromus hordeaceus*	
44.150.04	*Avena fatua*	
52.106.00	***Azolla (filiculoides, mexicana)*** **(Mosquito fern mats) Provisional Alliance**	G4 S4
45.413.00	***Bistorta bistortoides - Mimulus primuloides*** **(Western bistort - primrose monkey flower meadows) Alliance**	G4 S4
45.413.02	*Bistorta bistortoides*	
42.011.00	***Brassica nigra and other mustards*** **(Upland mustards) Semi-natural Stands**	
42.011.01	*Brassica nigra*	
42.011.02	*Brassica nigra - Bromus diandrus*	
42.011.03	*Brassicas tournefortii / Ambrosia dumosa*	
42.011.04	*Raphanus sativus*	
42.026.00	***Bromus (diandrus, hordeaceus) - Brachypodium distachyon*** **(Annual brome grasslands) Semi-natural Stands**	
42.040.03	*Brachypodium distachyon*	
42.026.21	*Bromus diandrus*	
42.026.22	*Bromus diandrus - Avena spp.*	
42.026.11	*Bromus diandrus - Mixed herbs*	
42.026.20	*Bromus hordeaceus - Aira caryophyllea*	
42.026.23	*Bromus hordeaceus - Amsinckia menziesii - Hordeum murinum*	
42.026.08	*Bromus hordeaceus - Bromus tectorum*	
42.026.10	*Bromus hordeaceus - Dichelostemma multiflorum*	
42.026.09	*Bromus hordeaceus - Erodium botrys*	
42.040.02	*Bromus hordeaceus - Erodium botrys*	
42.026.13	*Bromus hordeaceus - Erodium botrys - Plagiobothrys fulvus*	
42.026.15	*Bromus hordeaceus - Holocarpha virgata - Lolium perenne*	
42.026.14	*Bromus hordeaceus - Holocarpha virgata - Taeniatherum caput - medusa*	
42.026.17	*Bromus hordeaceus - Leontodon taraxacoides*	
42.026.16	*Bromus hordeaceus - Limnanthes douglasii*	
42.026.18	*Bromus hordeaceus - Lupinus nanus - Trifolium spp.*	
42.026.07	*Bromus hordeaceus - Taeniatherum caput - medusae*	
42.026.02	*Bromus hordeaceus - Vulpia hirsuta*	
42.026.19	*Bromus hordeaceus (-Vicia villosa - Lolium multiflorum) - Trifolium hirtum*	
42.024.00	***Bromus rubens - Schismus (arabicus, barbatus)*** **(Red brome or Mediterranean grass grasslands) Semi-natural Stands**	
42.024.01	*Bromus rubens*	
42.024.02	*Bromus rubens - mixed herbs*	
42.024.03	*Schimus playa*	
42.020.00	***Bromus tectorum*** **(Cheatgrass grassland) Semi-natural Stands**	
42.020.01	*Bromus tectorum*	
42.020.02	*Bromus tectorum - Bromus diandrus*	
*52.112.00	***Bulboschoenus maritimus*** **(Salt marsh bulrush marshes) Alliance**	G4 S3
*52.112.03	*Bolboschoenus maritimus*	
*52.112.04	*Bolboschoenus maritimus / Sarcocornia pacifica (depressa)*	
*52.112.05	*Bolboschoenus maritimus / Sesuvium verrucosum*	
21.125.00	***Cakile (edentula, maritima)*** **(Sea rocket sands) Provisional Semi-natural Stands**	
*41.224.00	***Calamagrostis canadensis*** **(Bluejoint reed grass meadows) Alliance**	G5 S3
*41.224.01	*Calamagrostis canadensis*	
*41.224.02	*Calamagrostis canadensis - Carex utriculata*	
*41.224.03	*Calamagrostis canadensis - Dodecatheon redolens*	
*41.224.04	*Calamagrostis canadensis - Scirpus microcarpus*	

45.141.00	***Calamagrostis muiriana*** **(Shorthair reed grass meadows) Alliance**	G4 S4
45.141.02	*Calamagrostis muiriana - Oreostemma alpigenum*	
45.141.03	*Calamagrostis muiriana - Ptilagrostis kingii*	
45.141.04	*Calamagrostis muiriana - Trisetum spicatum*	
45.141.01	*Calamagrostis muriana - Juncus drummondii*	
*41.190.00	***Calamagrostis nutkaensis*** **(Pacific reed grass meadows) Alliance**	G4 S2
*41.190.03	*Calamagrostis nutkaensis*	
*41.190.01	*Calamagrostis nutkaensis - Baccharis pilularis*	
*41.190.02	*Calamagrostis nutkaensis - Carex obnupta. - Juncus spp.*	
41.211.00	***Calamagrostis purpurascens*** **(Fell-fields with purple reed grass) Alliance**	G4? S4?
41.211.02	*Calamagrostis purpurascens - Ericameria parryi var. monocephala - Linanthus pungens*	
41.211.01	*Calamagrostis purpurascens - Linanthus pungens*	
41.211.03	*Calamagrostis purpurascens / Ribes cereum*	
*45.416.00	***Camassia quamash*** **(Small camas meadows) Alliance**	G4? S3?
*45.416.01	*Camassia quamash / Sphagnum subsecundum*	
*45.168.00	***Carex (aquatilis, lenticularis)*** **(Water sedge and Lakeshore sedge meadows) Alliance**	G5 S3
*45.168.01	*Carex aquatilis*	
*45.168.04	*Carex aquatilis - Carex lenticularis*	
*45.168.02	*Carex lenticularis / Aulacomnium palustre*	
*45.168.03	*Carex lenticularis / Perideridia parishii*	
52.121.00	***Carex (utriculata, vesicaria)*** **(Beaked sedge and blister sedge meadows) Alliance**	G5 S4
52.120.01	*Carex utriculata*	
52.121.01	*Carex utriculata - Mimulus primuloides*	
45.110.22	*Carex vernacula - Antennaria media*	
45.170.01	*Carex vesicaria*	
*45.142.00	***Carex barbarae*** **(White-root beds) Alliance**	G2? S2?
*45.142.01	*Carex barbarae*	
*45.150.00	***Carex breweri*** **(Brewer sedge mats) Alliance**	G4 S3
*45.150.01	*Carex breweri*	
*45.150.03	*Carex breweri - Cistanthe umbellata*	
*45.150.02	*Carex breweri - Poa wheeleri*	
*45.160.00	***Carex congdonii*** **(Congdon's sedge talus) Provisional Alliance**	G2 S2
*45.160.01	*Arnica amplexicaulis - Carex congdonii*	
*45.165.00	***Carex densa*** **(Dense sedge marshes) Provisional Alliance**	G2? S2?
*45.165.02	*Carex densa - Juncus xiphioides*	
*45.165.03	*Carex densa - Lolium perenne - Juncus spp.*	
*45.169.00	***Carex douglasii*** **(Douglas' sedge meadows) Provisional Alliance**	G4? S2?
45.140.00	***Carex filifolia*** **(Shorthair sedge turf) Alliance**	G4 S4
45.140.06	*Carex filifolia*	
45.140.09	*Carex filifolia - Calamagrostis muiriana*	
45.140.10	*Carex filifolia - Cistanthe monosperma*	
45.140.05	*Carex filifolia - Erigeron algidus*	
45.140.11	*Carex filifolia - Erigeron petiolaris*	
45.140.08	*Carex filifolia - Penstemon heterodoxus*	
45.140.07	*Carex filifolia - Saxifraga aprica*	
45.140.01	*Carex filifolia - Trisetum spicatum*	
*45.145.00	***Carex helleri*** **(Heller's sedge fell-fields) Alliance**	G4 S2
*45.145.03	*Carex helleri - Saxifraga tolmiei - Luzula divaricata*	
*45.145.06	*Carex helleri - Arabis platysperma - Penstemon heterodoxus*	

*45.145.05	*Carex helleri - Eriogonum incanum - Raillardella argentea*	
*45.145.04	*Carex helleri - Poa suksdorfii*	
*45.115.00	***Carex heteroneura*** **(Different-nerve sedge patches) Provisional Alliance**	G3? S3?
*45.115.01	*Carex heteroneura - Achillea millefolium*	
*45.175.00	***Carex integra*** **(Small-fruited sedge meadows) Provisional Alliance**	G4? S2?
*45.162.00	***Carex jonesii*** **(Jones's sedge turf) Alliance**	G4 S3
*45.162.02	*Carex jonesii*	
*45.162.01	*Carex jonesii - Bistorta bistortoides*	
*45.162.03	*Carex jonesii / Sphagnum subsecundum*	
*45.166.00	***Carex lasiocarpa*** **(Slender sedge meadows) Provisional Alliance**	G5? S3?
*45.166.01	*Carex lasiocarpa*	
*45.178.00	***Carex limosa*** **(Shore sedge fens) Alliance**	G4? S2?
*45.178.02	*Carex limosa - Menyanthes trifoliata*	
*45.110.03	*Carex limosa - Mimulus primuloides*	
*45.178.01	*Carex limosa / Drepanocladus sordidus*	
*45.179.00	***Carex luzulina*** **(Woodland sedge fens) Provisional Alliance**	G3 S2?
*45.181.00	***Carex microptera*** **(Small-winged sedge meadows) Provisional Alliance**	G4 S2?
45.130.00	***Carex nebrascensis*** **(Nebraska sedge meadows) Alliance**	G5 S4
45.130.01	*Carex nebrascensis*	
45.130.02	*Carex nebrascensis - Ptilagrostis kingii*	
*45.164.00	***Carex nigricans*** **(Showy sedge sod) Provisional Alliance**	G4 S3?
*45.182.00	***Carex nudata*** **(Torrent sedge patches) Alliance**	G3 S3
*45.182.01	*Carex nudata*	
*45.183.00	***Carex obnupta*** **(Slough sedge swards) Alliance**	G4 S3
*45.183.01	*Carex obnupta*	
*45.183.02	*Carex obnupta - Juncus lescurii*	
*45.183.03	*Carex obnupta - Juncus patens*	
*45.184.00	***Carex pansa*** **(Sand dune sedge swaths) Provisional Alliance**	G4? S3?
*45.120.00	***Carex scopulorum*** **(Sierra alpine sedge turf) Alliance**	G4 S3
*45.120.01	*Carex scopulorum*	
*45.120.07	*Carex scopulorum - Allium validum*	
*45.120.04	*Carex scopulorum - Eleocharis quinquefolia*	
*45.120.03	*Carex scopulorum - Eriophorum crinigerum*	
*45.120.08	*Carex scopulorum - Mimulus primuloides*	
*45.120.02	*Carex scopulorum - Pedicularis groenlandica*	
*45.120.06	*Carex scopulorum / Aulacomnium palustre*	
*45.120.05	*Carex scopulorum / Oreostemma alpigenum*	
*45.180.00	***Carex serratodens*** **(Twotooth sedge seeps) Provisional Alliance**	G3 S3?
*45.190.00	***Carex simulata*** **(Short-beaked sedge meadows) Alliance**	G4 S3
*45.190.01	*Carex simulata*	
*45.190.04	*Carex simulata - Carex utriculata*	
*45.190.05	*Carex simulata - Carex vesicaria*	
*45.190.02	*Carex simulata / Aulacomnium palustre*	
*45.190.03	*Carex simulata / Philonotis fontana*	

*45.155.00	***Carex spectabilis*** **(Showy sedge sod) Alliance**	G4 S3
*45.155.02	*Carex spectabilis - Senecio triangularis*	
*45.155.01	*Carex spectabilis - Sibbaldia procumbens*	
*45.185.00	***Carex straminiformis*** **(Mount Shasta sedge meadows) Provisional Alliance**	G3? S3?
*45.186.00	***Carex subnigricans*** **(Dark alpine sedge turf) Alliance**	G4 S3
*45.186.01	*Carex subnigricans - Antennaria media*	
*45.186.05	*Carex subnigricans - Deschampsia caespitosa*	
*45.186.03	*Carex subnigricans - Dodecatheon alpinum*	
*45.186.02	*Carex subnigricans - Oreostemma alpigenum*	
*45.186.04	*Carex subnigricans - Pedicularis attollens*	
21.200.00	***Carpobrotus edulis or other Ice Plants*** **(Ice plant mats) Semi-natural Stands**	
42.042.00	***Centaurea (solstitialis, meletensis)*** **(Yellow star-thistle fields) Semi-natural Stands**	
42.042.01	*Centaurea melitensis - Brassica nigra*	
42.042.02	*Centaurea solstitialis*	
42.040.04	*Centaurea spp. - Brachypodium distachyon.*	
42.043.00	***Centaurea (virgata)*** **(Knapweed and purple-flowered star-thistle fields) Provisional Semi-natural Stands**	
*44.160.00	***Centromadia (pungens)*** **(Tar plant fields) Alliance**	G2? S2?
*44.160.02	*Centromadia pungens - Downingia bella*	
*44.160.01	*Centromadia pungens ssp. laevis*	
*42.100.00	***Cirsium fontinale*** **(Fountain thistle seeps) Alliance**	G1 S1
*42.100.01	*Cirsium fontinale var. campylon - Carex serratodens - Hordeum brachyantherum*	
*42.100.02	*Cirsium fontinale var. campylon - Hemizonia congesta var. luzulifolia*	
*42.100.03	*Cirsium fontinale var. campylon - Mimulus guttatus - Stachys pycnantha*	
45.311.00	***Cistanthe (umbellata) - Gayophytum (diffusum)*** **(Pussypaws - groundsmoke openings) Alliance**	G4 S4
45.311.01	*Astragalus bolanderi - (Cistanthe umbellatum)*	
45.311.02	*Cistanthe umbellatum - Achnatherum occidentalis*	
45.311.03	*Cistanthe - Castilleja arachnoidea*	
45.311.04	*Polygonum douglasii - Gayophytum dffusum*	
45.556.00	***Conium maculatum - Foeniculum vulgare*** **(Poison hemlock or fennel patches) Semi-natural Stands**	
45.556.01	*Conium maculatum*	
45.556.02	*Foeniculum vulgare*	
42.070.00	***Cortaderia (jubata, selloana)*** **(Pampas grass patches) Semi-natural Stands**	
46.100.00	***Cressa truxillensis - Distichlis spicata*** **(Alkali weed - Salt grass playas and sinks) Alliance**	G4 S4
46.100.02	*Chamaesyce hooveri - Bolboschoenus maritimus*	
46.100.03	*Neostapfia colusana - Malvella leprosa*	
46.100.04	*Neostapfia colusana - Polypogon maritimus*	
46.100.05	*Orcuttia pilosa*	
42.044.00	***Cynosurus echinatus*** **(Annual dogtail grasslands) Semi-natural Stands**	
42.044.07	*Cynosurus echinatus - Arrhenatherum elatius / Dichelostemma capitatum*	
42.044.01	*Cynosurus echinatus - Bromus hordeaceus - Avena fatua*	
42.044.02	*Cynosurus echinatus - Bromus hordeaceus - Madia elegans*	
42.044.04	*Cynosurus echinatus - Bromus hordeaceus - Taeniatherum caput-medusae*	
42.044.03	*Cynosurus echinatus - Bromus hordeaceus - Taraxacum officinale*	
42.044.05	*Cynosurus echinatus - Lagophylla ramosissima*	

*41.050.00	***Danthonia californica* (California oat grass prairie) Provisional Alliance**	G4 S3
*41.050.05	*Danthonia californica*	
*41.050.04	*Danthonia californiaca - Aira caryophyllea*	
*41.050.01	*Danthonia californica - Arrhenatherum elatius*	
*41.050.02	*Danthonia californica - Elymus elymoides*	
*41.050.03	*Danthonia californica - Muhlenbergia filiformis*	
*41.051.00	***Danthonia intermedia* (Wild mountain oat grass meadows) Alliance**	G4? S3?
*41.051.01	*Danthonia intermedia - Antennaria rosea*	
*41.051.02	*Danthonia intermedia - Ptilagrostis kingii*	
*51.200.00	***Darlingtonia californica* (California pitcher plant fens) Alliance**	G4? S3
*51.200.01	*Darlingtonia californica*	
*44.161.00	***Deinandra fasciculata* (Clustered tarweed fields) Alliance**	G3? S3?
*44.161.01	*Deinandra fasciculata - annual grass-herb*	
*44.161.02	*Deinandra fasciculata - Hordeum depressum - Atriplex coronata var. notatior*	
41.220.00	***Deschampsia caespitosa* (Tufted hair grass meadows) Alliance**	G5 S4? (some associations are of high priority for inventory)
*41.220.08	*Deschampsia caespitosa*	
*41.220.05	*Deschampsia caespitosa - Anthoxanthum odoratum*	
41.220.12	*Deschampsia caespitosa - Bistorta bistortoides*	
*41.220.02	*Deschampsia caespitosa - Cardamine breweri*	
41.220.01	*Deschampsia caespitosa - Carex nebrascensis*	
41.220.09	*Deschampsia caespitosa - Danthonia californica*	
*41.220.13	*Deschampsia caespitosa - Horkelia marinensis*	
*41.220.14	*Deschampsia caespitosa - Lilaeopsis masonii*	
41.220.11	*Deschampsia caespitosa - Perideridia parishii*	
41.220.03	*Deschampsia caespitosa - Senecio scorzonella*	
41.220.04	*Deschampsia caespitosa - Senecio scorzonella - Achillea millefolium*	
41.220.07	*Deschampsia caespitosa - Solidago multiradiata*	
*41.220.10	*Deschampsia caespitosa - Trifolium longipes*	
*41.220.15	*Deschampsia caespitosa var. holciformis*	
*22.100.00	***Dicoria canescens - Abronia villosa* (Desert dunes) Alliance**	G3 S2
*22.100.01	*Dicoria canescens*	
41.200.00	***Distichlis spicata* (Salt grass flats) Alliance**	G5 S4 (some associations are of high priority for inventory)
41.200.14	*Distichlis spicata - Agrostis viridis*	
*41.200.11	*Distichlis spicata - Ambrosia chamissonis*	
41.200.15	*Distichlis spicata - Atriplex triangularis*	
41.200.16	*Distichlis spicata - Bromus diandrus*	
41.200.17	*Distichlis spicata - Cotula coronopifolia*	
*41.200.07	*Distichlis spicata - Frankenia salina - Jaumea carnosa*	
41.200.18	*Distichlis spicata - Hordeum murninum*	
*41.200.06	*Distichlis spicata - Jaumea carnosa*	
41.200.05	*Distichlis spicata - Juncus arcticus ssp. balticus (J. arcticus ssp. mexicanus)*	
*41.200.02	*Distichlis spicata - Juncus cooperi*	
41.200.19	*Distichlis spicata - Leymus triticoides / Lupinus (albifrons, arboreus)*	
41.200.10	*Distichlis spicata - Parapholis strigosa*	
*41.200.20	*Distichlis spicata - Sarcocornia pacifica*	
*41.200.01	*Distichlis spicata / Allenrolfea occidentalis*	
41.200.13	*Distichlis spicata / annual grasses*	
*41.200.04	*Distichlis spicata / Chrysothamnus albidus*	
*41.200.03	*Distichlis spicata / Sarcobatus vermiculatus*	
*52.115.00	***Dulichium arundinaceum* (Three-way sedge meadows) Provisional Alliance**	G3? S1
*52.115.01	*Dulichium arundinaceum*	
*45.231.00	***Eleocharis acicularis* (Needle spike rush stands) Alliance**	G4? S3?
*45.231.01	*Eleocharis acicularis - Eryngium castrense*	
*45.231.03	*Navarretia spp. - (Eleocharis acicularis - Eryngium alismaefolium)*	
*45.231.02	*Plagiobothrys mollis - (Eleocharis acicularis - Eryngium mathiasiae)*	
45.230.00	***Eleocharis macrostachya* (Pale spike rush marshes) Alliance**	G4 S4 (some associations are of high priority for inventory)
45.230.01	*Eleocharis macrostachya*	
*45.230.07	*Eleocharis macrostachya - (Pleuropogon californicus)*	
*45.230.02	*Eleocharis macrostachya - Callitriche hermaphroditica*	
*45.230.04	*Eleocharis macrostachya - Eryngium aristulatum ssp. Parishii*	
*45.230.05	*Eleocharis macrostachya - Lasthenia glaberrima*	
*45.230.06	*Eleocharis macrostachya - Marsilea vestita*	
*45.230.03	*Eleocharis macrostachya - Sagittaria montevidensis*	
45.220.00	***Eleocharis quinqueflora* (Few-flowered spike rush marshes) Alliance**	G4 S4 (some associations are of high priority for inventory)
45.220.01	*Eleocharis quinqueflora*	
*45.220.02	*Eleocharis quinqueflora - Mimulus primuloides*	
*45.220.03	*Eleocharis quinqueflora / Aulacomnium palustre*	
*45.220.04	*Eleocharis quinqueflora / Campylium stellatum*	
*45.220.05	*Eleocharis quinqueflora / Drepanocladus aduncus - Drepanocladus sordidus*	
*45.220.06	*Eleocharis quinqueflora / Philonotis fontana*	
*41.640.00	***Elymus glaucus* (Blue wild rye meadows) Alliance**	G3? S3?
*41.640.01	*Elymus glaucus*	
*41.640.03	*Elymus glaucus - Carex feta*	
*41.640.02	*Elymus glaucus - Carex pellita*	
*41.640.04	*Elymus glaucus - Heracleum lanatum*	
41.650.00	***Elymus multisetus* (Big squirreltail patches) Provisional Alliance**	G4 S4?
*38.120.00	***Ericameria discoidea - Hulsea algida* (Fell-fields with California heath-goldenrod and Pacific alpine gold) Alliance**	G3? S3?
*38.120.02	*Ericameria discoidea - Linanthus pungens*	
*38.120.01	*Ericameria discoidea - Minuartia nuttallii*	
*38.120.04	*Hulsea algida*	
*38.120.05	*Hulsea algida - Ericameria discoidea - Phacelia hastata*	
*38.120.06	*Hulsea algida - Muhlenbergia richardsonis - Achnatherum pinetorum*	
*42.004.00	***Eryngium aristulatum* (California button-celery patches) Alliance**	G3 S3?
*42.004.01	*Eryngium aristulatum - Lupinus bicolor*	
43.200.00	***Eschscholzia (californica)* (California poppy fields) Alliance**	G4 S4
43.200.01	*Eschoscholzia californica*	
*91.170.00	***Festuca brachyphylla* (Alpine fescue fell-fields) Alliance**	G4? S3?
*91.170.02	*Festuca brachyphylla - Penstemon davidsonii*	
*91.170.01	*Festuca brachyphylla - Eriogonum ovalifolium*	
*41.250.00	***Festuca idahoensis* (Idaho fescue grassland) Alliance**	G4 S3?
*41.250.03	*Festuca idahoensis - Achillea millefolium*	
*41.250.01	*Festuca idahoensis - Bromus carinatus*	
*41.250.02	*Festuca idahoensis - Festuca rubra*	
*41.255.00	***Festuca rubra* (Red fescue grassland) Alliance**	G4 S3?
*41.255.01	*Festuca rubra*	
*52.500.00	***Frankenia salina* (Alkali heath marsh) Alliance**	G4 S3
*52.500.02	*Frankenia salina*	
*52.500.01	*Frankenia salina - Limonium californicum - Monanthochloe littoralis - Sarcocornia pacifica*	

*52.500.03	*Frankenia salina / Agrostis avenacea*	
*52.500.04	*Frankenia salina / Distichlis spicata*	
*52.500.06	*Suaeda taxifolia / Hordeum murinum*	
*41.222.00	***Glyceria (elata, striata)*** **(Manna grass meadows) Alliance**	G4 S3?
*41.222.01	*Glyceria elata*	
*41.222.03	*Glyceria elata - Lotus longifolius*	
*41.222.02	*Glyceria elata - Scirpus microcarpus*	
*41.222.04	*Glyceria striata*	
*41.223.00	***Glyceria occidentalis*** **(Northwest manna grass marshes) Provisional Alliance**	G3? S3?
*52.206.00	***Grindelia (stricta)*** **(Gum plant patches) Provisional Alliance**	G3? S3?
42.050.00	***Holcus lanatus - Anthoxanthum odoratum*** **(Common velvet grass - sweet vernal grass meadows) Semi-natural Stands**	
42.050.08	*Holcus lanatus*	
42.050.09	*Holcus lanatus - Anthoxanthum odoratum*	
*42.052.00	***Hordeum brachyantherum*** **(Meadow barley patches) Alliance**	G4 S3?
*42.052.01	*Hordeum brachyantherum*	
*42.052.04	*Hordeum brachyantherum - Poa pratensis*	
*42.052.02	*Hordeum brachyantherum - Polypogon monspeliensis*	
*42.052.03	*Hordeum brachyantherum - Senecio triangularis*	
*52.117.00	***Hydrocotyle (ranunculoides, umbellata)*** **(Mats of floating pennywort) Alliance**	G4 S3?
*52.117.01	*Hydrocotyle ranunculoides*	
*52.117.02	*Hydrocotyle ranunculoides - Schoenoplectus pungens*	
45.401.00	***Iris missouriensis*** **(Western blue flag patches) Provisional Alliance**	G5 S4
*52.109.00	***Isoetes (bolanderi, echinospora, howellii, nuttallii, occidentalis)*** **(Quillwort beds) Provisional Alliance**	G3 S3?
*45.568.00	***Juncus (oxymeris, xiphioides)*** **(Iris-leaf rush seeps) Provisional Alliance**	G2? S2?
45.562.00	***Juncus arcticus (var. balticus, mexicanus)*** **(Baltic and Mexican rush marshes) Alliance**	G5 S4
45.562.07	*Juncus arcticus var. balticus*	
91.120.21	*Juncus arcticus var. balticus*	
45.562.05	*Juncus arcticus var. balticus - Argentina egedii*	
45.562.04	*Juncus arcticus var. balticus - Carex praegracilis*	
45.562.01	*Juncus arcticus var. balticus - Conium maculatum*	
45.562.06	*Juncus arcticus var. balticus - Lepidium latifolium*	
45.562.02	*Juncus arcticus var. mexicanus*	
*45.563.00	***Juncus cooperi*** **(Cooper's rush marsh) Alliance**	G3 S3
*45.563.01	*Juncus cooperi*	
45.561.00	***Juncus effusus*** **(Soft rush marshes) Alliance**	G4 S4?
45.561.01	*Juncus effusus*	
*45.569.00	***Juncus lescurii*** **(Salt rush swales) Alliance**	G3 S2?
*45.569.01	*Juncus lescurii*	
*45.569.02	*Juncus (lescurii) - Distichlis spicata*	
*45.567.00	***Juncus nevadensis*** **(Sierra rush marshes) Alliance**	G3? S3?
*45.567.01	*Juncus nevadensis*	
*45.567.02	*Juncus nevadensis - Carex leporinella*	
*45.567.03	*Juncus nevadensis - Eleocharis quinqueflora*	

45.566.00	***Juncus parryi*** **(Parry's rush outcrops) Alliance**	G4 S4
45.566.01	*Juncus parryi - Eriogonum incanum*	
45.564.00	***Juncus patens*** **(Western rush marshes) Provisional Alliance**	G4? S4?
*91.115.00	***Kobresia myosuroides*** **(Pacific bog sedge meadows) Alliance**	G5 S1
*91.115.01	*Kobresia myosuroides - Thalictrum alpinum*	
44.108.00	***Lasthenia californica - Plantago erecta - Vulpia microstachys*** **(California goldfields - Dwarf plantain - Six-weeks fescue flower fields) Alliance**	G4 S4 (some associations are of high priority for inventory)
44.109.03	*Lasthenia californica*	
*44.109.01	*Lasthenia californica - Atriplex coronata var. notatior*	
*44.109.04	*Lasthenia californica - Lupinus bicolor - Layia platyglossa - Bromus spp.*	
*44.108.01	*Lasthenia californica - Plantago erecta - Hesperevax sparsiflora*	
*52.500.05	*Lasthenia ferrisiae - Lasthenia conjugens*	
44.108.02	*Plantago erecta - Lolium perenne lichen-rocky*	
*44.108.08	*Vulpia microstachys - Elymus elymoides - Achnatherum lemmonii*	
*44.109.05	*Vulpia microstachys - Lasthenia californica - Agrostis elliottiana*	
44.108.05	*Vulpia microstachys - Mimulus guttatus - Pentagramma triangularis*	
*44.108.09	*Vulpia microstachys - Navarretia tagetina*	
44.109.06	*Vulpia microstachys - Parvisedum pumilum - Lasthenia californica*	
*44.108.04	*Vulpia microstachys - Plantago erecta*	
44.108.03	*Vulpia microstachys - Plantago erecta - Calycadenia (truncata, multiglandulosa)*	
*44.108.10	*Vulpia microstachys - Selaginella hansenii*	
*44.108.11	*Vulpia microstachys - Selaginella hansenii - Lupinus nanus*	
*44.108.07	*Vulpia microstachys - Selaginella hansenii - Lupinus spectabilis*	
*44.119.00	***Lasthenia fremontii - Distichlis spicata*** **(Fremont's goldfields - Saltgrass alkaline vernal pools) Alliance**	G4 S3
*44.119.01	*Downingia bella - Lilaea scilloides*	
*44.119.02	*Downingia cuspidata - Myosurus minimus*	
*44.119.03	*Downingia insignis - Psilocarphus brevissimus*	
*44.119.04	*Downingia pulchella - Cressa truxillensis*	
*44.119.05	*Downingia pulchella - Distichlis spicata*	
*44.119.07	*Lasthenia fremontii - Pleuropogon californicus*	
*44.119.09	*Lasthenia platycarpha - Lepidium latipes*	
*44.119.10	*Limnanthes douglasii ssp. rosea - Pleuropogon californicus*	
*44.119.06	*Hordeum (depressum, murinum spp. leporinum)*	
*44.119.11	*Lasthenia fremontii - Distichlis spicata*	
*42.007.00	***Lasthenia fremontii - Downingia (bicornuta)*** **(Fremont's goldfields - Downingia vernal pools) Alliance**	G3 S3
*42.007.02	*Downingia (bicornuta, cuspidata)*	
*42.007.01	*Downingia bicornuta*	
*42.007.06	*Eryngium (vaseyi, castrense)*	
*42.007.08	*Lasthenia californica - Downingia bicornuta*	
*42.007.07	*Lasthenia fremontii*	
*42.007.03	*Lasthenia fremontii - Downingia bicornuta*	
*42.007.04	*Lasthenia fremontii - Downingia ornatissima*	
*42.007.05	*Ranunculus bonariensis - Holocarpha virgata*	
*44.140.00	***Lasthenia glaberrima*** **(Smooth goldfields vernal pool bottoms) Alliance**	G3 S3
*44.119.08	*Lasthenia glaberrima - Atriplex persistens*	
*44.140.01	*Lasthenia glaberrima - Downingia bicornuta*	
*44.140.05	*Lasthenia glaberrima - Downingia insignis*	
*44.140.06	*Lasthenia glaberrima - Lupinus bicolor*	
*44.140.02	*Lasthenia glaberrima - Pleuropogon californicus*	
*44.140.03	*Lasthenia glaberrima - Pogogyne douglasii*	
*44.140.04	*Lasthenia glaberrima - Trifolium variegatum*	

*42.002.00 ***Layia fremontii - Achyrachaena mollis*** **(Fremont's tidy-tips - Blow wives vernal pools) Alliance** G3 S3?
- *42.002.01 *Layia fremontii - Achyrachaena mollis*
- *42.002.02 *Layia fremontii - Lasthenia californica - Achyrachaena mollis*
- *42.002.03 *Layia fremontii - Leontodon taraxacoides - Plagiobothrys greenei*
- *42.002.04 *Plagiobothrys austina - Achyrachaena mollis*

52.105.00 ***Lemna (minor) and Relatives*** **(Duckweed blooms) Provisional Alliance** G5 S4?

52.205.00 ***Lepidium latifolium*** **(Perennial pepper weed patches) Semi-natural Stands**
- 52.205.02 *Lepidium latifolium*
- 52.205.01 *Lepidium latifolium - Distichlis spicata.*

*41.020.00 ***Leymus cinereus*** **(Ashy ryegrass meadows) Alliance** G4 S2

*41.265.00 ***Leymus condensatus*** **(Giant wild rye grassland) Alliance** G3 S3
- *41.265.01 *Leymus condensatus*

*41.260.00 ***Leymus mollis*** **(Sea lyme grass patches) Alliance** G4 S2
- *41.260.03 *Leymus mollis - Abronia latifolia - (Cakile sp.)*
- *41.260.02 *Leymus mollis - Ammophila arenaria*
- *41.260.01 *Leymus mollis - Carpobrotus edulis*

*41.080.00 ***Leymus triticoides*** **(Creeping rye grass turfs) Alliance** G4 S3
- *41.080.01 *Leymus triticoides*
- *41.080.05 *Leymus triticoides - Anemopsis californica*
- *41.080.02 *Leymus triticoides - Bromus spp. - Avena spp.*
- *41.080.04 *Leymus triticoides - Carduus pycnocephalus - Geranium dissectum*
- *41.080.03 *Leymus triticoides - Lolium perenne*
- *41.080.06 *Leymus triticoides - Poa secunda*

41.321.00 ***Lolium perenne*** **(Perennial rye grass fields) Semi-natural Stands**
- 41.321.01 *Lolium perenne*
- 41.321.07 *Lolium perenne*
- 41.321.02 *Lolium perenne - Bromus hordeaceus*
- 41.321.03 *Lolium perenne - Centaurium muehlenbergii*
- 41.321.08 *Lolium perenne - Convolvulus arvensis*
- 41.321.09 *Lolium perenne - Festuca arundinacea*
- 41.321.04 *Lolium perenne - Hemizonia congesta*
- 41.321.05 *Lolium perenne - Hordeum marinum - Ranunculus californicus*
- 41.321.10 *Lolium perenne - Lepidium latifolium*
- 41.321.06 *Lolium perenne - Leymus triticoides*
- 41.321.11 *Lolium perenne - Lotus corniculatus*
- 41.321.12 *Zigadenus fremontii (- Lolium perenne)*

52.230.00 ***Lotus purshianus*** **(Spanish clover fields) Provisional Alliance** G4? S4?

52.118.00 ***Ludwigia (hexapetala, peploides)*** **(Water primrose wetlands) Provisional Semi-natural Stands**

*41.275.00 ***Melica torreyana*** **(Torrey's melic grass patches) Provisional Alliance** G2 S2?
- *41.275.01 *Melica torreyana*

*44.111.00 ***Mimulus (guttatus)*** **(Common monkey flower seeps) Alliance** G4? S3?
- *44.111.01 *Mimulus guttatus*
- *44.111.03 *Mimulus guttatus - (Mimulus spp.)*
- *44.111.02 *Mimulus guttatus - Vulpia microstachys*
- *44.111.04 *Mimulus lewisii*
- *45.413.03 *Mimulus primuloides*

*44.113.00 ***Montia fontana - Sidalcea calycosa*** **(Water blinks - Annual checkerbloom vernal pools) Alliance** G2 S2
- *44.113.01 *Montia fontana - Sidalcea calycosa*

41.276.00 ***Muhlenbergia filiformis*** **(Pullup muhly meadows) Provisional Alliance** G4? S4?

41.277.00 ***Muhlenbergia richardsonis*** **(Mat muhly meadows) Provisional Alliance** G4? S4?

*41.278.00 ***Muhlenbergia rigens*** **(Deer grass beds) Alliance** G3 S2?
- *41.278.01 *Muhlenbergia rigens*

*41.140.00 ***Nassella cernua*** **(Nodding needle grass grassland) Provisional Alliance** G4 S3?

*41.110.00 ***Nassella lepida*** **(Foothill needle grass grassland) Provisional Alliance** G3? S3?

*41.150.00 ***Nassella pulchra*** **(Purple needle grass grassland) Alliance** G4 S3?
- *41.150.04 *Nassella pulchra*
- *41.150.02 *Nassella pulchra - Avena fatua*
- *41.150.05 *Nassella pulchra - Avena spp. - Bromus spp.*
- *41.150.10 *Nassella pulchra - Distichlis spicata - Bromus spp.*
- *41.150.06 *Nassella pulchra - Erodium spp. - Avena barbata*
- *41.150.11 *Nassella pulchra - Leontodon taraxicoides*
- *41.150.01 *Nassella pulchra - Lolium perenne (-Trifolium spp.)*
- *41.150.12 *Nassella pulchra - Lolium perenne - Astragalus gambelianus - Lepidium nitidum*
- *41.150.13 *Nassella pulchra - Lolium perenne - Calystegia collina*
- *41.150.09 *Nassella pulchra - Melica californica - annual grass*
- *41.150.03 *Nassella pulchra - Sanicula bipinnatifida*
- *41.150.14 *Nassella pulchra / Baccharis pilularis*
- *41.150.07 *Nassella pulchra / Hazardia squarrosa*

*52.110.00 ***Nuphar lutea*** **(Yellow pond-lily mats) Provisional Alliance** G5 S3?

*52.119.00 ***Oenanthe sarmentosa*** **(Water-parsley marsh) Alliance** G4 S2?
- *52.119.01 *Oenanthe sarmentosa*

*45.418.00 ***Oxypolis occidentalis*** **(Western cowbane meadows) Alliance** G3 S3
- *45.418.02 *Oxypolis occidentalis - Bistorta bistortoides*
- *45.418.03 *Oxypolis occidentalis - Carex amplifolia*
- *45.418.04 *Oxypolis occidentalis - Eleocharis montevidensis*
- *45.418.05 *Oxypolis occidentalis - Senecio triangularis*
- *45.418.06 *Oxypolis occidentalis / Philonotis fontana*

*91.122.00 ***Oxyria digyna*** **(Mountain sorrel patches) Provisional Alliance** G4 S3?

*42.095.00 ***Panicum urvilleanum*** **(Desert panic grass patches) Alliance** G3 S1
- *42.095.01 *Panicum urvilleanum*

42.085.00 ***Pennisetum setaceum*** **(Fountain grass swards) Semi-natural Stands**
- 42.085.01 *Pennisetum setaceum - Coreopsis gigantea - Hesperoyucca whipplei - Malosma laurina*

*45.414.00 ***Penstemon heterodoxus*** **(Heretic penstemon patches) Provisional Alliance** G4? S3?
- *91.120.02 *Antennaria alpina - Penstemon heterodoxus*

45.415.00 ***Penstemon newberryi*** **(Mountain pride patches) Alliance** G4 S4
- 45.415.03 *Penstemon newberryi - Streptanthus tortuosus - Sedum obtusatum ssp. boreale - Muhlenbergia montana*
- 45.415.04 *Penstemon newberryi - Streptanthus tortuosus / Selaginella watsonii*
- 45.415.02 *Penstemon newberryi - Streptanthus tortuosus / Spiraea densiflora*

42.207.00 ***Persicaria lapathifolia - Xanthium strumarium* (Smartweed - cocklebur patches) Provisional Alliance** G4 S4

42.051.00 ***Phalaris aquatica* (Harding grass swards) Semi-natural Stands**
42.051.02 *Phalaris aquatica*
42.051.03 *Phalaris aquatica - Avena barbata*
42.051.01 *Phalaris aquatica - Bromus hordeaceus - Centaurea solstitialis*

*91.123.00 ***Phlox covillei* (Coville's phlox fell-fields) Alliance** G4 S3
*91.123.03 *Astragalus kentrophyta - Draba oligosperma*
*91.123.04 *Draba oligosperma - Poa glauca ssp. Rupicola*
*91.120.36 *Festuca minutiflora - Penstemon davidsonii*
*91.120.06 *Ivesia muirii*
*91.123.01 *Phlox covillei - Elymus elymoides - Podistera nevadensis*
*91.123.02 *Phlox covillei - Elymus elymoides - Podistera nevadensis - Erigeron pygmaeus*
*91.123.09 *Phlox covillei - Eriogonum gracilipes*
*91.123.05 *Phlox covillei - Eriogonum incanum*
*91.123.07 *Phlox (covillei) - Ivesia shockleyi*
*91.123.08 *Phlox covillei - Linum lewisii*
*91.120.08 *Podistera nevadensis - Arenaria kingii*
*91.123.06 *Podistera nevadensis - Erigeron pygmaeus*

*91.150.00 ***Phlox pulvinata* (Cushion phlox fell-fields) Alliance** G4 S3
*91.150.02 *Phlox pulvinata - Anelsonia eurycarpa*
*91.150.03 *Phlox pulvinata - Ericameria suffruticosa - Ipomopsis congesta*
*91.150.05 *Phlox pulvinata - Festuca brachyphylla*
*91.150.06 *Phlox pulvinata - Ivesia gordonii*
*91.150.04 *Phlox pulvinata - Lupinus argenteus var. montigenus*

41.061.00 ***Phragmites australis* (Common reed marshes) Alliance** G5 S4?
41.061.01 *Phragmites australis*
41.061.02 *Phragmites australis - Scirpus spp.*

43.300.00 ***Plagiobothrys nothofulvus* (Popcorn flower fields) Alliance** G4 S4
43.300.01 *Plagiobothrys nothofulvus - Daucus pusillus - Bromus hordeaceus*

*41.610.00 ***Pleuraphis jamesii* (James' galleta shrub-steppe) Alliance** G3 S2
*41.610.03 *Pleuraphis jamesii / Ephedra nevadensis*
*41.610.01 *Pleuraphis jamesii / Eriogonum fasciculatum*
*41.610.02 *Pleuraphis jamesii / Lycium andersonii*

*41.030.00 ***Pleuraphis rigida* (Big galleta shrub-steppe) Alliance** G3 S2
*41.030.01 *Pleuraphis rigida*
*41.030.04 *Pleuraphis rigida - Dalea mollissima*
*41.030.02 *Pleuraphis rigida / Acamptopappus sphaerocephalus*
*41.030.06 *Pleuraphis rigida / Ambrosia dumosa*
*41.030.05 *Pleuraphis rigida / Atriplex canescens*
*41.030.07 *Pleuraphis rigida / Ephedra californica*
*41.030.03 *Pleuraphis rigida / Ericameria cooperi*
*41.030.08 *Pleuraphis rigida / Larrea tridentata*

42.060.00 ***Poa pratensis* (Kentucky blue grass turf) Semi-natural Stands**
42.060.05 *Poa pratensis*
42.060.01 *Poa pratensis - Carex (nebrascensis, pellita)*
42.060.04 *Poa pratensis - Juncus patens - Luzula comosa*
42.060.02 *Poa pratensis - Potentilla gracilis*
42.060.07 *Poa pratensis ssp. pratensis*
42.060.06 *Poa pratensis ssp.agassizensis*

*41.180.00 ***Poa secunda* (Curly blue grass grassland) Alliance** G4 S3?
*41.180.04 *Poa secunda - Danthonia unispicata*
*41.180.03 *Poa secunda ssp. juncifolia*
*41.180.02 *Poa secunda ssp. secunda*

*41.040.00 ***Pseudoroegneria spicata* (Bluebunch wheat grass grassland) Alliance** G4 S2

41.225.00 ***Ptilagrostis kingii* (King's needle grass meadows) Alliance** G4 S4
41.225.01 *Ptilagrostis kingii*
41.225.02 *Ptilagrostis kingii - Oreostemma alpigenum*
91.120.25 *Ptilagrostis kingii - Senecio scorzonella*

*52.202.00 ***Ruppia (cirrhosa, maritima)* (Ditch-grass or widgeon-grass mats) Alliance** G4? S2
*52.202.02 *Ruppia cirrhosa - algae*

*52.215.00 ***Sarcocornia pacifica (Salicornia depressa)* (Pickleweed mats) Alliance** G4 S3
*52.215.12 *Sarcocornia pacific - Lepidium latifolium*
*52.215.04 *Sarcocornia pacifica*
*52.215.22 *Sarcocornia pacifica - Jaumea carnosa - Batis maritima*
*52.215.06 *Sarcocornia pacifica - Atriplex prostrata*
*52.215.07 *Sarcocornia pacifica - Bolboschoenus maritimus*
*52.215.15 *Sarcocornia pacifica - Brassica nigra*
*52.215.16 *Sarcocornia pacifica - Cotula coronopifolia*
*52.215.17 *Sarcocornia pacifica - Crypsis schoenoides*
*52.215.01 *Sarcocornia pacifica - Cuscuta salina - Spartina densiflora*
*52.215.02 *Sarcocornia pacifica - Distichlis spicata*
*52.215.08 *Sarcocornia pacifica - Distichlis spicata*
*52.215.18 *Sarcocornia pacifica - Echinochloa crus-galli - Polygonum - Xanthium strumarium*
*52.215.09 *Sarcocornia pacifica - Frankenia salina*
*52.215.21 *Sarcocornia pacifica - Frankenia salina - Suaeda taxifolia*
*52.215.10 *Sarcocornia pacifica - Grindelia stricta*
*52.215.11 *Sarcocornia pacifica - Jaumea carnosa*
*52.215.03 *Sarcocornia pacifica - Jaumea carnosa - Distichlis spicata*
*52.215.20 *Sarcocornia pacifica - Sesuvium verrucosum*
*52.215.13 *Sarcocornia pacifica - Spartina foliosa*
*52.215.14 *Sarcocornia pacifica / algae*
*52.215.19 *Sarcocornia pacifica/annual grasses (Polypogon, Hordeum, Lolium)*

*91.124.00 ***Saxifraga nidifica* (Pink saxifrage patches) Provisional Alliance** G4? S3?
*91.124.03 *Polygonum minimum*
*91.124.02 *Rhodiola integrifolia - Selaginella watsonii*

*91.125.00 ***Saxifraga tolmiei* (Patches of Tolmie's alpine saxifrage) Provisional Alliance** G4 S3?

52.122.00 ***Schoenoplectus acutus* (Hardstem bulrush marsh) Alliance** G5 S4
52.122.01 *Schoenoplectus acutus*
52.122.02 *Schoenoplectus acutus - Apocynum cannibinum*
52.122.03 *Schoenoplectus acutus - Typha angustifolia*
52.102.02 *Schoenoplectus acutus - Typha domingensis*
52.122.04 *Schoenoplectus acutus - Typha latifolia*
52.122.05 *Schoenoplectus acutus - Typha latifolia - Phragmites australis*
52.122.06 *Schoenoplectus acutus - Xanthium strumarium*

*52.111.00 ***Schoenoplectus americanus* (American bulrush marsh) Alliance** G5 S3
*52.111.04 *Schoenoplectus americanus*
*52.111.05 *Schoenoplectus americanus - Eleocharis rostellata*
*52.111.02 *Schoenoplectus americanus / Argentina egedii*
*52.111.03 *Schoenoplectus americanus / Lepidium latifolium*
*52.111.06 *Schoenoplectus americanus / Schoenoplectus californicus - Schoenoplectus acutus*

52.114.00 ***Schoenoplectus californicus* (California bulrush marsh) Alliance** G5 S4?
52.114.02 *Schoenoplectus californicus*
52.114.03 *Schoenoplectus californicus - Apocynum cannabinum*

52.114.04	*Schoenoplectus californicus - Eichhornia crassipes*	
52.114.01	*Schoenoplectus californicus - Schoenoplectus acutus*	
52.114.06	*Schoenoplectus californicus - Schoenoplectus acutus / Rosa californica*	
52.114.05	*Schoenoplectus californicus - Typha latifolia*	
*52.113.00	***Scirpus microcarpus* (Small-fruited bulrush marsh) Alliance**	G4 S2
*52.113.01	*Scirpus microcarpus*	
*52.113.02	*Scirpus microcarpus - Oxypolis occidentalis*	
*52.113.03	*Scirpus microcarpus - Scirpus congdonii*	
43.400.00	***Sedum spathulifolium* (Coast Range stonecrop draperies) Provisional Alliance**	G4? S4?
*42.062.00	***Selaginella bigelovii* (Bushy spikemoss mats) Alliance**	G4 S3
*42.062.01	*Selaginella bigelovii / Eriogonum fasciculatum*	
45.419.00	***Senecio triangularis* (Herb-rich meadows) Alliance**	G4 S4
45.419.04	*Senecio triangularis - Athyrium filix-femina*	
45.419.01	*Senecio triangularis - Lupinus latifolius*	
45.419.05	*Senecio triangularis - Lupinus polyphyllus*	
*52.210.00	***Sesuvium verrucosum* (Western sea-purslane marshes) Alliance**	G3? S2
*52.210.01	*Sesuvium verrucosum*	
*52.210.02	*Sesuvium verrucosum - Cotula coronopifolia*	
*52.210.03	*Sesuvium verrucosum - Distichlis spicata*	
*52.210.04	*Sesuvium verrucosum - Lolium perenne*	
45.420.00	***Solidago canadensis* (Canada goldenrod patches) Provisional Alliance**	G4? S4?
*52.010.00	***Sparganium (angustifolium)* (Mats of bur-reed leaves) Alliance**	G4 S3?
*52.010.01	*Sparganium angustifolium*	
*41.070.00	***Spartina (alterniflora, densiflora)* (Smooth or Chilean cordgrass marshes) Semi-natural Stands**	
41.070.02	*Spartina densiflora*	
*52.020.00	***Spartina foliosa* (California cordgrass marsh) Alliance**	G3 S3
*52.020.02	*Spartina foliosa*	
*52.020.01	*Spartina foliosa - Sarcocornia pacifica*	
*52.030.00	***Spartina gracilis* (Alkali cordgrass marsh) Alliance**	GU S1
*52.030.01	*Spartina gracilis - Sporobolus airoides*	
*41.010.00	***Sporobolus airoides* (Alkali sacaton grassland) Alliance**	G4 S2
*41.010.01	*Sporobolus airoides*	
*41.010.03	*Sporobolus airoides / Allenrolfea occidentalis*	
*41.010.02	*Sporobolus airoides / Ericameria nauseosa*	
*52.107.00	***Stuckenia (pectinata) - Potamogeton spp.* (Pondweed mats) Alliance**	G3G5 S3?
*52.107.02	*Potomogeton spp.*	
*52.107.01	*Stuckenia pectinata*	
*41.600.00	***Swallenia alexandrae* (Patches of Eureka Valley dune grass) Special Stands**	G1 S1
*45.171.00	***Torreyochloa pallida* (Floating mats of weak manna grass) Alliance**	G3 S3?
*45.171.01	*Torreyochloa pallida*	
*45.171.02	*Torreyochloa pallida - Isoetes bolanderi*	
*45.135.00	***Triantha occidentalis - Narthecium californicum* (Western false asphodel - California bog asphodel fens) Alliance**	G2? S2?
*45.135.01	*Triantha occidentalis - Rhynchospora alba*	
*45.135.02	*Triantha occidentalis / Sphagnum teres*	
*45.135.03	*Triantha occidentalis - Narthecium californicum*	
*45.426.00	***Trifolium longipes* (Long-stalk clover meadows) Provisional Alliance**	G3? S3?
*42.005.00	***Trifolium variegatum* (White-tip clover swales) Alliance**	G3? S3?
*42.005.02	*Trifolium gracilentum - Hesperevax caulescens*	
*42.005.01	*Trifolium variegatum*	
*42.005.03	*Trifolium variegatum - Lolium perenne - Leontodon taraxacoides*	
*42.005.04	*Trifolium variegatum - Vulpia bromoides (Hypochaeris glabra - Leontodon taraxacoides)*	
*42.005.05	*(Trifolium variegatum - Vulpia bromoides) - Hypochaeris glabra - Leontodon taraxacoides*	
52.050.00	***Typha (angustifolia, domingensis, latifolia)* (Cattail marshes) Alliance**	G5 S5
52.050.01	*Typha angustifolia*	
52.050.02	*Typha angustifolia - Distichlis spicata*	
52.050.05	*Typha angustifolia - Typha latifolia - Typha domingensis*	
52.050.06	*Typha angustifolia - Typha latifolia - Typha domingensis / Distichlis spicata*	
52.050.07	*Typha angustifolia - Typha latifolia - Typha domingensis / Echinocloa crus-galli*	
52.050.08	*Typha angustifolia - Typha latifolia - Typha domingensis / Phragmites australis*	
52.050.09	*Typha angustifolia - Typha latifolia - Typha domingensis / Schoenoplectus americanus*	
52.050.03	*Typha domingensis*	
52.103.02	*Typha latifolia*	
52.050.04	*Typha latifolia - Typha angustifolia*	
45.423.00	***Veratrum californicum* (White corn lily patches) Alliance**	G5 S4
45.423.02	*Veratrum californicum*	
45.423.03	*Veratrum californicum - Bistorta bistortoides*	
45.423.04	*Veratrum californicum - Juncus nevadensis*	
45.423.01	*Veratrum californicum - Senecio triangularis*	

EXHIBIT 13

http://water.epa.gov/scitech/methods/cwa/pollutants-background.cfm

EPA United States Environmental Protection Agency

Water: CWA Methods

You are here: Water » Science & Technology » Analytical Methods & Laboratories » CWA Methods » Toxic and Priority Pollutants

Toxic and Priority Pollutants

Two lists have special significance to water quality regulatory programs in the Clean Water Act (CWA):

- list of toxic pollutants
- list of priority pollutants

List of Toxic Pollutants

Key Features

1. The Clean Water Act references the list of toxic pollutants at §307(a)(1) (also labelled §1317(a)(1)).
2. The list appears in the Code of Federal Regulations at 40 CFR 401.15
3. The list is an important starting point for EPA to consider, for example, in developing national discharge standards (such as effluent guidelines) or in national permitting programs (such as NPDES).
4. The list contains 65 entries. Many of the entries, such as "haloethers," are for groups of pollutants.

Connection between CWA §307(a)(1) and the List of Toxic Pollutants

1. Section 307(a)(1) says, "…the list of toxic pollutants or combination of pollutants subject to this Act shall consist of those toxic pollutants listed in table 1 of Committee Print Numbered 95-30 of the Committee on Public Works of the House of Representatives…"
2. Committee Print 95-30 (November 1977) is titled "Data Relating to H.R. 3199 (Clean Water Act of 1977)."
3. Table 1 is titled "Section 307—Toxic Pollutants." EPA incorporated Table 1 into the Code of Federal Regulations at §401.15.

History of the List of Toxic Pollutants

1. Source of the list: The list was negotiated among parties to a settlement agreement (NRDC et al. vs Train, 6 ELR 20588, D.D.C. June 9, 1976).
2. That settlement agreement is sometimes referred to as the Toxics Consent Decree, or the Flannery Decision (for presiding U.S. District Court Judge Thomas A. Flannery).
3. Congress subsequently ratified the Settlement Agreement and the list of toxic pollutants when they amended the CWA (Public Law 95-217) in 1977.
4. Note to readers: The Congressional Research Service prepared a paper in 1993 on Toxic Pollutants and Clean Water Act EXIT Disclaimer .
5. The list was first published on January 31, 1978 in the Federal Register (43 FR 4108).
6. In a final rule on July 31, 1979 (44 FR 44501), EPA published the list again and added the list to the CFR at 40 CFR 401.15.

Modifications

1. EPA removed three pollutants from the list in 1981, after determining that their chemical properties did not justify their inclusion:
   - *Dichlorodifluoromethane* and *trichlorofluoromethane* were de-listed on January 8, 1981 (46 FR 2266) at the request of E.I. duPont de Nemours and Co. because of low solubility in water and high volatility combined with low human and mammalian toxicity. *Bis(chloromethyl) ether* was de-listed on February 4, 1981 (46 FR 10723) based on data that indicated a half-life in water of 38 seconds at 20°C.
2. De-listing the three pollutants did not change the 65 entries because the three de-listed pollutants were specific compounds within entries for the groups Halomethanes (list entry 38) and Haloethers (list entry 37).

Priority Pollutants

Key Features

Key features of the list of priority pollutants and its relationship to the list of toxic pollutants:

1. The Priority Pollutants are a set of chemical pollutants EPA regulates, and for which EPA has published analytical test methods.
2. The Priority Pollutant list makes the list of toxic pollutants more usable, in a practical way, for the purposes assigned to EPA by the Clean Water Act. For example, the Priority Pollutant list is more practical for testing and for regulation in that chemicals are described by their individual chemical names. The list of toxic pollutants, in contrast, contains open-ended groups of pollutants, such as "chlorinated benzenes." That group contains hundreds of compounds; there is no test for the group as a whole, nor is it practical to regulate or test for all of these compounds.

Derivation

Starting with the list of toxic pollutants, EPA used four criteria to select and prioritize specific pollutants:

1. We included all pollutants specifically named on the list of toxic pollutants;
2. There had to be a chemical standard available for the pollutant, so that testing for the pollutant could be performed;
3. The pollutant had to have been reported as found in water with a frequency of occurrence of at least 2.5%, and
4. The pollutant had to have been produced in significant quantities, as reported in Stanford Research Institute's 1976 Directory of Chemical Producers, USA.

Number of Entries

Originally, there were 129. When three pollutants were removed from the list of toxic pollutants in 1981 (see above), they were also removed from the Priority Pollutant list.

1. Entry numbers 17, 49, and 50 were removed.
2. The last number on the list is still 129, although there are 126 entries.

Publication

Why is the Priority Pollutant list published at 40 CFR 423, Appendix A, rather than at section 401, or some other, more general section?

1. One of the first industrial categories for which EPA developed effluent regulations was the Steam Electric Power Generating Point Source Category. The Priority Pollutant list was included to support regulations for that category.
2. Although the other sections within part 423 apply only to Steam Electric Power Generating, the Priority Pollutant list in Appendix A is not limited in terms of its relevance to that one industrial category.
3. Some users find it helpful to think of Appendix A to Part 423 as a convenient storage place for the list, or as a matter of convenience for citation.
4. The list of Priority Pollutants can be found here.

Last updated on Friday, May 02, 2014

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August 7, 2015

SENT VIA EMAIL (warriors@sfgov.org)

Tiffany Bohee
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Comments on Environmental Review for Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Dear Ms. Bohee:

Our firm, on behalf of Mission Bay Alliance, submitted a letter on July 27, 2015, regarding comments on the environmental review for the project known as the Event Center and Mixed Use Development at Mission Bay Blocks 29-32. In support of our comments, we attached five subject matter expert reports, Exhibits A through E. With regard to Exhibit C (July 21, 2015 letter report authored by geotechnical engineer Lawrence Karp, CE, CEG, regarding Geology and Soils impacts), enclosed is Dr. Karp's summary of qualifications and expertise, which was inadvertently omitted.

Thank you and please do not hesitate to contact our office if you have any questions.

Very truly yours,

SOLURI MESERVE
A Law Corporation

By: [signature]
Osha R. Meserve

ORM/mre

Attachment: Dr. Karp's summary of qualifications and expertise

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LAWRENCE B. KARP
CONSULTING GEOTECHNICAL ENGINEER

FOUNDATIONS, WALLS, PILES
UNDERPINNING, TIEBACKS
DEEP RETAINED EXCAVATIONS
SHORING & BULKHEADS
CEQA, EARTHWORK & SLOPES
CAISSONS, COFFERDAMS
COASTAL & MARINE STRUCTURES
SOIL MECHANICS, GEOLOGY
GROUNDWATER HYDROLOGY
CONCRETE TECHNOLOGY

June 10, 2015

Soluri Meserve
1010 F Street, Suite 100
Sacramento, CA 95814

Attention: Osha Meserve, Esq.

Dear Ms. Meserve:

The following is a summary resumé of qualifications and expertise that was used recently in an expert disclosure statement:

> "Lawrence B. Karp holds an earned doctorate in civil engineering and other degrees from the University of California, Berkeley (with honors), and is licensed as a civil engineer, geotechnical engineer, and architect in California and as an architect and professional, civil, marine, and structural engineer, and naval architect, in other states. He was awarded a post-doctoral Earthquake Engineering certificate by the University of California, Berkeley (with distinction). He has been issued national certifications in architecture and structural engineering. Dr. Karp taught advanced foundation design and construction at Berkeley for 11 years and at Stanford for 3 years, and he has been a court appointed expert on engineering design and construction at various times over the last 40 years. He has membership in various professional societies, and he has authored numerous technical reports as well as conference and journal papers.
>
> With over 50 years experience in design and construction, Dr. Karp specializes in soil-structure interaction and resistance to lateral forces with applications to foundations for buildings and other structures including all types of ground support systems, underpinning, shoring and demolition, environmental analyses, controlled grading and slope stabilization including landslide repair, investigation of causation and remediation of foundation failures, seismic upgrades of foundation for buildings and other structures, reinforced and prestressed concrete technology, determination of defects in construction and materials, stability evaluation of excavations and earthwork, demolition and construction logistics, coastal engineering, and groundwater hydrology."

I trust this information is responsive to your request.

Yours truly,

[signature]
Lawrence B. Karp

REGISTERED PROFESSIONAL ENGINEER · LAWRENCE B. KARP · No. 452 · GEOTECHNICAL · STATE OF CALIFORNIA

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SOLURI MESERVE
a law corporation

tel: 916.455.7300 · fax: 916.244.7300
1010 F Street, Suite 100 · Sacramento, CA 95814

October 7, 2015

<u>SENT BY U.S. MAIL AND EMAIL (</u><u>warriors@sfgov.org</u>**<u>)</u>**

Tiffany Bohee
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Supplemental Comments on Environmental Review for Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 – Clean Water Act 404 and CZMA Consistency

Dear Ms. Bohee:

This firm represents the Mission Bay Alliance ("MBA") with respect to the Warriors Event Center Project ("Project"). These comments supplement MBA's prior comments on the Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("DSEIR").

As described in the July 24, 2015, comment letter submitted by the Law Offices of Thomas Lippe regarding Hydrology, Water Quality and Biological Impacts ("Hydro Comments"), the Project site contains a wetland feature that is likely jurisdictional and will require permits from the U.S. Army Corps of Engineers ("Corps") and/or the State Water Resources Control Board in order to lawfully fill. (See Hydro Comments, pp. 11-15, and Exhibit 2, pp. 2-3.) Specifically, the Project site contains a wetland area consisting of a large, permanent pond created by a narrow channel that seasonally contains surface waters and creates further, seasonal wetland features. (Exhibit 2, p. 2.) The area is replete with shrubs and riparian plants, and it serves as habitat for various species, including nesting and foraging sites for native birds. (*Id*. at pp. 2-3.)

Despite the existence of likely jurisdictional wetlands on the site, the DSEIR does not include the Clean Water Act ("CWA") 404 fill permit that will be needed to fill the wetland in the list of project approvals. (DSEIR, pp. 3-51 to 52.) The need for a 404 fill permit also requires the Corps to prepare a Coastal Zone Management Act ("CZMA") consistency finding, as required by the Bay Conservation Development Commission

("BCDC") Management Program (see 16 U.S.C., § 1456, subd. (c)(3)), which should also be on the list of project approvals. (See CEQA Guidelines, § 15124, subd. (d).)

Under the CZMA, any applicant for a federal permit to conduct an activity, regardless of its location, will be required to certify its consistency if that activity will affect a land use, water use, or natural resource of the coastal zone. (See, e.g., *Amber Res. Co. v. United States* (Fed.Cir. 2008) 538 F.3d. 1358, 1363-1364; *Southern Pacific Transp. Co. v. California Coastal Com.* (N.D.Cal. 1981) 520 F.Supp. 800, 802-803.) Effects on coastal uses and resources need not be direct, but may include "any reasonably foreseeable effect," including "indirect (cumulative and secondary) effects which result from the activity and are later in time or further removed in distance, but are still reasonably foreseeable." (15 C.F.R., § 930.11, subd. (g).) It is likely that this Project will have effects on coastal resources, as the area to be filled is adjacent to the coastal zone. Coastal resources include biological and physical resources, such as vegetation and animals that are found in the state's coastal zone on a regular or cyclical basis. (15 C.F.R., § 930.11, subd. (b).) This Project site provides nesting and foraging habitat for several such species of birds. (See Hydro Comments, Exhibit 2, p. 3.) Thus, a consistency determination is necessary.

In summary, the DSEIR omits necessary project approvals and overlooks impacts associated with the Project's inconsistency with the BCDC Management Program. These omissions from the Project description and lack of analysis must be corrected prior to certification of the EIR. Thank you for considering these supplemental comments. Please feel free to contact my office with any questions.

Very truly yours,

SOLURI MESERVE
A Law Corporation

By: [signature]
Osha R. Meserve

From:	Mary Miles
To:	Warriors, PLN (CPC)
Subject:	Public Comment on SDEIR
Date:	Monday, July 27, 2015 5:01:05 PM

FROM:
Mary Miles, Attorney at Law (State Bar # 230395)
364 Page St # 36
San Francisco CA 94102
(415) 863-2310

TO:
Tiffany Bohee
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission St., Ste. 400
San Francisco CA 94103

BY E-MAIL: to warriors@sfgov.org

DATE: July 27, 2015

RE: "Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32" OCII File No. ER 2014-919-97; San Francisco Planning Department No. 2014.1441E

PUBLIC COMMENT ON DRAFT SUPPLEMENTAL EIR

This is Public Comment on the Draft Supplemental Environmental Impact Report ("DSEIR") for the "Golden State Warriors Event Center and Mixed Use Development at Mission Bay Blocks 29-32" ("the Project"). The Project proposes placing a championship basketball team drawing capacity crowds of more than 18,000 for every game in a new sports arena and "event space" with drastically inadequate parking and access for vehicles, inadequate public transportation, less than one mile from the AT&T baseball stadium with overlapping events and already-existing severe traffic congestion. The proposed Project location is directly adjacent to the largest medical facility in San Francisco, creating blocked access for both existing staff, visitors, and emergency vehicles.

The Project proposes a sports arena for the Golden State Warriors in San Francisco, relocating that arena and "event center" from its present location in Oakland California to the Mission Bay complex adjacent to new medical centers and residential developments, where the Warriors would then host capacity crowds of 18,000 from all over the Bay Area. (DSEIR, pp.1-8; 5.2-235.) The "events" would be held 225 times per year. (DSEIR p. 1-8.) Even the severely flawed SDEIR admits the Project will generate significant traffic and transit impacts affecting travel throughout the City and the entire region "at multiple intersections and freeway ramps" with "regional transit providers exceeding capacity," "noise and crowd noise affecting sensitive receptors," air quality impacts, wind impacts, and impacts on public utilities, including wastewater facilities with existing already-"inadequate capacity to serve the project's wastewater demand." (SDEIR, p. 1-9.) The SDEIR proposes no effective or publicly enforceable mitigation for those significant impacts.

Instead of improving severely congested traffic and already substandard air quality conditions, the Project proposes to make them worse throughout the Project area, which includes the entire downtown area cumulatively, freeway ingress and egress, and AT&T Ballpark. The Project therefore directly and facially conflicts with the mandates of the California Environmental Quality Act ("CEQA," Pub. Res. Code [PRC] § 21000 *et seq*.) to "enhance the environmental quality of the state," to mitigate the Project's impacts, and to "consider alternatives to proposed actions affecting the environment." (PRC § 21001.) The DSEIR fails propose feasible mitigation measures or alternatives for the admitted impacts of the Project, and therefore violates not only those mandates but the legal requirements of CEQA to inform the public of the Project's impacts and mitigate them. The DSEIR fails propose feasible mitigation measures or alternatives for the admitted impacts of the Project, and therefore violates not only those mandates but the legal requirements of CEQA to inform the public of the Project's impacts and mitigate them.

The SDEIR fails to accurately identify the magnitude of the obvious congestion, transportation and parking impacts of the proposed Project, has no coherent or accurate cumulative impacts analysis, and no accurate direct or cumulative analysis of the Project's impacts on air quality, and fails to meet other requirements of the California Environmental Quality Act ("CEQA"), Public Resources Code ("PRC") §§21000 *et seq.*

The DSEIR does not comply with CEQA's requirements to accurately state existing (baseline) conditions of traffic, thus negating the impacts analysis, the mitigations analysis, and the alternatives analysis on these crucial impacts affecting traffic, transit, air quality, safety, and human health throughout the affected area. The DSEIR contains *no* traffic counts or other traffic indicators and inadequate analysis of operational air quality impacts from the congestion inevitably caused by removing traffic lanes and parking. The DSEIR's disingenuous conclusion that the Project will have no impact on emergency services is false and dangerous. With the gridlock created by bottlenecked traffic, those emergency vehicles will not be able to climb over the backed up cars and buses. The DSEIR also fails comply with CEQA's mandate to mitigate the Project's impacts by proposing in a separate section of the EIR feasible, effective, and enforceable mitigation measures for each impact identified, and to present a full range of alternatives, including off-site alternatives, to the Project to eliminate or reduce the Project's impacts.

These defects make the DSEIR legally inadequate, since it fails to inform the public and decisionmakers of the Project's true impacts and fails to mitigate them. Further, the DSEIR's conclusory statements are in many instances unsupported. The large number of references to other EIR's and documents on other projects make the document user-unfriendly and its conclusions unsupported. The minimal public comment period on the DSEIR from June 5 to July 27, 2015, is inadequate for a Project of this size, regional importance, magnitude, and severity of impact, and a DSEIR of this complexity. The location of the Project area in downtown San Francisco and the large number of affected travelers and residents in the area make this Project of regional and statewide importance. Therefore, this public comment is necessarily incomplete, and other comment may be submitted later on issues not addressed here. The following are some inadequacies of the DSEIR.

1. **Traffic Impacts Are Neither Adequately Analyzed Nor Mitigated.**

Even though it drastically underestimates the vehicle traffic generated by the Project, the DSEIR concludes that the Project will have significant "project-specific" impacts at seven study intersections, including King/Fourth; Fifth/Harrison; I-80 westbound off-ramp; Fifth/Bryant/I-80 eastbound on-ramp; Third/Channel; Seventh/Mission Bay Drive; and seventh/Mississippi/16th. (DSEIR 5.2-128.) The DSEIR then claims that it will not provide proposed mitigation measures for the Project's gridlock-creating mess throughout downtown San Francisco and on major freeways in violation of CEQA's fundamental mandate, claiming that any mitigation of the Project's impacts would have to increase lane capacity, which the DSEIR claims would "generally be infeasible," providing no substantial evidence to support the conclusion of infeasibility. (DSEIR 5.2-128.)

The Project description in the DSEIR fails to include an accurate description of The Project area, since the Project’s impacts extend far beyond the Project site and will affect citywide and regional streets, freeways, and transit lines.

There appears to be no accurate traffic count data supporting the baseline (existing) conditions from which the impacts analysis proceeds. Further, even if only seven of the analyzed intersections streets were impacted by the Project, the backup from those intersections would affect many entire streets and other intersections that the DSEIR claims would not be degraded. An EIR that fails to inform the public and decisionmakers of the Project's impacts is legally defective.

The DSEIR proposes admittedly ineffective "mitigation," such as on-site "PCO's that shall be deployed," without saying where and when they would be "deployed," who would pay for them (the public), and how they would affect the intersections where impacts are identified. (DSEIR 5.2-128.) Instead of proposing effective mitigation measures for the identified impacts, the DSEIR then claims that "strategies to reduce traffic congestion" "could" include more ineffective "outreach" to urge people not to drive, urging the project sponsor to buy up more parking spaces, and other vague "strategies." (DSEIR 5.2-129.) The DSEIR then proposes a "Strategy to Enhance Non-auto Modes," which also would not mitigate the Project's impacts on traffic, including traffic that is not attending a basketball game or a "special event," which is not even considered in the DSEIR. (DSEIR 5.2-129.) The "Non-auto Mode" strategy includes, *e.g.*, a "promotional incentive…for public transit use and/or bicycle valet use at the event center." (*Id.*) The "Non-auto Mode" strategy, however, again fails to address the traffic impacts of the Project, and does nothing to mitigate them.

Regardless of whether the City provides additional Muni "Special Event Transit Service," a central assumption of the DSEIR, the document admits that traffic impacts will affect the entire Project area, freeway ingress/egress, and Bay Bridge travel. (DSEIR 5.2-118 - 129, 5.2-191-207.)

The DSEIR's analysis and the proposed "mitigation" fall far short of the requirements of CEQA to identify significant impacts and mitigate them.

2. The Cumulative Traffic Analysis Is Factually and Legally Defective.

Even though its cumulative analysis is severely flawed, the DSEIR admits that the Project will cause cumulative traffic impacts at 16 "study intersections" including I-80 and I-280 freeway ramps. (DSEIR 5.2-219-221.) The DSEIR then fails to propose any effective mitigation measures for those impacts.

The DSEIR's cumulative traffic impacts analysis legally inadequate and unsupported. The document claims that it assessed cumulative impacts "by calculating the project-generated traffic conditions at intersections that are projected to operate at LOS E or LOS F under 2040 cumulative conditions for the No Event scenario for the weekday p.m. and Saturday evening peak hours." (DSEIR 5.2-212-213.) However, that "methodology" is irrelevant to, and does not meet the legal requirements of, CEQA for assessing cumulative impacts. Rather, the DSEIR was required to identify the Project's impacts in combination with other past, present, and reasonably foreseeable future projects that would also result in traffic impacts. The baseline for assessing cumulative traffic impacts is not conditions existing in 2040 but is conditions existing now. The DSEIR's pointless computer exercise thus does not comply with CEQA. (DSEIR 5.2-212-215.) Further, the DSEIR fails to include in the cumulative analysis many other reasonably foreseeable future projects that will also result in traffic impacts, such as the "Second Street Bicycle Plan project," a major project that will eliminate two traffic lanes, turning facilities, and all parking on Second Street from Market Street to King Street to create raised separated bicycle lanes, and similar bicycle plan "road diet" features proposed by the City in the "Central Soma Plan" on Third, Fourth, and Fifth Streets and the closure of Market Street to vehicles in August, 2015, and large private development projects in the project area, all of which should have been included in the cumulative analysis. In short, the Project's impacts today and in the future will contribute significantly to the creation of severe congestion and gridlock throughout the downtown area, the freeway system, and the Project area. The failure to identify and mitigate these foreseeable cumulative impacts violates CEQA.

3. The Project Will Overwhelm Transit Capacity With No Effective Mitigation.

There is no accurate analysis of transit impacts in the SDEIR. The SDEIR says that "the project sponsor is working with the City to secure funding for the Muni Special Event Transit Service Plan as part of the project improvements." (SDEIR 5-2.191.) That vague promise is not a legally adequate project description or baseline assumption. The SDEIR then engages in an argument to secure that funding, which requires public subsidy in an unstated amount, with a series of claims showing how much *worse* vehicle traffic will be if that funding isn't provided. However, that strong-arm tactic is irrelevant to CEQA's required analysis and mitigation of the Project's transit impacts. (DSEIR 5-2-192 - 194)

The DSEIR fails to properly identify and propose mitigation for the Project's specific impacts on Muni, concluding that "the project would result in no new or substantially more severe significant effects than those identified in the Mission Bay FSEIR related to transit impacts." (DSEIR 5.2-224.) That conclusion improperly relies on an EIR that is both outdated and irrelevant to the Project, which was not included in that EIR.

Transit will also be delayed by queuing and gridlock caused by the project, since buses and vehicles will have to share the congested streets resulting from the Project.

The DSEIR admits that the Project will cause significant impacts due to exceeding capacity on other transit services, including BART, proposing no mitigation. (DSEIR 5.2-226.)

The SDEIR also admits that the Project would result in significant cumulative transit impacts on BART, Caltrain, Golden Gate Transit, and WETA, particularly with overlapping events, again proposing no mitigation. (DSEIR 5.2-226.)

4. Direct, Indirect, Secondary, and Cumulative Parking Impacts Are Not Analyzed or Mitigated

The DSEIR claims that it need not analyze or mitigate the Project's direct, indirect, secondary, and cumulative impacts from creating a shortfall of thousands of parking spaces throughout the area, falsely claiming that the Project is either a "residential, mixed-use residential, or employment center project on an infill site within a transit priority area." (DSEIR 5.2-233, citing PRC §21099(d).) The Project fits none of those categories, and the DSEIR must therefore analyze and propose effective mitigation for the Project's significant parking impacts.

The parking analysis understates the drastic parking shortfall created by the Project and misleadingly overstates the number of available parking spaces outside the Project area on which it irresponsibly relies.

Warriors games will always draw peak attendance of 18,000 (DSEIR, pp.1-5 [stadium capacity of 18,064 seats]; 1-8.) with most attendees driving and parking at the arena. The Project admits that it will supply only 1,082 parking spaces, including 950 in the "on-site parking garage" and 132 "within the 450 South Street Parking Garage for which the project sponsor has acquired parking rights to serve the project." (DSEIR 5.2-235.)

Admitting that the Project's proposed on-site parking is grossly inadequate and that there are few metered parking spaces in the Project area, the DSEIR claims to include parking lots within a mile of the Project, and still comes up drastically short of the parking capacity needed for the "events" in the stadium.

The parking availability baseline is outdated and inaccurate, particularly since it incorrectly lists in its offsite parking inventory the "SF Giants Facilities," which are slated for removal and development under the "Mission Rock Project." Therefore, where the DSEIR claims there are "2,530" available parking spaces at "SF Giants facilities," no such spaces will be available under the planned development, and those spaces are not available when Project "events" overlap with "events" at the AT&T stadium. (DSEIR 5.2-236-238.) The baseline (existing conditions) thus grossly overestimates the existing parking supply, disregarding the reality of ongoing development throughout the downtown and Project area.

The baseline also grossly underestimates existing parking demand for its proposed "events," claiming without support that, with 18,000 event attendees, the parking space "demand" would be only 5,937 spaces for midday events, and 9,614 spaces for evening events. (DSEIR 5.2-242.) The DSEIR does not state how those baseline "demand" figures were derived. The failure to set forth either an accurate baseline supported by evidence and an accurate description of the Project demand not surprisingly results in the DSEIR's implausible and irresponsible conclusions that it need not realistically assess and effectively mitigate the Project's significant parking and traffic impacts due to a lack of parking.

Instead, we are told that by creating a parking shortfall, attendees "may instead use transit to arrive at the site because the perceived convenience of driving is lessened by a shortage of parking" (DSEIR 5.2-241) is completely unsupported, and evades the Project's impacts on other travelers who are not attending a Project "event" who must also contend with the secondary impacts of snarled traffic, congestion, delays, and lack of parking throughout the area. That conclusion is even more dubious in view of the DSEIR's admission that existing transit cannot accommodate Project demand. (DSEIR 5.2-140-147.)

The DSEIR concludes that, "By promoting carpooling, providing parking attendant services, providing clear direction to alternative parking locations in advance of events, and adjusting event parking rates (raising them), the parking supply would likely be more efficiently utilized during the event days and the potential parking deficit would be eliminated." (DSEIR 5.2-241.) That absurd conclusion is again completely unsupported.

The same error that flaws all of the cumulative impacts analyses in the DSEIR also applies to the cumulative parking impacts analysis, which again mistakenly begins with a baseline of "existing" conditions in 2040, instead of present existing conditions. (DSEIR 5.2-248.)

5. There Is No Accurate or Legally Adequate Analysis and Mitigation of the Project's Air Quality Impacts or GHG Impacts.

The DSEIR fails to quantify or coherently analyze air quality impacts, complaining, for example, that "it is difficult to predict the magnitude of health effects from the project's exceedance of significance criteria for regional ROG and NOx emissions. (DSEIR 5.4-40.) The DSEIR also admits that its proposed "mitigation" of reducing vehicle trips by not providing adequate parking or transportation capacity "would be difficult to quantify." The DSEIR may not hide behind its failure to gather the necessary data to analyze these and other air quality impacts, because that failure also violates CEQA's requirement to inform the public and decisionmakers of the Project's impacts and to mitigate them.

6. The DSEIR Fails To Propose Effective And Feasible Mitigation Measures For The Project's Impacts.

Under CEQA, "An EIR is an informational document which will inform public agency decisionmakers and the public generally of the significant environmental effect of a project, identify possible ways to minimize the significant effects, and describe reasonable alternatives to the project." (14 Cal. Code Regs. ["Guidelines"] §15121(a); PRC §21002.1(a), (b).) CEQA requires specific content in the EIR, including either a separate chapter on mitigation measures proposed to minimize the significant effects or a table showing where that subject is discussed. (Guidelines §15126.) The DSEIR contains *no* chapter on mitigation and no table showing where mitigation, including feasibility analyses, are discussed. (*Id.*)

Proposed mitigation measures include "[a]voiding the impact altogether by not taking a certain action or parts of an action." (Guidelines, §15370(a).) The EIR should propose effective, enforceable mitigation measures for each impact it identifies. The effectiveness of proposed mitigation measures should be supported by substantial evidence.

Claiming a significant impact is "unavoidable" does not excuse the failure to propose effective mitigation, but that is what this DSEIR assumes it may do, including significant transportation and circulation impacts, noise impacts, air quality impacts, wind impacts, and utilities impacts. (DSEIR 6-1 - 6-4.) That does not comply with CEQA.

7. The DSEIR Fails To Adequately Evaluate Alternatives To The Project, Including Offsite Alternatives.

The DSEIR fails to evaluate a "range of reasonable alternatives to the project, or the location of the project, which…would avoid or substantially lessen any of the significant effects." (Guidelines, §15126.6(a).) The DSEIR proposes instead analyzes only three alleged "alternatives": "Alternative A: No Project Alternative," "Alternative B: Reduced Intensity Alternative," and "Alternative C: Off-Site Alternative at Piers 30-32 and Seawall Lot 330."

The "No-Project Alternative" may not be counted as an "alternative," because it will be rejected as not satisfying the "Project-Sponsor's Objectives." The other two alternatives do not substantially lessen any of the significant impacts, and could even make them worse. (SDEIR 7-48, 7-73 - 109. Indeed, "Alternative C" met with such intense public outcry that it resulted in the land deal that moved the proposed Project to the present location. The only proposed alternative that should be considered is the No Project alternative, which is also the environmentally superior alternative.

8. There Is No Accurate Analysis or Mitigation of Impacts on Emergency and Public Services on the Directly Adjacent Major Medical Complex.

The DSEIR's conclusions that the Project will not cause significant impacts for emergency vehicles is false, dangerous, and irresponsible. The false implication that the entire area would not be gridlocked is silly, since the backup from gridlocked intersections would prevent any vehicles from moving anywhere during "events."

9. There Is No Proposed Mitigation Of The Project's Impacts On Wastewater.

10. The SDEIR Fails to Address The Project's Direct and Cumulative Land Use

Impacts.

The DSEIR incorrectly claims that an "Initial Study" can substitute for the analysis and mitigation of the Project's land use impacts, claiming the Project "would not physically divide an established community; conflict with land use plans, policies, or regulation adopted for the purpose of avoiding or mitigating an environmental effect; or have impacts on the existing character of the vicinity." (DSEIR 6-4.) In fact, the Project it plainly incompatible with existing uses in the immediate vicinity, including a major medical center, research and hospital facility, and residential uses. The Project's significant impacts clash with and affect all of those other land uses. Indeed a "subsequent" environmental impact report is inappropriate for this Project, since it drastically departs from existing land uses.

11. The SDEIR Lacks Objectivity.

The DSEIR fails to fulfill CEQA's requirement of objectivity, instead advocating for the Project sponsor. The lack of objective analysis flaws the DSEIR as an informational document and violates CEQA. (See *e.g., Citizens for Ceres v. Superior Court* (2013) 217 Cal.App.4th 889, 918-919.)

For the foregoing and other reasons, the DSEIR is legally inadequate in violation of CEQA.

POTRERO BOOSTERS
NEIGHBORHOOD ASSOCIATION
SERVING THE HILL SINCE 1926

July 27, 2015

Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Potrero Boosters Comments to Warriors SEIR

Via Email

Dear Mr. Bollinger:

When the Golden State Warriors announced the acquisition of the rights to Mission Bay blocks 29-32, the Potrero Boosters Neighborhood Association was carefully optimistic that the City, with its stated desire to lure the Warriors to San Francisco, would provide additional transportation and transit infrastructure to our neighborhoods.[1] Indeed, we saw the Warriors as a tremendous opportunity, as the City has lagged in developing the infrastructure to accommodate the growth, both residential and commercial, experience by our neighborhoods over the last decade.

However, upon reading the Supplemental Environmental Impact Report (the "SEIR") for the Golden State Warriors Event Center and Mixed Use Development (the "Arena"), we have some significant concerns. We are distressed by the volume of identified impacts on traffic transit and parking identified as "significant and unavoidable." A failure to avoid significant impacts will directly reduce the day-to-day quality of life for the residents living and moving into the Potrero neighborhoods.

As a result, we are compelled to comment on the SEIR. We do so not with an eye to preventing the Arena from being built. We do so based on our belief that the City is capable, with the right measures in place, of making this development an asset to not just the City as a whole, but to its direct neighbors as well.

This letter will consider two sets of impacts, those associated with (i) parking, transit, traffic and emergency vehicles, and (ii) air quality.

[1] The "Boosters" represent the Potrero neighborhoods of Potrero Hill, Showplace Square and Dogpatch, i.e., those neighborhoods directly adjacent to the Mission Bay site in question.

Parking, Transit, Traffic and Emergency Vehicles

General Comments

For the Arena to coexist within its rapidly developing surrounding neighborhoods, the City must maintain dedicated funding of full time transit and transportation solutions and review the parking management programs throughout the adjacent areas. Proper attention must be paid to the travel needs of the populations that live and work (and who will soon live and work) in the area full time, and not be reserved for those few times a year when the confluence of San Francisco Giants and Arena events bring about the largest transportation challenges. New transit should be based on current data and SFMTA should be prepared to move away from more outdated transit planning.

Impact TR-2b: Parking

Parts of northeast Potrero Hill and Dogpatch are currently part of Residential Parking Permit ("RPP") Zone X. RPP enforcement is from Monday to Friday, from 8:00 am to 6:00 pm reflecting the out-of-City commuter concerns RPP was designed to remedy. These hours do not correspond with the weekend and evening operations of the Arena. Due to proximity to the Arena and existing transit options, Zone X is well within the parking shed for the Arena.

Extension of RPP enforcement hours should be considered. Yet mere extension of enforcement may not be enough. RPP areas marked with four-, rather than two-, hour limits, which may serve local businesses well, would not generally provide protection from Arena parking. Areas in our neighborhoods not currently under RPP, but which are otherwise residential in character, cannot be allowed to suffer the pressures of Arena parking. And, of course, enforcement must have the resources behind it to provide appropriate ticketing and towing for violators.

A plan needs to be developed to prevent our neighborhoods from becoming a free parking zone for Arena event attendees. Metering by itself will not provide an adequate solution given the day-to-day mixed uses of the areas in question. A meeting with community stakeholders would ensure the adequacy of a plan and help garner the support necessary to make it a reality.

We also believe that parking for the Arena should be bundled with the tickets sold. No person driving to an event at the Arena should have to guess about where they will be parking. Remote, satellite parking served by shuttles and taking advantage of mobile application technology should be required under the SEIR.

Impact TR-4: Transit

We would celebrate the introduction of ferry service to the Arena site, and would hope that an electrified Caltrain would provide additional service to and from the Peninsula. We consider both improvements to be part of the critical path to the Arena opening—that is, they must be operational prior to the Arena's first tip-off. That parochial interests on the Peninsula have tied-up Caltrain electrification is of great concern. Ridership is already at capacity levels throughout much

of the weekday schedule. Without additional trains on the schedule, we question the extent that Caltrain can be depended on in the Arena rideshare models.

Transit improvements should be funded from dedicated sources, regardless of whether those funds come from the incremental property, sales or ticket taxes arising from the Arena. With a current estimate of $14 million being collected by the City annually, at least half that mount should be funding improvements to our transportation system intended to move people out of cars. Our neighborhood intersections are overburdened as they are, with many graded a "D" or an "F" under level of service standards. We do not have any excess capacity to accommodate more drivers.

Transit funding can go to infrastructure and operations that, when not deployed for the largest of events, can mitigate the day-to-day concerns of the neighborhood. We have identified the following necessary enhancements:

- Connecting the 11 North Point-Mission Bay line through to the commercial districts on 17th, 18th, and 20th streets in Potrero Hill, to the 22nd Street Caltrain Station, and terminating adjacent to the Pier 70 and NRG Power Plant development projects. This line can serve as an outlet for residents and business to move around, rather than through, the greatest Arena impacts.
- Increased running of the 10 Townsend to three times an hour during events.
- Making the E Embarcadero a seven-days-a-week line, turning south from its current 4th and King terminus to serve the Arena, with a terminus at the 25th Street Muni Yard.
- Moving the proposed Muni Turnaround from the congestion inducing 18th and 19th Streets to the 25th Street Muni Yard, where staging could be done more efficiently and more residents to the south of the Arena could be served on a daily basis.
- Keeping the 55 16th Street line as a dedicated connector from 16th Street BART to Mission Bay, and perhaps extending the line to incorporate transfers from the J Church.

This list of improvements is not intended to be exhaustive. But they represent the need for a global transit plan for the area—one with a growing population and growing businesses—and one that has additional transit *decreases* planned, exacerbating cuts made in 2008-2009.

Impact TR-5: Traffic

Traffic is perhaps the Boosters greatest concern; increased traffic drives every other discussion in this letter. The intersection of 7th and 16th Streets is already at an "F" grade for level of service, creating danger to bicycles and pedestrians at all hours of the day. New drivers, not familiar with the area, will only compound the difficulties of an intersection where four modes (Caltrain's tracks run adjacent to 7th Street) of traffic come together. Prior to the Arena's opening, this intersection should be reworked under the City's Vision Zero plan.

Additional bicycle infrastructure may also be appropriate. Both 16th Streets and Mariposa Streets experience significant automobile traffic, and with dedicated bus lanes coming to 16th Street, neither are ideal for bicycles. A pedestrian and bicycle connector at 17th Street, including an overpass over the Caltrain tracks, would extend the bicycle routes already on 17th Street through the Mission and the western part of Potrero Hill. Such improvements should be evaluated so that bicycling can be a safer, more prevalent means of reaching the Arena.

Impact TR-10: Emergency Vehicle Access

The SEIR should provide greater clarity as to how emergency vehicles, patients and hospital staff will access the UCSF medical facilities adjacent to the Arena. Mariposa Street between 101 and 280 has an increasingly residential character and a three-ton vehicle weight limit, and runs adjacent to a school and Jackson Park. It should not be depended upon as a route from the 101 Freeway to UCSF. Emergency traffic along this stretch would be dangerous and inconvenient to residents and patients alike.

Early discussions on UCSF transportation showed Minnesota Street through the Dogpatch Historic District serving the hospital. The SEIR should make clear that this routing has been abandoned, and show an alternative route that allows ease of access to the hospital under the heaviest of traffic conditions.

Air Quality Impacts

Impact AQ-2 and Mitigation M-AQ-2b

The air quality mitigation disbursement plan described in AQ-2 and M-AQ-2b is not adequate to meet the needs of the Potrero neighborhoods and our neighbors to the south. Given our proximity to freeways, industrial activities (including a UPS distribution center and a Recology recycling facility), heavy trucking, and the historical uses of our neighborhoods (including a recently decommissioned power plant), we feel that this represents a significant environmental justice issue.

While the Bay Area Air Quality Management District ("BAAQMD") may be able to use mitigation funding anywhere in the counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara and portions of Solano, and the Arena is likely to draw automobile traffic from all of these areas, the bulk of the pollution by vehicles will be within two miles of the Arena. Mitigating pollution sources in Solano County will not go to reduce the impacts in our neighborhoods, which will experience additional car traffic at least 225 times per year.

As pointed out by the San Francisco Department of Environment, "The City's neighborhoods in the Southeast areas are heavily burdened by air pollution-not only from major industrial facilities, but also from the thousands of automobiles and heavy-duty diesel trucks that travel daily on nearby freeways and City streets."

The SEIR forecasts that 53% of Arena attendees on a weekday, and 59% on a weekend, will drive to the Arena. While those mobile sources of pollution will travel through other Bay Area counties, they will all arrive in our neighborhood, the analysis of the BAAQMD seems to equate moving efficiently at freeway speeds to idling on our neighborhood off-ramps and our poor level-of-service intersections.

As Arena traffic is the source of the impact, money should mitigate pollution sources near the Arena. If a stationary source of mitigation cannot be identified near the Arena, then mitigation could take the form of additional hybrid and electric buses for the SFMTA.

As a result, 80% of the funds called for in Mitigation M-AQ-2b should go to reducing the impacts in the area of the Arena itself.

Summary

The Potrero Boosters Neighborhood Association believes that, without mitigation, the Arena would significantly impact our neighborhoods for the worse. The SEIR, with its failure to identify reasonable mitigations to predicted impacts, causes us significant concern. That said, we are still optimistic that, with dedicated funding and enforceable agreements between the City and the Warriors, and with appropriate air quality management, there are opportunities to not only accommodate the Arena, but to address concerns with the context in which it is proposed to be built.

Sincerely,

J.R. Eppler

J.R. Eppler
President

From: Martin Sabelli
To: Warriors, PLN (CPC)
Subject: Warrior Stadium
Date: Thursday, July 23, 2015 12:04:53 PM

Dear Mr. Bollinger,

I am a San Francisco resident and I am dismayed that the city would devote substantial resources, obstruct views, and congest an already highly over-used area for the sake of a sports franchise. I happen to be a major sports fan, but this type of municipal support (financial and political) is profoundly inconsistent with the needs of the vast majority of San Franciscans.

Thank you for your time and consideration.

Martín Antonio Sabelli
Law Offices of Martín A. Sabelli
1857 Market Street
San Francisco, CA 94103
(415) 817-9476 (Direct)
(415) 298-8435 (Mobile)
(415) 520-5810 (Facsimile)
msabelli@sabellilaw.com

San Francisco Bicycle Coalition
833 Market Street, 10th Floor
San Francisco CA 94103
T 415.431.BIKE
F 415.431.2468
sfbike.org

PROMOTING THE BICYCLE FOR EVERYDAY TRANSPORTATION

Monday, July 27 2015

Tiffany Bohee
C/o Brett Bollinger
OCII Executive Director
San Francisco Planning Department
1650 Mission Street Suite 400
San Francisco, CA 94103

RE: Comments on the Draft Subsequent Environmental Impact Report for Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Dear Ms. Bohee,

Please accept the San Francisco Bicycle Coalition's comments on the Draft Subsequent Environmental Impact Report for Event Center and Mixed-Use Development at Mission Bay Blocks 29-32.

Background

Over the course of nearly a year, GSW Arena LLC, an affiliate of Golden State Warriors, LLC ("Warriors") and the San Francisco Bicycle Coalition ("SFBC") have had on-going discussions, outside of the formal EIR process, to address bicycle access and infrastructure at the proposed arena site. Discussions thus far between SFBC and the Warriors have led to strong plans and support of existing and future bicycle travel to and from the Project, as well as plans to address enhanced bicycle infrastructure in and around the Project site, including publicly accessible bicycle parking, bicycle valet and additional secure bicycle parking for special events, secure commercial bike parking for employees. These discussions have also led to the Warriors and SFBC's commitment to work with appropriate agencies to add public bike share to the project vicinity, intersection management during special events to maximize bicycle and pedestrian safety, ongoing bicycle encouragement for special events, and a commitment to expanding bicycle capacity if/when need increases over the life of the Project.

We would like to commend the Warriors for being receptive and responsive partners that have demonstrated a strong commitment to promoting bicycle trips to the Project site in this Draft Subsequent Environmental Impact Review document (DSEIR) and in their goals beyond this document. Both the Warriors and SFBC acknowledge that bicycle infrastructure and promotion on and near the Event Center site are critical and cost-effective investments for the immediate and long-term success of the project and help to reduce neighborhood congestion, improve local environmental quality, support positive health outcomes, and drive local economic development.

SFBC, working in close partnership with the Warriors, supports the following activities to create better biking at the Project Site. These recommendations, if not already included in the DSEIR, should be addressed under Mitigation Measure M-TR-2b, Impact TR-7, or wherever appropriate in the DSEIR document:

New and Enhanced On-Street Bicycle Facilities
SFBC supports the Warriors' and this DSEIR's inclusion of new and/or enhanced on-street bicycle facilities, to be designed in coordination with SFBC, the San Francisco Municipal Transportation Agency (SFMTA), Port of San Francisco, Office of Community Investment and Infrastructure (OCII), and Mission Bay Development Group (MBDG). These priority streets for bicycle infrastructure include:

- **Terry Francois Boulevard,** two-way protected bikeway on the East side of the roadway from Lefty O'Doul Bridge to Mariposa Street;
- **16th Street between 3rd and Terry Francois Boulevard**: one-way buffered and/or parking-protected bike lanes on North and South side;
- **Enhanced intersection designs around the arena**, with special attention paid to bicycle and pedestrian safety at 16th and Illinois Streets and 16th Street and Terry Francois Boulevard and;
- **Managed intersections around the site during special events**, with special attention paid to 16th and Illinois Streets.

The Warriors should encourage Mission Bay Development Group and public agencies to construct or implement these improvements prior to the opening of the event center.

Bicycle Parking
Adequate bicycle parking is critical to support the mode share goals of the project. SFBC encourages the Warriors to provide ample bicycle parking at the Project for special events, as well as for everyday commercial and neighborhood use. SFBC appreciates the Warriors commitment in on-going discussions to expand bicycle capacity as needed over the life of the development to meet additional capacity requirements that may arise.

Valet Bicycle Parking
The Warriors and this DSEIR indicate a need for enclosed bicycle valet space with a minimum capacity of 300 bikes. SFBC supports and encourages the current allocation of roughly 2,000 square feet for the operation and management of on-site bicycle valet, which would allow proper space for expansion, as noted above. The valet space should be designed to maximize the amount of bike storage available and to be consistent with current and projected neighborhood transportation plans. The bicycle valet should be sited as close to a main entrance to the Event Center as reasonably possible and located along one of the new or enhanced on-street bicycle facilities described above. The bicycle valet space should be completed and fully operational in conjunction with the opening of the Project.

We are pleased that valet bicycle parking will be provided at special events at the Event Center, including concerts and performances throughout the year, and at other events with an expected attendance past a threshold size to be reasonably determined in consultation with the SFBC, and revisited annually, as needed. Bicycle valet services could also be scaled up or down based on expected attendance levels on a per-event basis.

SFBC could plan to promote the availability of bicycle valet parking in communications and in programs to drive use. This could include promotion on the SFBC website, newsletters and social media with a reach of over 30,000 San Franciscans, and through programs and events as outlined below.

Commercial Bicycle Parking
As indicated in the DSEIR, the Warriors should provide secure (Class 1) bicycle parking for commercial office tenants and short-term bike parking (Class 2) for retail tenants, customers and guests at or above the requirements of applicable law including the City of San Francisco Planning Code Section 155.2, which sets standards for the provision of bike parking in new commercial development.

Other Bicycle Parking and As-Needed Expansion
SFBC supports the Warriors' and this DSEIR's proposal for an approximately 100-bike "pop-up" corral in a publicly accessible and highly visible location at the Event Center for special events on an as-needed basis. The pop-up corral should be monitored by event security staff and should be set up no less than one hour before such events.

SFBC also supports the Warriors' intention to identify on-site locations for additional pop-up corrals and/or additional bike parking facilities if/when the need for expanded bicycle parking capacity should arise. This additional bike parking capacity should be provided as additional pop-up corrals, expanded valet, and/or other forms of secure, monitored bicycle parking.

SFBC is encouraged by the Warriors' plan to identify additional future bike parking capacity to achieve a total of up to 900 potential spaces available to the general public during full-capacity special events (the sum of on-site bicycle valet spaces, on-site Class 2 spaces, pop-up corral spaces, and other publicly accessible secure bike parking spaces in the project vicinity). The Warriors should assess the need for expanded event bicycle parking facilities up to this number on a yearly basis and in consultation with SFBC to meet projected growth in bicycle trips. These spaces would be in addition to the permanent bike rooms in each on-site office building, which together with expanded event bicycle parking as described above, may in the future exceed 1,000 total available bike spaces for varied users at the project site.

SFBC is committed to continue working with the Warriors to find secure, public, and appropriate locations and systems to accommodate future bicycle capacity at the Project site.

Bay Area Bike Share Stations
SFBC supports the Warriors and this DSEIR's inclusion of Bay Area Bike Share stations at and/or around the Project site.

Marketing and Bicycle Promotion
We are pleased that the Warriors and this DSEIR acknowledge that increasing the number of bicycle trips to and from the Project will support the Citywide goal of a 8% bicycle mode share by 2023. As such, trends in bicycle trip generation and mode split should be studied and

evaluated on at least a yearly basis, with bicycle parking expansion, marketing, and promotion adjusted, to support this goal.

The Warriors and this DSEIR discuss integrating bicycle transportation into marketing and promotional activities for the Event Center to support the above stated goals. SFBC is supportive and committed to work with the Warriors on an on-going basis to further develop, implement, and promote the programs outlined below.

The Warriors and this DSEIR note that marketing and promotion are possible mitigations under *Mitigation Measure M-TR-2b: Additional Strategies to Reduce Transportation Impacts* for enhancing non-auto modes. As consistent with on-going discussions with the Warriors, SFBC encourages the Warriors to also consider marketing the Event Center as a bicycle-friendly destination in other press and marketing materials that may include but are not limited to:

- Warriors players and employees on bicycles at Warriors events and at SFBC events
- Feature bicycle facilities and programs in sustainability or environmental promotional materials or media
- Encourage bicycle travel information in non-Warriors special event promotions and marketing, such as concerts and performances

Promotions to enhance the bicycle experience should also include a recurring, season-long program that encourages more people to arrive to basketball games by bicycle. Similar promotions could also be used to promote bicycle trips at other events at the Event Center throughout the year.

The Warriors should design a plan prior to the opening of the Project for promoting bicycling to the Event Center that may include but is not limited to:

- Regular “Bike to Game” nights that include group rides from various starting locations in San Francisco and the region, rides with GSW staff prior to the game, and/or special offers for people who bike to the game;
- Bike-related raffles or prizes for people who bike to games. Giveaways could include branded lights, stickers, discount tickets, etc.;
- Special services and programs for people who bike to games. These could include monthly free or discounted tune-ups and minor repairs, and other incentives for people who frequently ride their bikes to games, such as a Bike Fan of the Month/Year program, and;
- Special events leading up to and during NBA “Green Week”, in coordination with the Green Sports Alliance.

SFBC could help organize, implement and promote bicycle-related events and promotions, ensuring strong attendance and participation. SFBC could promote the plan and the Warriors’ commitment through existing email and social media channels, through partners, and on our website.

The Warriors and SFBC, through both the EIR process and on-going discussions, are committed to continued refinement of the plans and roles described in this letter and in the DSEIR.

Thank you for considering these comments as part of a truly collaborative effort to make the proposed Mission Bay Arena and Event Center the most bicycle-friendly sports venue in the country and an addition to the neighborhood that supports current city and neighborhood transportation goals.

Sincerely,

Paolo Cosulich-Schwartz
Business and Community Program Manager
San Francisco Bicycle Coalition

July 27, 2015

Ms. Tiffany Bohee
OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Warriors Arena Draft Environmental Impact Report (DEIR)

Dear Ms. Bohee:

The San Francisco Bay Trail is a 500-mile shoreline walking and bicycling path that will one day encircle the Bay. With over 340 miles complete, it follows the shoreline in nine counties, passes through 47 cities and crosses four-and-a half toll bridges. The Trail provides scenic recreation for hikers, joggers, bicyclists, skaters and wheelchair riders. It offers a setting for wildlife viewing and environmental education, and serves as an important commute alternative for bicyclists.

Several inaccuracies regarding the Bay Trail alignment and bicycle infrastructure were found in the DEIR, and it is our hope they can be corrected in the final.

Page 5.2-3, under "Local Access" states "As part of the Mission Bay Plan, Terry A. Francois Boulevard will be realigned to the west to be adjacent to the east side of Blocks 30 and 32, and a buffered two-way cycle track (Class II)3 will be provided as part of the San Francisco Bay Trail on the east side of the street." The term "Class II" is a Caltrans standard that refers to a striped bicycle lane as opposed to the buffered two-way cycletrack referenced here. Cycletracks do not currently have a Caltrans classification, though it is our understanding that one may be forthcoming. The footnote at the bottom of this page also erroneously defines both a bike lane and a cycletrack as a Class II bikeway.

Page 5.4-4 states that Fourth Street between King and Mission is part of the Bay Trail alignment. It is not. The Bay Trail alignment in this area is on Terry Francois, Lefty O'Doul Bridge, waterside of AT&T Park, and north along the Embarcadero. See attached map.

Page 5.2-28 states "At various locations, the Bay Trail consists of paved multi-use paths, dirt trails, bike lanes, sidewalks or city streets signed as bicycle routes." The vision and goal of the Bay Trail is a Class I, multi-use pathway for cyclists and pedestrians, separated from traffic, as close to the shoreline as possible. While in certain locations, on a case-by-case-basis, the Bay Trail can consist of Class II bike lanes and sidewalks where there is *no possibility* for a multi-use path, city streets signed as bike routes are never proposed or accepted as complete segments of Bay Trail.

On page 5.2-43, the DEIR states that the Bay Trail is a 400-mile pathway, and that 338 miles are complete. Please note the Bay Trail's total length is 500 miles, and we are happy to report that 341 miles are complete.

Signage and Wayfinding

The San Francisco Bay Trail should be included in wayfinding signage on and around the project site. We would be happy to provide either the physical signs or our logo in electronic format for incorporation into the Warriors Arena signage and wayfinding plans.

While the Bay Trail Project was a commenter on the Notice of Preparation for this project, we were not notified regarding the availability of the Draft EIR. Please add us to your list of interested parties so that we will be notified when the Final EIR is available for review.

If you have any questions regarding these comments or about the Bay Trail, please contact me at (510) 464-7909 or by e-mail at maureeng@abag.ca.gov.

Sincerely,

Maureen Gaffney
Bay Trail Planner

From:	Sue Vaughan
To:	Warriors, PLN (CPC); Bollinger, Brett (CPC)
Cc:	Becky Evans; Arthur Feinstein; Karen Babbitt; John Rizzo
Subject:	SF Group Sierra Club Comments on the Proposed Warriors project
Date:	Monday, July 27, 2015 10:31:14 AM
Attachments:	Warriors SC Comments to SEIR 07-27-2015.pdf

Dear Mr. Bollinger:

Please see the attached letter with comments from the Sierra Club on the proposed Golden State Warriors project in Mission Bay.

--

Susan Elizabeth Vaughan
(415) 668-3119
(415) 601-9297

SIERRA CLUB
FOUNDED 1892

San Francisco Group of the San Francisco Bay Chapter

July 27, 2015

Reply to:
Sierra Club, San Francisco Group
85 Second Street, 2nd floor
Box SFG
San Francisco, CA 94105

Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco CA 94103-2414

Dear Mr. Bollinger:

Please accept the following comments on the Draft Supplemental EIR for the Event Center and Mixed-Use development at Mission Bay, Blocks 29-32.

The Sierra Club does not agree that this project fits the definition of an AB 900 Leadership project. The state legislature passed, and the governor signed, AB 900 as an economic boost during the Great Recession. It was designed to fast track infill projects through any CEQA litigation proceedings if those projects created good permanent jobs while at the same time minimizing environmental impacts, including GHG emissions, as determined by the CARB. We are well past the Great Recession, and California's economy is booming. In this midst of this boom, the project sponsors have proposed constructing a venue to nearly match the current Oracle Arena in capacity.

However, the project sponsors are proposing a project in Mission Bay without proposing adequate transportation infrastructure to match the capacity of BART in Oakland, especially when events are happening simultaneously at AT&T Park and in Mission. (*Volume 1, TR-2 through TR-6*).

The Sierra Club also believes there are other inadequacies in the SEIR. For example, the Warriors currently have about 150 full-time employees (Volume 3, Page 16). Have the project sponsors done an analysis of where these employees live, and to what extent GHG emissions will increase or decrease as a result of their commutes to the new location? Have the sponsors estimated how many FTEs will take advantage of the proposed transportation subsidies described in FSEIR Mitigation Measure E47.c: *Employee Transit Subsidies - Provide a system of employee transportation subsidies for major employers*? And will part-time employees who are not actually employees of the Warriors or other event sponsors (but who may work for food and souvenir concessions that have contracts with event sponsors) be eligible for these subsidies?

The SEIR notes that the roughly 1,000 day-of-game/event staff at the Mission Bay site will be assumed to be new hires (*Volume 3, Page 42*). The SEIR is inadequate because of this assumption. Project sponsors have not actually determined the number of events that will still be held at the Oracle Arena or surveyed current part-time employees to determine where they live and how many might transfer to the Mission Bay site in lieu of losing hours, if not their jobs, at the Oracle Arena. If roughly 1,000 part-time day-of-game employees will commute to events at the Mission Bay site from the East Bay, or anywhere else in the Bay Area, what are the GHG impacts?

The Sierra Club notes that project sponsors intend to rely on the availability of livery and TNC vehicles after events to transport people (*Volume 1 – TR-2)*. No analysis, to the knowledge of the Sierra Club, has ever yet been done on the environmental impact of TNCs in San Francisco. No one knows how many additional vehicle miles are being traveled in the City due to the availability of TNCs. No study, to the knowledge of the Sierra Club, has been done on the impact of TNCs on congestion or air quality, including GHG emissions. And yet the project sponsors propose to rely on TNCs for an unspecified portion of transportation needs of people going to and getting from events. Project sponsors should include an analysis of the GHG and other air pollution impacts of the TNCs they intend to rely on for transporting people to and from events.

The SEIR notes that there are many GHG regulations – both state and local – with which the project must comply. It credits these laws with reducing emissions of greenhouse gases in San Francisco. However, the Sierra Club notes that a large part of the reason the City's GHG emissions levels have dropped is because of the closure of the PG&E power plant in the Bayview a few years ago. (*Volume 2, 5-5-11*)

The Sierra Club does not agree that the purchase of carbon credits is an adequate method for reducing greenhouse gases, in this case, or that the purchase of carbon credits, in this case, render the project "GHG neutral." (*Volume 2, 5-5-11: As part of the AB 900 application, the project sponsor has committed to purchase carbon credits from a qualified GHG emissions broker in an amount sufficient to offset all GHG emissions from project construction and operations, as reiterated in Improvement Measure I-C-GG-1, Purchase Voluntary Carbon Credits.*) The Sierra Club believes mitigations should be implemented at the point of impact.

The Sierra Club is also concerned that there is no requirement to purchase carbon credits until the site is 90 percent leased and occupied, and, for the arena, until 90 percent of the available booking dates are utilized. (*Volume 2, 5-5-12*). If more than 10 percent of the facility remains vacant and/or more than 10 percent of the available booking dates are never filled, the project sponsors will never have to purchase carbon credits – let alone mitigate for the impacts of all the additional car traffic and transit use on the ground. The Sierra Club believes that the project sponsors should mitigate for all GHG emissions.

Additionally, the Sierra Club thinks that the requirement to mitigate for greenhouse gas emissions should not end after 30 years, as the project sponsors propose, but should continue as long as the facility is in use.

The SC also notes many inadequacies in the 1999 and 2006 testing for hazard substances in the soil at the site, including the fact that the methodology used in 1999 and 2006 is outdated.

The Sierra Club believes that the project sponsors should design a project that remains at the current site in Oakland but proposes conversion of the parking lot for the Oracle Arena into workforce housing – and then compare GHG emissions to current operations.

Sincerely,
Susan Elizabeth Vaughan
Chair
San Francisco Group, Sierra Club

UCSF
University of California
San Francisco

September 22, 2015

The Honorable Edwin M. Lee
City Hall, Room 200
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102

Re: Golden State Warriors Arena and Events Center in Mission Bay

Dear Mayor Lee,

We write as faculty members at UCSF who are also members of the US National Academy of Sciences. Many of us either are, or have previously been, leaders on this Campus. We have seen this University rise to true excellence over the course of the past 40 years, and we look forward to an even greater future for UCSF and the exciting private biotech and medical organizations that it has attracted to Mission Bay. But we are seriously concerned that this future is threatened by the plan to construct a very large sports, entertainment, and event arena in our midst.

As you know, the plan for Mission Bay approved by the Board of Supervisors (October 1998) states, as one of the major objectives of this visionary project:

> Facilitating emerging commercial and industrial sectors including those expected to emerge or expand due to the proximity to the new UCSF site, such as research and development, bio-technical research, telecommunications, business service, multi-media services, and related light industrial…

And indeed, Mission Bay has rapidly become one of the most prominent academic-industry biotechnology/medical complexes in the world. But we cannot stop here: we face increasing competition from other rapidly growing complexes of this type, both in the US and abroad. It will be critical to keep moving aggressively forward, if we are to continue to attract the very best talent – both academic and private sector – to San Francisco.

It is absolutely clear to us that the planned new Golden State Warriors Arena and Events Center in Mission Bay would severely degrade the environment for the many thousands of researchers and private sector biomedical scientists who come to work at Mission Bay each day. It would also curtail the beehive-like, daily exchanges of personnel – from the South Bay and elsewhere – on which the success of the Mission Bay biomedical complex depends. Our major fear is that the Mission Bay site will lose its appeal – not only for the new biomedical enterprises that the city would like to attract here, but also for most of its current occupants. The result could critically harm not only UCSF, but also the enormously promising, larger set of biomedical enterprises that currently promises to make San Francisco the envy of the world.

Much attention has been properly focused on how traffic gridlock caused by the new stadium would affect access to the three new UCSF hospitals that are immediately adjacent to the site, one of which houses one of only two Children's Emergency rooms in San Francisco. It is unavoidable that terrible, and possibly even life-threatening, traffic congestion will be associated with the planned complex, given that it is intended to be the site of some 220 events per year, held both in the evening and during the day (*New York Times*, September 6, 2015; business section, pages 1, 4 and 5). Many of us have experienced the hours-long gridlock that paralyzes all Mission Bay streets before and after San Francisco Giants home games. The absolute paralysis that it creates is already a non-trivial problem, which the planned stadium promises to both greatly expand and intensify.

The presence of the 41,000-seat AT&T Park less than a mile (a 15-minute walk) from UCSF Mission Bay has not been sufficiently factored into the plans to build the Warriors' huge new sports/entertainment complex. The ballpark already significantly impacts life and work at Mission Bay, with nearly 50 San Francisco Giants home weekday games per season. Due to these events, it can take cars and UCSF shuttle buses over an hour to exit from the UCSF parking lot onto the streets, and a 20-minute trip may require two hours.

The widespread traffic impact of AT&T Park games is noted on the website for the San Francisco Municipal Transportation Agency (SFMTA):

> "Motorists are advised to avoid the increased congestion in downtown San Francisco related to these special events and advises commuters to use transit, taxis, bicycles or walk and to avoid using the Bay Bridge in the two hours before or after these games. ... As a reminder to fans, in order to reduce congestion on city streets after all events at AT&T Park, the SFMTA will close eastbound King Street between 3rd and 2nd streets from the seventh inning until after the post-game traffic has died down. Additionally, the northbound portion of the 4th Street (Peter R. Maloney) Bridge will be closed to all traffic except streetcars, buses, taxis and bicycles during the post-game period. (https://www.sfmta.com/news/press-releases/sfmta-weekend-transit-and-traffic-advisory)

Adding an 18,500-seat Warriors complex on top of what is already a transportation mess is asking for disaster. We are highly skeptical of any plan that proposes to segment traffic by restricting 4th street and other routes for "UCSF business only," since those of us at Mission Bay have experienced the unruly behavior of frustrated drivers stuck for long times in traffic jams. In fact, there is no believable transportation solution for two very large complexes placed in such close proximity at Mission Bay.

Imagine dropping a 41,000-seat stadium anywhere within a 1-mile radius of San Francisco City Hall, and then tripling the capacity of Bill Graham Civic Auditorium. It would make no sense, for the same reason that it makes no sense to squeeze the planned Warriors facility into the Mission Bay neighborhood. The resulting perfect storm of traffic would make it miserable for both the existing neighborhood and for sports fans – in addition to threatening the entire future of UCSF as the center of a world-class academic/ biotech/medical complex.

In summary, we urge you and the city to reconsider the wisdom of proceeding with current construction plans.

Sincerely yours,

Bruce Alberts, Chancellor's Leadership Chair in Biochemistry and Biophysics for Science and Education
Elizabeth Blackburn, Professor of Biochemistry and Biophysics, and Nobel laureate
James Cleaver, Professor of Dermatology and Pharmaceutical Chemistry
John A. Clements, Professor of Pediatrics and Julius H. Comroe Professor of Pulmonary Biology, Emeritus
Robert Fletterick, Professor of Biochemistry, Pharmaceutical Chemistry, and Cellular and Molecular Pharmacology
Carol Gross, Professor of Microbiology
Christine Guthrie, Professor of Biochemistry and Biophysics
Lily Jan, Professor of Physiology, Biochemistry and Biophysics
Yuh-Nung Jan, Professor of Physiology
Alexander Johnson, Professor of Microbiology and Immunology, and Biochemistry and Biophysics
Cynthia Kenyon, Emeritus Professor, UCSF, and Vice President, Aging Research, Calico Life Sciences
Gail Martin, Professor Emerita, Department of Anatomy
Frank McCormick, Professor Emeritus, UCSF Helen Diller Family Comprehensive Cancer Center**,** David A. Wood Distinguished Professorship of Tumor Biology and Cancer Research
Ira Mellman, Professor (Adjunct) of Biochemistry and Biophysics
William J. Rutter, Chairman Emeritus, Department of Biochemistry, and Chairman, Synergenics LLC
John Sedat, Professor Emeritus, Department of Biochemistry & Biophysics
Michael Stryker, William Francis Ganong Professor of Physiology
Peter Walter, Professor of Biochemistry and Biophysics
Arthur Weiss, Professor of Medicine, and of Microbiology and Immunology
Zena Werb, Professor of Anatomy

Cc: Tiffany Bohee

From: sulaa@comcast.net
To: Warriors, PLN (CPC)
Subject: warriors new stadium in San Francisco
Date: Monday, July 13, 2015 12:21:28 PM

Dear Brett,
I am very concerned about the new warrior stadium in San Francisco...The health and well being of patients and people are at risk here...
Please help with the new stadium NOT coming to San Francisco!!!

Thank you,
Sula Anagnostou

From: rrraphy@aol.com
To: Warriors, PLN (CPC)
Subject: Comments and objections to the Warrior"s plans and EIR
Date: Monday, July 27, 2015 3:53:48 PM

Dated July 27, 2015

From: Ralph A. Anavy
420 Mission Bay Blvd N #1503
San Francisco CA 94158
Phone 415 647-8093, cell 415 813-7457

Subject: Comments and objections to the Warriors' plans and EIR.

Mission Bay is a planned community with specific businesses allowed in the Master plan.
Mission Bay is subject to strict usage and zoning rules, in particular for type of business, building heights, density, open space. It is a planned community and all buildings must fit within the guidelines of the Master plan.
While the Mission Bay master plan should be respected in its entirety, one can visualize needs for minor modifications. Any requested for variances to the Master plan should be fully justified, and provide offsets.

The EIR clearly shows that the proposed arena and the adjoining developments on blocks 29, 30, 31, 32 ignore this master plan, and will have major negative impacts that are inadequately or not addressed in the EIR.

Many have commented on parking, traffic congestion and the impact on nearby hospitals, UCSF and businesses. I fully concur and will not add to the discussion here, except in voicing my support for the filed objections.

This addresses specific design flaws that are totally ignored in the EIR and are in complete disagreement with the Mission Bay Master plan.
First the height issue: Lots 30 and 32 are zone 90 ft. Lots 29 and 31 are zoned 160 ft and height density is spelled out. Not all the lot surface can be built to 160 ft.
The Warriors could have put the arena that has a peak height of 130 ft on the lots zoned 160 ft max height. Instead they chose to located mostly of it to the east, on the lots zoned maximum 90 feet. This is counter to the Master plan for Mission Bay. Yet they chose to put it on the 90 ft max height lots asking for variances and offering no offsets by lowering the height of buildings on lot 29 and 32.
In order to get conditional approval to the plan, and stay within the Master plan intent for Mission Bay, they should either move the arena to lots 29 & 31(the lots zoned to the proper height for the arena) or offset their request for the height variance (necessitated by placing the arena on lots 30 & 32), by lowering significantly the remaining buildings.
Second the Usage issue: The Mission Bay plan is quite explicit about the type of businesses it allows. An arena and entertainment center are not considered as valid developments in the Master Plan. If an exception is granted, it should be for cause. And the impact on the rest of Mission Bay should be minimized.

But more that just an arena, aspects of the design, not properly addressed in the EIR are of great concern. In particular, the so called "viewing deck" or "sky bar" which it really is.

Usage and reason for the "viewing deck" or "sky bar".
In addition to asking that the height limitations of the Master Plan be raised to 130 ft for the arena on lots zoned 90 ft, (understandable if an arena is to be built, as an arena does require a certain height), the Warriors plan adds a "viewing deck" at 110 ft elevation (on lots zone maximum 90 ft) for the sole purpose of gaining views of the downtown and bridge for their sky bar patrons. This would put the "sky bar", well above the adjacent buildings which are all built within code! Gaining views is an outrageous request for a height variance, one of at least 20 ft, and more like 30 ft! These views are not even guaranteed as the Giants may yet build higher than allowing them to the North! But the impact will not change!
No one gets to climb higher than allowed by code just to get views, especially if it impacts the nearby buildings! And for what? a "sky bar"! Are they also contemplating a restaurant, as it was once described during preliminary meetings? The plans are devoid of any specifics for it, and should be disallowed just for this cause alone. Its impact is not measured. It is being swept under the rug!
The views on the Bay are just as spectacular on the East side. If the Warriors want to add a "viewing deck" or "sky bar", justifying its use which is not allowed in the Mission Bay plan, it should not tower above adjacent buildings, encroaching even more than the arena on the 90 ft maximum height limit of lots 30 & 32.
Furthermore the open deck now looks straight into office and residential buildings windows next to it. These, built specifically within the Mission Bay Master Plan will now have this new invasive intrusion, a few hundred feets away. Above all it is not allowed in the plan.
And its stated usage occupancy of thousands of guests, its hours of occupation (conceivably until 11pm, 365 days per year), its ill-defined and open ended purpose, the bright light pollution impact and the potential noise pollution impact (it is an open deck) on nearby residences is just unjustifiable.
And it is totally ignored in the EIR study. No impact discussed, no offsets, no specifics... a quick underhanded way of trying to slip in this totally unjustifiable aspect of the project!
There are no "sky decks", "sky bars", "sky restaurants" or "sky lounges" allowed in the Mission Bay plan. That aspect of the Arena project should be cut out. Not modified. Just cut out! There are no functional justifications for it, except the Warriors wanting it, at the height they chose!

If the Warriors insist on a "viewing deck" or "sky bar", it should be strictly within the guidelines of the Mission Bay plan, its purpose stated, its limited usage defined and strict use restrictions should be agreed upon. And not subject to future appeal. It should be lower, topping at a maximum height of 90 feet (thus sheltering nearby buildings from its impact). It should face East. Its hours of operation should be pre-agreed upon.
And the EIR should address its specific impact.

Submitted respectfully on July 26, 2015

Ralph A. Anavy
420 Mission Bay Blvd N #1503
San Francisco CA 94158
Phone 415 647-8093, cell 415 813-7457

From: Josh Anon
To: Warriors, PLN (CPC)
Subject: Mission Bay resident concerns
Date: Monday, July 13, 2015 12:40:34 PM

Hi,
I own a unit in the Madrone and have lived here since December, 2012. I'm rather concerned about the traffic implications of the new Warriors stadium. Frankly, it feels like SF doesn't understand traffic flow and density in Mission Bay in general, and I'm concerned that the Warrior's impact is totally unknown/inaccurately-planned. For example:

* I frequently seeing fire trucks driving the wrong way on 3rd St so that they can get to China Basin St.
* Around game times, the traffic on 3rd st backs up so much it's faster to walk downtown and catch a cab than try to drive somewhere.
* The light timing, especially around Berry St and 3rd/4th, makes it very hard to get out of Mission Bay during games. I've had it take me 50 minutes to go from the Madrone to 4th & King because of the light timing.

Right now, during a Giants game, the only way to get out of Mission Bay is to head towards 3rd & 16th, and if the Warriors are there, with 200 events/year at least, we'll basically be trapped. Yes, I know if Salesforce had been there we would've had additional traffic, but I suspect the number of employees would be significant less than the people at a game, and tech busses + people biking to work take even more cars off the road.

I can't imagine the fire department, police departments, and UCSF are terribly happy about having to get through even more traffic to get to an emergency, and in some emergencies, seconds can make the difference between life and death. It seems like a lack of foresight to have built this new station if they can't function at 100% efficiency.

I've also heard the mayor wants to add additional public transit into the area, reducing road space, but I'm sure many people will still drive, and this will just make the roads more congested.

Last, I have additional concerns about parking. We're fortunate enough to have 1 space per unit, but we don't have guest parking and some units have multiple cars. It's quite difficult to find parking during a game, and it's expensive for me to have a driving guest over given how expensive the meters are during games. That hassle will only increase with the Warriors. (Plus guests hate having to drive over here because of the game traffic!)

Thanks,
Josh

From: Patricia Arack
To: Warriors, PLN (CPC)
Subject: Warriors Arena in Mission Bay--NO!
Date: Friday, July 24, 2015 10:58:15 AM

I think putting a sporting arena that close to a hospital with very sick people is not only bad planning, it is greedy and selfish. The hospital and the UCSF buildings were there first. The traffic, noise, pollution, and general crowding and confusion that this plan would bring should be obvious to everyone concerned. I vote no on the arena in Mission Bay.

Patricia Arack, ESL Faculty
City College of San Francisco
Ocean Campus; Office: 532 Batmale Hall,
Phone: 415-216-9221

"All experience is an arch where through gleams that untraveled world."
-- from "Ulysses" by Alfred, Lord Tennyson.

From: Maylou Bartlett <mayshinb@gmail.com>
Sent: Friday, July 17, 2015 10:05 PM
To: Warriors, PLN (CPC)
Subject: Warriors stadium should remain in Oakland where accessibility to the entirety of the Bay Area is best

From: Jason Barton
To: Warriors, PLN (CPC)
Subject: Warriors Arena
Date: Monday, July 27, 2015 1:54:48 PM

Hello,

I live in the surrounding area, Potrero Hill, of the future Warriors Arena and I am writing this email in support of the new arena. I believe the stadium is the perfect choice for this neighborhood. The Mission Bay has been poorly planned up to this point as outlined in this video clip comparing SF and Vancouver https://vimeo.com/86566866. The Mission Bay has become a sterile business park without any character or life. It needs something that can give it some kind of character and a major NBA sporting arena can help do just that. The arena alone will not give it a character, but the businesses that will sprout up once it is developed to support the people coming and going should reflect more character than another office building that closes down at 5 pm. I am excited for the bars, restaurants, and other small businesses that will come to this area to support the weekend and after 5 pm events (note: I am a parent of two, not a single kid just looking for parties)

The arguments against the stadium do not hold water

-The traffic will be horrible

The traffic is already horrible because of the Giants game. The addition of additional cars are not going to make traffic worse it will just be traffic more frequently something that will happen no matter what is built there. The detractors make it seem like the traffic will be analogous to a flood where cars are going to pile on top of each other and block every nook and cranny preventing any kind of human movement

-The space is for bio science

I'd say there is an ample amount of research space provided for research between the hospital and UCSF campus.

-The original plan did not call for a stadium

While the very original plan did not include a stadium, the Giants have been kicking around the idea of putting a stadium across the ball park since 2001

-Pregnant ladies and sick children will not be able to get to the hospital

If this were true why did they build it so close to the Giants stadium. The Giants traffic definitely reaches the Hospital. Furthermore, if this were true than I am curious if pregnant women are advised not to live in high congestion areas. Do they not like in the towers near the Baybridge on ramps where traffic is often gridlocked

-It will be difficult for employees to drive to work
SFMTA has been employing a policy of making driving worse for years and years.

-The infrastructure is not adequate to support this arena.
I am not aware of SFMTA being proactive in creating infrastructure for a neighborhood. You need to build it first and then use the funds to create the infrastructure

This is private land and it will be developed along with the traffic. Please approve this project so we do not get another borring business park and a neighborhood without character and turns into a ghost town on weekends and evenings.

Best Regards
Jason Barton

Jason Barton
Potrero Hill Resident

From: Sharon Beals
To: Warriors, PLN (CPC)
Subject: Warriors Arena
Date: Monday, July 27, 2015 11:41:43 AM

Hello,

As someone who has lived on Potrero Hill for over 25 years, I must comment on the proposed Warriors project. Traffic getting in and out of our neighborhood has already increased and slowed to a crawl during rush hour, and is even worse before and after Giant's games. Third to Cesar Chavez is impossible, and the other directions to 80 on 3rd and 5th are a half hour crawl to get on the freeway. All despite the promise of better public transportation that were made before the Giants moved into town.

Can you imagine what it will be like with Warriors games and the events that will certainly be held their off season year round? I think this is absolutely the wrong place for a new stadium and yet another development to be built.
But I am sure that our current city father's will explain these problems away, and we'll no longer be living in what was once the best neighborhood in the city.

Has their been any consideration of putting them in the Candlestick site?

Sharon Beals
1454 Rhode Island Street

Beals

From: Lynda Bilodeau
To: Warriors, PLN (CPC)
Subject: Warriors Stadium
Date: Sunday, July 26, 2015 3:44:39 PM

As a second generation San Franciscan, I am writing to voice my opposition to the building of the proposed Golden State Warriors Arena and Events Center at Mission Bay. This is the worst idea and it would not be a welcome addition to the neighborhood.

The area is already congested with traffic and this structure would only add more congestion.

Regards,
Lynda Bilodeau
Lynda.bilodeau@yahoo.com

From: Norman Bookstein
To: Warriors, PLN (CPC)
Subject: arena not a welcome addition to the neighborhood or the Bay Area
Date: Monday, July 13, 2015 1:54:50 PM

As the most congested city in the US, we have seen what a mess ensues with each game by observing the ball park.
We really do not need a new stadium, especially in an area that impacts the whole bay area.

I for one, and one of many oppose it.

-norman bookstein

From: Cathy Bullard
To: Warriors, PLN (CPC)
Subject: Warriors
Date: Friday, July 24, 2015 12:25:53 AM

Please do not go forward with this project. It is not good for the neighborhood nor for the Warriors to move out of Oakland. Thank you for your time.

Cathy Bullard

--
Sent from myMail app for Android

From: Jessie Bunn
To: Warriors, PLN (CPC)
Subject: Warriors Stadium
Date: Monday, July 06, 2015 4:21:12 PM

Brett Bollinger:

I'm writing to oppose the construction of the Warriors new stadium at the currently proposed site in Mission Bay. I'm a neighbor in the area, already affected by the great increase in traffic on game days from the Giants Stadium. We often have complete gridlock NOW on home game days. An additional arena for a very popular team (!) would make the area impassable on Warriors game days. I have read the traffic solution currently being considered by the City and the Warriors, and find it laughable. The neighborhood simply doesn't have enough parking to support TWO major stadiums within blocks of each other.

I'm also a nurse, and completely agree with the California Nurses Association's opposition to the new Warriors stadium. The traffic congestion will make it difficult or impossible for patients, families and emergency responders to reach the new UCSF Hospital on game days. Emergency access to the Hospital is critical to the survival of patients. The gridlock produced by the proposed Warriors stadium would result in patient deaths.

Thank you for your consideration,
Jessie Bunn, RN, PNP
555 Missouri St

From: Karen Burkhart
To: Warriors, PLN (CPC)
Subject: Warriors
Date: Thursday, July 16, 2015 8:57:01 AM

They belong in Oakland!!!

Sent from my iPad.

From: John Cale
To: Warriors, PLN (CPC)
Subject: Warriors Arena
Date: Monday, July 27, 2015 3:34:53 PM

I'm a homeowner on Mississippi St and would love the Arena in my Neighborhood. For people who are concerned with parking issues maybe we can extend the permit parking hours. John Cale

From: Janet Carpinelli <jc@jcarpinelli.com>
Date: August 4, 2015 at 12:06:53 PM PDT
To: warriors@sfgov.org
Subject: 2014.1441E DSEIR traffic/parking comments

Hello Brett Bollinger

Re: Comments on Warriors Traffic/transportation Management proposal DSEIR
2014.1441E Golden State Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Based on the transportation Management Plan presented to Dogpatch Neighborhood Association by the Warriors (Theo Ellington, and MTA Peter Albert) on July 14, 2015, the plan lacks sufficient plans/funding for congestion management.

There is a need for:

1. No added parking at 19th St./Illinois St because it will:
a. add to Dogpatch traffic congestion while not serving the neighborhood in any way.
2. It will draw game and function day Peninsula parkers through Dogpatch via 280 N. 23rd St off/on ramp, and THIRD St., crowd out the official Traffic route for trucks and bikes on Illinois St. and interfere with the planned but also opposed MTA turn-around loop at 19th and Illinois St as well as the proposed and opposed 19th St. extension and egress for 10 wheeler trucks from BAE ship repair business on SFPort land.
3. It will interfere with/cause safety issues for pedestrians, park users of the upcoming Crane Cove Park at 19th St./Illinois and Blue Greenway along Illinois St and Pier 70.

2. Need for more PCO's pre and post game/event located throughout Dogpatch and south to Cezar Chavez to avoid traffic going through neighborhood to/from 23rd St. on/off ramp at 280 N. Traffic should be kept off Tennessee, Minnesota, Indiana, 22nd St and 20th streets as these are mainly residential in nature.

3. Dogpatch Neighborhood mitigation projects/ funds need to be identified and funded by the Warriors:
These could include:

a. 250 parking space garage located on Port land or south of 24th St. Dogpatch (with shuttle buses to the stadium). This lot would also serve workers and shoppers in Dogpatch while not sending traffic through the neighborhood. It could be designed such that it could be a park-like setting or off-leash dog park on non-game days.
b. Ongoing funds for Esprit Park maintenance and capital improvements
c. Ongoing maintenance and upgrading of neighborhood basketball court at the Historic Scott School (1060 Tennessee St) playground area on Minnesota St.
d. Ongoing cleaning/greening funds for public sidewalks and now neighborhood volunteer maintained spaces in and around Dogpatch.
e. Increased funding for more N/S T-Third cars and E/W MTA routes and ongoing funding/maintenance of these expansions
f. Ongoing funding for Blue Greenway
g. Ongoing educational scholarship funds for underprivileged Dogpatch/Potrero neighborhood children to attend Dogpatch and Mission Bay pre-schools, after school programs, and charter schools

Thank you,
Janet Carpinelli
934 Minnesota St.
SF, CA 94107
415-282-5516

From: Cehand, Jadine
To: Warriors, PLN (CPC)
Subject: Letter of feedback re: proposed arena
Date: Tuesday, June 30, 2015 4:12:47 PM

Jadine M. Cehand
420 Mission Bay Blvd N.
#1003
San Francisco, CA 94158

June 30, 2015

Tiffany Bohee, OCII Executive Director
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear OCII and the Golden State Warriors:

I am writing to provide my feedback during the allowed period for the Draft SEIR. I live in Mission Bay with a direct view of the planned venue. Already a neighbor to the SF Giants let me briefly convey my concerns about the planned arena based on my lived experience living down the street from the SF Giants.

Quality of life:

- Noise- Intoxicated people being loud outside after games- after 10 pm and weeknights.
- Public urination and discarded trash/alcohol bottles- fans urinating on our building and landscaping.
- All public parking around the building taken up by sports fans. Try having friends over.
- People driving the wrong way down *one-way* Mission Bay Blvd. North and South.
- Full Muni cars as I am trying to get home from work. I now ride a Vespa because of this.
- Mission Bay shuttles stuck in traffic, mainly due to the next:
- No traffic officers at Mission Bay Blvd N. and S.; cars blocking the intersection in bumper to bumper traffic. Cross traffic not getting through.
- Local traffic diverted off China Basin St. down Mission Bay Blvd. North to accommodate SFPD Southern Station during games.
- People double parked/idling in the "mews" on Bridgeview (our garage entrance).
- Cars idling across our driveway entrance- blocking access to our homes.

And now there will be "traffic lanes" with the new stadium? *Please make sure we can get across 3rd Street to get to our homes*. I strongly recommend/request stickers for our vehicles to make passing through traffic lanes an easier process. Also- anything you can do to route foot traffic away from our homes would be appreciated.

Sincerely,
Jadine M. Cehand, RN
Mission Bay resident
The Madrone

Jadine M. Cehand, NP, CNS
415-503-4789

OBIC & COPE Clinics
1380 Howard St., 2nd Floor
SF, CA 94103

phone: 415-503-4789
fax: 415-503-4791
UCSF Department of Psychiatry

From: Erin Collins <collins.erin@icloud.com>
Sent: Friday, July 17, 2015 8:10:53 PM
To: Warriors, PLN (CPC)
Subject: mission bay resident against warriors arena

keep the warriors arena out! We have enough congestion in our neighborhood as is....Wishing that the residents of mission bay have a voice in this!

Sincerely,
Erin Collins
Resident @ Berry / 6th Street
Mission Bay

From: Marcus Corey
To: Warriors, PLN (CPC)
Subject: Warriors stadium
Date: Thursday, July 23, 2015 1:15:06 PM

We dont need a new stadium we need to help out earth nd community's survive and live

Sent from my iPhone

From: Cornwell John
To: Warriors, PLN (CPC)
Subject: Fw: Comments on Draft EIR of Warriors Mission Bay Project.
Date: Tuesday, July 28, 2015 12:09:18 AM

July 27, 2015

John Cornwell
38 Bryant St #809
San Francisco, CA 94105

Re: Comments on Draft EIR for Warriors Mission Bay Project

I have significant concerns that the Draft EIR does not adequately address traffic impacts beyond the defined project area.

Specifically:

1) The additional auto trips generated by this project will have far-reaching impacts across the entire SOMA district, including on the Embarcadero, and the on-ramps to the eastbound lanes of the Bay Bridge from Bryant, Harrison and First Streets.These are already heavily congested freeway access points.

2) Indeed, it will have a regional impacts on highways, including the Bay Bridge/580/880 maze and 101/92 interchanges, much as Giant's games currently do. On dates with overlapping events at AT&T and the proposed project, traffic will likely be negatively impacted for 8+ hours, including the main auto egress points out of the Financial District.

I believe a wider traffic study area needs to be defined for mitigation analysis.
abxahscx ahsc ashcv acsReceived: from [66.196.81.172] by nm44.bullet.mail.bf1.yahoo.com with NNFMP; 28 Jul 2015 07:00:00 -0000
Received: from [98.139.212.250] by tm18.bullet.mail.bf1.yahoo.com with NNFMP; 28 Jul 2015 07:00:00 -0000
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Received: by 76.13.27.70; Tue, 28 Jul 2015 07:00:00 +0000
Date: Mon, 27 Jul 2015 07:00:00 +0000 (UTC).

From: Michael Crosson
To: Warriors, PLN (CPC)
Subject: Warriors new stadium
Date: Thursday, July 23, 2015 12:05:24 PM
Attachments: 80247180-5411-4629-B21B-225F6C1E8167[177].png

What a total worthless crock of shit!

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THE CAPITOL OF SOCIAL MEDIA

Michael Crosson, Publisher
www.SocialMediopolis.com
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Email: mcrosson@changetheworld.com
Personal website: http://www.MichaelPCrosson.com
LinkedIn profile: http://www.LinkedIn.com/mcrosson

July 23, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

I am San Francisco homeowner and a local (4th and Townsend) worker concerned about the impact of the proposed Golden State Warriors stadium on the future of the close-knit, surrounding neighborhood communities and the medical campus at Mission Bay.

I believe that the proposed stadium will unequivocally add unbearable congestion and stress to the current neighborhood environment, besides creating an impossible situation for the local services including Fire Stations, and healthcare providers such as USCF and Kaiser Permanente.

My co-workers, many of whom are also homeowners in the Soma/Mission Bay have already been impacted by the traffic caused just by the SF GIANTS' home games! Many of us have had to adjust our work hours to avoid the traffic gridlock. This congestion has also impacted the health and welfare of our outside environment and has impeded our enjoyment of daily walks and outside lunching— which we deem necessary to keep up our health and sanity. During home games, it is virtually impossible to navigate the sidewalks and cars around 4th and Townsend not to mention the continuous bombardment of pedestrians who have parked in Mission Bay for the game. This creates sidewalk congestion even when walking on the San Francisco Bay Trail (one of our favorite walking trails) that runs along the Bay near Terry A Francois Blvd, RIGHT at the site of the proposed Warriors Stadium and other mixed-use buildings. This stadium project absolutely promises additional traffic logjams and parking nightmares.

This is area no longer a Healthy SF but a STRESS SF. This community is already impacted with very dense structures. This area should be PRESERVED and developed as a GREENSPACE PUBLIC PARK. As far as I have seen from walking this neighborhood for over 3 years, there is definitely not enough OPEN SPACE allotted for the population. Preserving this area should be a priority for the City of San Francisco! I DO NOT HAVE ANY FAITH, that the City Officials will be able to provide any traffic control that will alleviate the hellish congestion created by this proposed project.

I appeal to the Planning Department to step up, turn this proposition around and instead consider funding an OPEN SPACE 'Heritage' Project – one that this world-class city needs and deserves and an oasis to be enjoyed for many years by the surrounding neighborhoods, the guests and children of UCSF, local workers and visitors. I implore you to consider preserving what little is left of our beautiful waterfront by creating a gem to be enjoyed like Golden Gate Park on the western edge of our city.

This project is not a welcome addition and will only burden the city in the years to come; creating an impossibly hellish situation in an environment that is already unlivable and unsustainable! Again, I appeal to you to you please DO NOT place your support behind this project.

Sincerely,
Micki Cunningham
823 41st Ave
San Francisco, CA 94121

Work address:
340 Townsend Street
San Francisco, CA 94107

From:	Marian Dalere
To:	Warriors, PLN (CPC)
Subject:	My concern with Warriors/Mission Bay Project
Date:	Monday, July 27, 2015 2:09:57 PM

Dear Brett Bollinger,
I wish to comment on the Warriors/Mission Bay project. I was recently informed that Kaiser Permanente medical offices will be moving in the Mission Bay Area early 2016. My doctor and my elderly mother's doctor will be located there. My concern is the traffic especially during game days/special events. Yes, I can plan in advance my appointments but in case of an emergency or urgent care appointment I do not want to be stuck in traffic. I am not a basketball fan and I would not know when game days /special events are. I prefer to drive my mother to her appointments and I would not consider taking an 80 year old woman in a wheelchair on MUNI.
I was born and raised in San Francisco and I respect the development of The City. So I hope the necessary steps will be considered to make automobile traffic flow better in the areas of the UC hospital and Kaiser Permanente Medical offices in the Mission Bay Area most of the time and especially during game days and special events.

Thank you for letting me comment on this and thank you for your attention to this important matter.

Sincerely,
Marian Dalere
mdalere@yahoo.com
Sent from my iPhone

From:	John deCastro
To:	Warriors, PLN (CPC)
Subject:	Comments on Draft EIR for Warriors Arena
Date:	Monday, July 27, 2015 10:03:15 AM

As a long time resident of Potrero Hill that will be impacted by the unmitigated effects of the Warriors stadium and event arena's proposed 205 days a year of activities.

I am disappointed that the City is calling traffic, transit and parking issues “significant and unavoidable”.

First many of our blocks already have Residential Permits. What is the City going to do to keep people hunting for parking in our residential neighborhoods? We already suffer daily commuter parking problems cause by UCSF, Mission Bay and Caltrain that have not been addressed for years.

Second, transit is promised to be improved as a result of the Warriors Event Center. However plans are very fluid and not well described to the neighborhood. The only minor improvement is the 55 line which is an interim measure until the only reliable bus line (22) is removed from 18th St. The 22 is proposed to
be replaced by the unreliable 33.

The concept of a “lock box” for ticket tax revenue is a good idea. However I am waiting for legislative action to make it a reality. Given that the Eastern Neighborhoods Plan called for improved transit 5 years ago. We have seen little progress on that front.

Finally, traffic caused by on going development of thousands of units has not been addressed. How can I believe that the Warriors & City will follow through with their promises?

Potrero Hill is an island with only two east - west streets on the north slope of the Hill that cross the 101. Most of our intersections are gridlocked twice a day during morning and evening commute. Add a Giants game to the mix and we get a third rush hour gridlock.
I am not optimistic that the City is going to be able to implement an effective traffic management plan. The promised traffic officers will disappear during the next economic downturn, never to return unless the ticket tax money is in a “lock box” in the City budget.

If the City and the Warriors are going to build the Arena, traffic, transit and residential parking impacts can not be “significant and unavoidable”. They must be mitigated and addressed before the Arena is built.

John deCastro
Past President Potrero Boosters Neighborhood Association

From: Art D"harlingue
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Monday, June 22, 2015 9:49:47 AM

Dear group reviewing the EIR for the Mission Bay Warriors stadium:

I am writing to express my concern about the proposed new stadium for the Golden State Warriors in the Mission Bay area. I feel that this new complex will have a huge negative impact upon the UCSF Mission Bay medical center and upon the patients which it serves. The traffic congestion created by this new sports complex will make it very difficult for patients and their families to reach the medical center, which could delay urgent or emergency medical care. It is far more important to be able to provide care for the children and families of San Francisco and the larger Bay Area, than to meet the needs of the Golden State Warriors. The Warriors already have an excellent facility for its games in Oakland. Why compromise the care of children for the sake of a basketball team? The City of San Francisco needs to get its priorities straight. The City needs to be more concerned about children and families, and not the financial goals of the rich owners of the Warriors.

Arthur E. D'Harlingue, M.D.
Director, Dept. of Neonatology
UCSF Benioff Children's Hospital Oakland
President, East Bay Newborn Specialists, Inc.
Neonatology Office
747 52nd St.
Oakland, CA 94609
phone: 510-428-3838
mobile: 510-816-8938
fax: 510-428-3542
pager: 510-718-6627
email: adharlingue@mail.cho.org

From: Dhillon, Ragina
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Wednesday, June 24, 2015 4:37:52 PM

To whom it may concern,
I am concerned about the dangerous impact of having the warriors stadium/concert hall across the street from the ucsf childrens hospital. I feel like this part of the city already has issues during the baseball games at ATT park, sometimes hidering staff from getting where they are vitally needed in a timely manner. I also think its a burden stressed parents should not have to deal with. These streets cant handle much more congestion. I hope these concerns are looked at before anything is built because I think it will have a very negative impact on our facility.

R. Dhillon RN

From: HELEN D
To: Warriors, PLN (CPC)
Subject: Warriors at Mission Bsy
Date: Monday, July 13, 2015 8:30:23 PM

I am writing to express my opposition to building a stadium at Mission Bay.

It would cause too much traffic for the area; is too remote and difficult to access;

and is not a good fit with the surrounding medical establishment.

Surely there is a more suitable piece of land available.

Helen Dickey

From: Dieste, Desiree
To: Warriors, PLN (CPC)
Subject: UCSF Employee against Warriors Stadium at Mission Bay
Date: Monday, July 27, 2015 11:29:50 AM

Dear Tiffany Bohee,

I am an employee at UCSF and mother to a small child. I am writing today to share my very serious concerns for the Warriors stadium planned for the Mission Bay area of San Francisco. I commute every day to work along both the Bart and Muni lines (either T or 55). I have literally lost sleep about the commute home on days where the Giants are playing as it makes the commute home absolutely terrible and I am often late to pick my child up from daycare. Commuter trains are packed, late, or they get stuck after on a few stops due to the huge foot and car traffic that results on game days. Busses that were added that can sometimes avoid the Giant's stadium (55, Mission Bay Shuttle, UCSF Shuttles) are no better as cars in the area are desperate to find ways around the traffic and they clog up every side street and major through way for blocks around.

Beyond the commute, imagine being in labor and getting stuck in the traffic or having a child critically ill and needing to get to ER immediately. I have heard of ambulances getting stuck in traffic and have noticed that families are very late to their appointments on days where there are day games. As a mother and patient, I cannot even fathom the anxiety this would produce and would never plan any of my care at UCSF Mission Bay if any additional traffic hazards (like the stadium) were added to an already clogged area.

I feel like the planned stadium would be a huge liability to the City of San Francisco, the Warriors franchise, UCSF, and Kaiser (who is also building in the area) - imagine if the traffic held up an ambulance and a child died? Please consider the patients, employees, and families of San Francisco when considering this proposed development and the true cost it would have to our community.

Best,

Desiree Dieste, MSW, MPH
Pediatric Brain Center
UCSF Benioff Children's Hospital
Dept. of Pediatric Social Work
Phone: 415.514.2934
Fax: 415.476.4748

From:	Jeanie Dorrance
To:	Warriors, PLN (CPC)
Subject:	Mission Bay Arena and Events Center
Date:	Monday, July 13, 2015 1:01:54 PM

Kindly refrain from pursuing a plan to build an enormous arena and event center in such close proximity to UCSF Mission Bay. My daughter is a patient at UCSF Mission Bay and I can see that traffic congestion would likely impede patient access to critical care medical services.

Thank you,
Jean Dorrance

From:	Lewis Ellingham
To:	Warriors, PLN (CPC)
Subject:	mission bay project, sf
Date:	Monday, July 13, 2015 3:55:21 PM

I oppose this project for two reasons: (1) height-limit increases and (2) congestion. I am a frequent user of the UCSF Mission Bay campus, by public transportation. The 3rd Street MUNI line and local bus service is already strained. This huge add-on would be very damaging to both my concerns.
-lewis Ellingham
magicpool@earthlink.net
3850 18th Street, Apt. #306
San Francisco, CA 94114-2653

From: Janessa Faye
To: Warriors, PLN (CPC)
Subject: I SUPPORT the stadium :)
Date: Monday, July 13, 2015 1:18:43 PM

…….NOT!

don't do it. Please understand what the effects on our community would be. Specifically the destruction of the environment, and encouraging people to spend money they don't have.

What does the Warriors team, or the basketball league as a whole do for their community? How do they give back? I only see children who have been pummeled by their parents and coaches, happened to be the best of the best, to be paid exorbantly to "entertain" the crowds, only to piddle it away on childish things, go into debt, and be expected to be perfect spouses and parents as well as players. What kind of upside down world do we live in ?

Please see that we really don't need another stadium around. It is unfortunate football and soccer got their stadium around here but please respect where our lives are and our environment.
Please do not turn your cheek to the extremely fragile state the earth is in.
Please understand and choose to be the honorary example of a man who chooses to put the earth he lives on, the great great grandchildren he doesn't know yet, a fighting chance at survival.

Thank you for your consideration

JANESSA

From: Dan J Finkle
To: Warriors, PLN (CPC)
Subject: Re: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors" Stadium
Date: Thursday, July 23, 2015 12:33:11 PM

Done!

On Thu, Jul 23, 2015 at 12:32 PM, Dan J Finkle <danfinklesf@gmail.com> wrote:

> ---------- Forwarded message ----------
> From: **Alex Doniach** <alex@singersf.com>
> Date: Thu, Jul 23, 2015 at 12:27 PM
> Subject: RE: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors' Stadium
> To: Dan J Finkle <danfinklesf@gmail.com>
>
> Hi Dan,
>
> Thanks for this! if you could forward exactly what you have below to warriors@sfgov.org it would be fabulous!
>
> Thanks,
>
> Alex
>
> **From:** Dan J Finkle [mailto:danfinklesf@gmail.com]
>
> **Sent:** Thursday, July 23, 2015 12:17 PM
> **To:** Alex Doniach
> **Subject:** Re: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors' Stadium
>
> My comment on the proposed arena:
>
> The traffic concerns that the nurses have raised are valid. Put the arena in the Bayview, they need it more than the residents of Mission Bay.
>
> Dan J. Finkle
>
> 2040 Franklin St. #706
> 94109-2979

415-921-4045

On Thu, Jul 23, 2015 at 11:45 AM, Alex Doniach <alex@singersf.com> wrote:

Dear Concerned Resident:

An important deadline is only four days away! **Monday, July 27 is now the final day to submit your comments and concerns about the proposed Golden State Warriors' Arena and Events Center at Mission Bay.** The deadline was extended by one full week, giving the public more time to submit their feedback. Please ignore this email if you've already submitted your comments.

If you have not yet submitted your comments, this is your last chance to join us in letting the City of San Francisco know that the arena is not a welcome addition to the neighborhood.

Need help? We're happy to provide assistance. Email me (Alex) or call at 415-227-9700 for more information.

These public comments are incredibly important as any comment submitted by Monday, July 27, 2015 will become part of the City's decision-making process. Plus, submitting your comment is easy. Either we can submit your letter on your behalf, or you can email a comment of any length directly to:

Brett Bollinger of the San Francisco Planning Department at warriors@sfgov.org.

You can also submit your comments by mail at:

Brett Bollinger

San Francisco Planning Department

1650 Mission Street, Suite 400

San Francisco, CA 94103

Thank you for your continued help and support. Every voice counts!

Sincerely,

Alex

415-806-8566

From: Warriors, PLN (CPC) [mailto:warriors@sfgov.org]
Sent: Wednesday, June 10, 2015 8:06 AM
To: Joyce
Cc: Paul Mitchell
Subject: FW: warriors stadium

From: Alaina Goetz [mailto:alainagoetz@gmail.com]
Sent: Tuesday, June 09, 2015 2:04 PM
To: Warriors, PLN (CPC)
Subject: warriors stadium

Greetings,

Keep the Warriors in Oakland. This is an incredibly ill conceived plan and will result in traffic beyond belief! You propose a few traffic cops to help with the congestion and a few hundred parking spaces?

Surely you must be insane! Have you been in that neighborhood now with the gridlock? No point in directing traffic in complete gridlock.

DO NOT BUILD IT IN SF!!! Please! Think of the families and the people that live there!

Alaina Fischer

15 year resident of Potrero Hill

From: Peter Freedman
To: Warriors, PLN (CPC)
Subject: Danger
Date: Sunday, July 26, 2015 1:12:45 AM

Danger to Medical care.
Please relocate.
Thank you,
Peter

Sent from my iPhone

From: Grabe, Michael
To: Warriors, PLN (CPC)
Subject: concerns over proposed Warriors Stadium
Date: Monday, July 27, 2015 1:55:41 PM

Dear Brett Bollinger,

I am writing to express my personal concerns over the planned stadium at Mission Bay. I am a professor and faculty member at the University of California, San Francisco, and my research lab and office are located on the Mission Bay Campus. The traffic in this region of the city is terrible on many days, especially those that have an event at the baseball stadium. A few months ago it took me 2 hours and 40 minutes to drive a car from Mission Bay across the Bay Bridge. This is completely unacceptable, and it highlights that the growth in this region of the city is outpacing the infrastructure for transport into and out of the region. As you know, this traffic problem is only going to get worse if this new proposed stadium is built in Mission Bay. Therefore, I oppose this new stadium, and I believe that the city should oppose this new construction also.

I want to state again that these are my own opinions.

Sincerely,
Michael Grabe

Michael Grabe
Associate Professor
University of California, San Francisco
Cardiovascular Research Institute
Department of Pharmaceutical Chemistry
555 Mission Bay Blvd South, Room 452T, MC 3122
San Francisco, California 94158-9001
415-502-2874 (office)
415-476-8173 (fax)

From: Max Grant
To: Warriors, PLN (CPC)
Subject: RE: My Opposition to Move the Warriors to San Francisco
Date: Monday, July 13, 2015 2:39:07 PM

Dear Brett Bollinger,

I am greatly oppose to having the Warriors move to San Francisco. I am opposed to this move for several reasons, but more importantly the Warriors are where they are supposed to be. They are in a city that love them--win or loose, support them, and are very loyal to them, not a city that only want them when they are at there best for financial gains.

In addition, San Francisco is becoming overly crowded with parking being a major problem and the city is becoming a city only for the wealthy. And despite of the wealth in the city, no one wanted to spend the money to repair Candlestick park and keep San Francisco 49ers in San Francisco. So , it's an enigma to me as to why it is okay to spend the money to build a new arena to steal the Warriors from Oakland?

Vehicle manslaughter is on the rise in San Francisco, parking is a nightmare, and traffic is a nightmare so a Warriors Arena is not a welcoming addition.

~Max K. Grant

From: Cassidy Hansen
To: Warriors, PLN (CPC)
Subject: No room for arena
Date: Monday, July 27, 2015 6:43:54 PM

3rd street is a parking lot when Giants' games get out. When the two seasons overlap, it will be catastrophic to the locals and those trying to reach the Bay Bridge.

There is hardly room in this tiny city for one sports team. The 49ers move although sentimentally disappointing made sense which is proving to be beneficial for San Francisco, I believe.

Unless a way could be devised to inhibit/divert the majority of extra cars coming into the city with some sort of shuttle service (we know Muni cannot handle it), Mission Bay is going to suffer. Let's also remember there is a hospital with emergency capabilities there. It would be devastating to generate a bunch of gridlock right around a major hospital.

--
Cassidy Hansen
cassidy.lee.hansen@gmail.com

From: Constance Harvey
To: Warriors, PLN (CPC)
Subject: WARRIORS ARENA
Date: Thursday, July 23, 2015 12:10:45 PM

Do not build a new WARRIORS arena in SF; we have too much traffic, the Giants, and all the glorification SF needs! Oakland needs the Warriors, and it gives their young people role models to look up to. Do not take everything away from Oakland. The proposed arena would be a major contributor to an already overly congested area.

I am a huge Warriors fan, and celebrated every moment of their 2015 CHAMPIONSHIP. I have been a Peninsula and San Francisco resident since 1957.

Sincerely,
Constance Harvey

June 30, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

I have serious concerns regarding the environmental impacts of the proposed Warriors Arena, which are not fully disclosed or fully analyzed in the Draft EIR.

Unmanageable Traffic and Incompatible Land Uses

The Draft EIR shows that the project would cause severe traffic gridlock, noise and air pollution in Mission Bay, right next to UCSF and other medical facilities. A new massive entertainment center is inconsistent with these current and previously planned future uses, previously proposed under the carefully developed Mission Bay Plan. Yet, the Draft EIR does not even discuss the land use impacts of the project, which were not analyzed in the Mission Bay Plan EIR.

Additionally, the project will further hinder access to other parts of the City and the Bay Bridge to Mission Bay. Even with the improvements promised by the City, Mission Bay cannot handle up to 18,500 fans at 225 events per year, especially when both stadiums have games. Parking will also be a nightmare, with less than 200 dedicated parking spaces for the 18,500-seat entertainment center. While restricting the number of parking spaces may be considered a means of traffic management under the City's regulations, the practical effect will be yet more gridlock and unhealthy air emissions.

The traffic and parking impacts will reduce access for emergency and urgent care for patients seeking health care services and add to the existing commute challenges for the nurses, doctors and medical staff who work at the Mission Bay medical campus. The Draft EIR also ignores the health and safety impacts of interfering with access to essential medical facilities.

Health Concerns

The project's traffic new massive gridlock and parking problems will also cause significant and unavoidable impacts on air quality. Increased car and truck emissions in the area will be unhealthy for residents, workers and hospital patients. This will have a disastrous impact on the health and welfare of Mission Bay residents and patients and families who rely on UCSF and other lifesaving services in Mission Bay. The Draft EIR fails to address and mitigate these health impacts, relying on vague plans and purchases of emissions offsets rather than effective mitigation measures as required by CEQA.

The current health care and research center is a hub of care and innovation, the future of this world-class medical center should not be jeopardized by billionaires seeking to double the value of the Warriors as a sports franchise on the backs of San Francisco residents.

* * *

Overall, we are disappointed in the City's approach to environmental review of this project, which fails to fully assess the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR. Specifically, reliance on the 1998 EIR prepared for entirely different land uses for several important impact areas defies common sense and CEQA's review requirements. Moreover, the Draft EIR does not reflect a commitment to in innovative and sustainable development, and rather represents a step backward from environmental stewardship.

Thus, we ask that the City of San Francisco avoid the disastrous impacts of the proposed entertainment center on the Mission Bay community, including the health and welfare of patients, families, employees and neighbors. The City should consider alternative sites, other than Mission Bay, for this environmentally damaging project and conduct a new and complete environmental review process before any decisions are made. Additionally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City with respect to this project.

Sincerely,
Alison Heath

333 Mississippi Street

San Francisco, CA 94107

From: jay herda
To: Warriors, PLN (CPC)
Subject: Public Comment: concern about street parking for residents
Date: Monday, June 22, 2015 5:17:50 PM

Hello -

While I'm very excited for the Warriors on their 2015 Championship - I am concerned with the impact that having their new stadium at their proposed SF location.
I live in the neighborhood nearby - Dogpatch - and street parking is already limited by the new hospital, university, private business and Giants fans (why use the paid parking when street is free?).

I would like to see the neighborhood parking restrictions extended later in the day for those without a permit to discourage game goers from using all the street parking before residents get home from work. We see this impact already with the AT&T stadium events and the continuing growth of the neighborhood - it will no doubt occur more with another event center nearby.

Thank you for considering your impact on the residents of the neighborhood
- Jay Herda

From: Sue Hestor
To: Bollinger, Brett (CPC)
Subject: Warriors EIR notice not given to area affected
Date: Monday, June 22, 2015 5:00:38 PM

In other words I can wait in line for an hour or so to pick up the EIR CDs at 1660. The people I talked to in Potrero Hill/Dogpatch had no mailed notice of this EIR even though the parking lots are in their neighborhood.

sue Hestor

From: jazzpix@pacbell.net
To: Warriors, PLN (CPC)
Subject: STADIUM
Date: Monday, July 27, 2015 5:37:56 PM
Importance: High

Please note that I am opposed to the building of a monster stadium in San Francisco's South of Market area. I moved to Potrero Hill in 1987 and, since then, every inch of land has been taken over by the developers and big money interests. Meantime, our quality of living has suffered and it is now impossible to even go to the grocery store without encountering traffic jams. When there is a game at AT&T, traffic is a nightmare and getting worse every day. We were told that measures would be taken to alleviate traffic problems when that stadium was proposed – that has not happened. At the beginning, there were traffic cops to assist with the traffic flow but they disappeared pretty quickly. **My street has become a thoroughfare before and after the games and I take my life in my hands trying to back out with cars racing up and down the hill.** On Sunday, the cars used my street to bypass the runners during the San Francisco Marathon—one after the other coming up the hill from 3rd Street to get onto the 280 south freeway. They are not polite and slide through the stop signs!

We are tired of broken promises!

I have no faith that this is going to be a good move. There is nowhere for the traffic to go. We have run out of land, folks, and also air space and all I see in the area now is one high rise after the other. Those movies now showing San Francisco destroyed are depicting what is going to happen when the next earthquake hits and it is not a pleasurable thing.

Ed Lee and the Board of Supervisors need to get back to taking care of the people who pay the taxes and love San Francisco for its unique qualities. Stop selling our streets to the highest bidder – remember the America's Cup...

I am a dedicated voter and I will not forget who voted for this disaster in the making!

Dorothy L. Hill
519A Pennsylvania Ave.
San Francisco, CA 94107
415-824-3502

From: Mary Hill
To: Warriors, PLN (CPC)
Subject: Support for Warriors
Date: Wednesday, July 01, 2015 2:33:12 PM

I live in Potrero Hill and totally support the new Warriors arena.

Mary Hill

From:	Dennis Hong
To:	Jones, Sarah (CPC); sarah.jones@sfgov.org
Cc:	Bollinger, Brett (CPC); warriors@afgov.org
Subject:	Case 2014.1441E - Event Center Mixed use DEIR
Date:	Monday, July 27, 2015 1:06:23 PM

San Francisco Planning Department
Atten: Miss. Sarah B. Jones, Environmental Review Officer
1650 Mission Street, Suite 400
San Francisco, CA. 94103

July 20, 2015

Subject: Comments on the Draft Subsequent Environmental Impact Report
(Draft SEIR) Case Number: 2014.1441E – Event Center and Mixed Use
Development Mission Bay Blocks 29-32

Good morning Miss. Sarah Jones,

My name is Dennis Hong, I have been a resident and a private citizen residing in San Francisco all my life – Sixty five plus years and currently retired. Thank you the opportunity to review and comment on this exciting Project. I appreciate all the professional work/efforts made by both the OCII and the Planning Department made on this document. I realize that the original scope of work done on this project had changed several times including; a different site, including a number of positive community meetings with the Planning Department, the City, the sponsor (GSW), UCSF and many other stakeholders. In addition, a number of changes have been made (tweaked out) since the publication of the current Draft SEIR – June 5, 2015. To me this shows that progress is being made. As always; communication, collaboration works.

Below you will find my response and comments to this Draft SEIR - as requested by the Planning Department for consideration by the San Francisco Planning Commission, these comments are my personal views. These comments are based on the above Draft SEIR June 5, 2015 – Comment Period – June 5, 2015 to July 20, 2015 (July 27, 2015 @5pm-recently revised).

1. TRAFFIC- I am writing to express my sincere and significant concern with the impact of the additional traffic to this area; both pedestrians and vehicles; both during and after construction. Especially when the project is completed. I have been tracking this project as best as I could. Both the sponsor (GSW) and UCSF have been doing the best possible and with other involved stake holders to resolve some of these issues. This Draft SEIR captures some of that. However, it did not include some of the recent comments and or concessions that came up since it's publication. The recent concerns are mainly with traffic; during and after the games. The possibilities of these issues seem endless. But it looks like all stakeholders are on the same page and are closer than ever to resolving these issues. Most of these issues have been vented, but a compromised plan still needs to be made, the best part is, we are getting there.

2. My main concern is making sure that the traffic issues with pedestrian, vehicle, public transit (Muni, Cal Trains), are worked out with UCSF's master Plan. If the removal of the 280 freeway happens as proposed, it needs to be part of the EIR/plan. Removing this major link and rerouting it under ground as proposed may have a major impact to the project and this area. As I understand it a tunnel would be under Third street which happens to be land fill.

3. Under Cumulative Projects 5.1.5.2, were the following projects considered? HOPE, possible removal of the 280 freeway, Giants Project-Pier 70, 590 Minnesota-UCSF proposed Student Housing and 600 Minnesota-UCSF proposed Student Housing? Several of these Projects may be identified as another name – specifically the HOPE Project. For clarity purposes, could all of these cumulative projects be shown on a map, similar to fig 5-2-12?

4. I realize that the control of Fugitive Dust and construction work is hard to handle. All to often the "best practices" does not work. But with all this work going on how will it affect/impact the ongoing adjacent projects, UCSF's adjacent facilities and their daily operations? The current project at Union Square, Central Subway Station is doing a better than usual job in controlling the dust from entering these high-end retail shops. This includes the California Pacific Medical Center along the Van Ness Corridor. (Use of semi- closed barriers with mesh screens). This may be an better option than some of the best practices.

5. The Draft SEIR does a good job trying to identify the Traffic issues. However, as I mentioned above, since it's publication additional thoughts from the community, MTA, UCSF and others came up are good, these comments should be part of the RTC / Final EIR. All stakeholders have done a relatively good job here. Most importantly the new Arena Facility needs to work with UCSF's Master Plan.

6. More on traffic:

a. During the Events at the arena, add a MUNI shuttle/service to and from the two BART stations 16th and 24th Mission Street to the arena.
b. Provide additional traffic control officers before and after the events.
c. Possibly use other near by garages for additional parking.
d. Restrict traffic along some of the main streets during the events for a smother flow of traffic.
e. During game/event time, work with Caltrans and the city to use a electronic freeway/street type of sign to help direct the traffic before they get in to the Mission Bay area,
these events. They are doing this now when freeway sections and the bridge/s close and it works fine.
f. Consider closing off some of the streets for emergency only access to the hospitals.

7. Aesthetics of the project, both the sponsor and the architects have done an wonderful job. However, I do disagree with some of the comments made on the describing the Area. The use of color Photo-simulations has done an excellent job in showing what this arena may look like. As the design, color and material could have an impact on the visual skyline. I also realize CEQA does not require this step.

8. The new Arena will be an economic boom to both the city and local business, including UCSF, the Dogpatch area and others in the South Eastern part of town.

9.The proposed location is in an ideal part of town. The Sponsor has already done a diligent job in selecting this new site from the original Pier 30-32 which was voted down.

10. Include any other comments made to the (RTC) Response to Comments made during any of the public Planning Commission meetings, i.e., Planning Commission hearing
held on June 30, 2015.

11. Construction Phase, request that the Final EIR provide time lines of this Project.

a. A construction time line showing all ongoing/current, cumulatively or upcoming projects in the vicinity of this project must be considered.
b. Provide the following for controls, signs and etc., for pedestrians and traffic during the construction; traffic control officers, signs, control barriers, etc.
c.Communicate with the local merchants, residences in the area of the dates, construction schedules. Especially if certain streets will be closed. A contact
i.e., Project Manager to call if needed.
d. Provide provisions for dust controls, safety barriers and control signs.
e.Can the use of dust barriers be used to control the dust from getting in to the restaurants, business and residences and the hospital?
f.Can any of the recent/current legislation under consideration (regarding construction dust) be used here? I believe there was something the Board of Supervisors were looking
at on this matter.

12. Will this plan include some of Muni's "Traffic Calming" measures such as some of the intersections along Market Street? This might be a great project to include some of these concept along Market and the Van Ness Corridor.

13. It would be a true shame if the sponsor should abandon this Project. Lets not loose this opportunity of a life time.

In Conclusion: Based on my comments and evaluation of this Draft SEIR, case 2014.1441E of June 5, 2015; I have concluded there is sufficient information and I fully support this Project and this Draft SEIR. With all that said; a little more work needs to be done with communicating and working on the traffic issues, especially how this will or will not impact the Hospitals operations.

If any additional information could be provided in the final Report (RTC), it would be appreciated by the many stakeholders who are personally interested in this project.

Thanks to you, the Office of Community Investment and Infrastructure (OCII), the Planning Department, the Board of Supervisors, the Planning Commission and the Mayors Office for working so hard on this project. I would like to see the process expedited so that construction can start.

Incidentally, I have also been working, I believe with UCSF's most recent Final-UCSF's Long range plan of – November 2014-State Clearing House Number 2013092047, chapter 5.

Thank you for your consideration of my comments as part of the DEIRIS and the process.
Should you have any questions regarding this email/letter, please do not hesitate to contact me at dennisj.gov88@yahoo.com.

Please: If there are any compelling reasons why you think this project should not continue or be delayed, I would be interested to understand why.

Respectfully Submitted,

Dennis Hong

Cc: B. Bollinger
T. Bohee

From: Stan Horn
To: Warriors, PLN (CPC)
Subject: Public comment about Warriors June 5 SEIR
Date: Friday, July 10, 2015 9:15:02 AM

Below is a comment about the June 5 Warriors SEIR. I hope you can incorporate it into the public comments section of the next version. Thank you. Stan Horn

A WIN-WIN FOR WARRIORS-UCSF

There's a win-win way around a potential Warriors /UCSF-land-bankers quarrel whose aim is to thwart the basketball team's Third Street arena plans until a distant time when UCSF may need additional space for research -- and then junk the arena altogether.

In this win-win scenario, the **Warriors** would get an arena a year ahead of when they would have if the mysterious non-UCSF-affiliated group sued "until the cows come home," as they've threatened. Plus, the Warriors would have an assured income stream from office leasing, leading to the best financing rate available in the commercial real estate market; **UCSF and biotech firms** would get access to a half-million square feet of research space accommodating 2000 workers, at a timing of the university's or biotech companies' choosing; the **anti-arena crowd** would get to claim a victory plus save at least $228 million in cash in the first year and earn untold millions later in a few years; and **non-basketball-fan San Franciscans** wouldn't have to travel 100 miles to San Jose and back to see a concert.

Here's how the idea would work:

The property upon which the arena and two 250,000 square foot office/research buildings would be built was purchased by Salesforce in 2010 for $278 million, according to Bloomberg Business News. So UCSF's benefactors would presumably have to pay that sum or more to acquire and land-bank the property. But suppose they land-banked it by leasing all 500,000 square feet now and then sub-leased completed, ready-to-occupy space as researchers needed it over the next several years. At the going rate of $60 per square foot for Class A San Francisco office space, the benefactors would have an expense of $30 million a year. That's as opposed to a minimum $278 million cost of buying-and-banking it…a savings of at least a cool $248 million. The cream upon this cake is that the benefactors would almost certainly be able to sublease the space for more than they leased it, thereby making a neat profit on their good deeds.

In such a scenario, the only losers would be the delay-delay lawyers whose salivating over the prospect of years of fees would suddenly dry up.

From: Stan Horn
To: Warriors, PLN (CPC)
Subject: Public comment about Warriors June 5 SEIR
Date: Friday, July 10, 2015 9:09:20 AM

Below is a comment about the June 5 Warriors SEIR. I hope you can incorporate it into the public comments section of the next version. Thank you. Stan Horn

Because San Francisco couldn't get its act together and build an arena 40 years ago -- the proposed arena site at 4th and Howard was turned into low-cost housing -- the Warriors defaulted to the nearest suitable place, the Oakland Coliseum. Oakland has had a good run. But now the party's over.

There are many good reasons why the Warriors belong in San Francisco.

- San Francisco has twice the population of Oakland. So it should have twice the fan base.

- San Francisco is much wealthier per capita, so it should provide the Warriors with a bigger potential.

- San Francisco's cachet alone will make the team more valuable as it basks in the reflections of one of the world's most popular cities.

- According to FBI statistics, fans visiting the Coliseum must forge through some of the nation's highest-crime zip codes. In San Francisco, the site is bounded by the bay, a world-renowned university, and some of the highest-priced real estate in America…none of which are known as high-crime breeders.

- Before and after games, there are nothing but acres of asphalt parking and concrete freeways and raw gray elevated train stations to greet fans in Oakland. Across the bay the arena would be surrounded by scores of cafes, night-spots, restaurants, bars, bayside parks, and pleasant walks in attractive, lively neighborhoods.

But perhaps the main reason the Warriors belong in the City is that it will finally bring San Francisco a modern events center. San Francisco is the only big city in America that doesn't have one. San Franciscans who want to see a concert, for example, must make a 100-mile round trip to San Jose or a 40-mile round trip to Oakland. No other residents of America's principal cities have to go through that.

Dozens of cultural, entertainment, artistic, educational, and sports experiences that are not now available to San Franciscans would be if there were an arena. In that sense, the events center would be as much a cultural addition to the region as our great museums. And not only San Franciscans would benefit: because of the new Muni-to-BART subway, Caltrain, future high-speed rail, ferry service, and thousands of parking spaces, the arena would be much more accessible to all Northern Californians than the freeway-and-parking-girded Coliseum is.

And don't cry for Oakland. The forever-wannabe has gone after -- and won -- virtually all of San Francisco's port jobs, more than a thousand former San Francisco BART headquarters jobs, more than a thousand former San Francisco Caltrans District IV headquarters jobs, more than a thousand former San Francisco federal government jobs, and more. Some would say that giving a little back is not unreasonable.

From: Stan Horn
To: Warriors, PLN (CPC)
Subject: Public comment about June 5 Warriors SEIR
Date: Friday, July 10, 2015 9:04:42 AM

Below is a comment about the June 5 Warriors SEIR. I hope you can incorporate it into the public comments section of the next version. Thank you. Stan Horn

A Chronicle letter-writer pointed out that more than a dozen cities have arenas near hospitals and co-exist well.

Perhaps the best such example is right here in San Francisco.

For three generations, the 60,000-seat Kezar Stadium was closer to the main entrance of the UCSF Hospital on Parnassus than the proposed 18,000-seat Warriors arena will be to the main entrance of UCSF Mission Bay. Yet never in those generations -- and thousands of 49er, USF, and high school games and traffic -- were there reported complaints about ambulance access. With 200 events per year scheduled and perhaps an hour or two of heavy traffic at each, that means that **96% of each year will be free of arena traffic that might affect ambulances.**

As for parking, there was none at Kezar. The Warriors will build almost 1000 spaces and the Giants are about to build several thousand spaces virtually adjacent to the new arena. Several thousand spaces already exist in UCSF garages, largely empty at nights and weekends when events will be scheduled.

Stan Horn, San Francisco

From:	Christopher Hrones
To:	Warriors, PLN (CPC)
Subject:	Mission Bay Event Center DSEIR
Date:	Tuesday, June 30, 2015 4:07:17 PM
Attachments:	DSEIR comments 063015.docx

To Whom It may Concern,

Please see attached my comments on the Mission Bay Event Center DSEIR. Note that I provided an abbreviated form of these comments at the Public Hearing earlier today. This submission is to ensure that my full comments are submitted for the record.

Thanks very much,
Christopher Hrones

Public Comments

Draft SEIR - Event Center and Mixed-Use Development at Mission Bay Blocks 29-32

Submitted by: **Christopher Hrones, AICP**

Date: **June 30, 2015**

Good afternoon and thank you for the opportunity to comment on this draft SEIR. I am a new resident to San Francisco who has followed this project with interest. Prior to this year I lived and worked in Brooklyn, New York, where I had the opportunity to participate professionally in the planning and public discussion of the Barclays Center arena and associated Atlantic Yards development, which saw the relocation of the Nets basketball team from New Jersey to Brooklyn. Although there are obviously differences between that development and this proposal, there are also some interesting parallels, namely, the creation of a new 18,000 seat multiuse arena at an urban infill site accessible by transit, with major concerns initially expressed by some about traffic and parking impacts.

I would like to offer some observations on my experience in Brooklyn that can be instructive as we think about how to plan for the Warriors arena development.

First, the traffic congestion impact feared by many at the Barclays Center site for the most part did not materialize. As a transportation professional involved in the project from the government agency side, the biggest story for me was that the fear of congestion generated by the arena so greatly exceeded the actual impact that when the facility opened traffic congestion was more or less a non-story. This was due to a number of factors, but the two most important were that transit utilization did meet the project goals, and that vehicle arrivals to the arena were more spread out than projected, as many people who drove came early to the area to go to nearby restaurants, bars, etc. Given this, I am happy to see that this EIR does focus on transit investments. Also, developing retail at the site as proposed will encourage some people to arrive early and eat or drink before an event. This should among, other potential benefits, disperse traffic impacts

A second observation from Brooklyn is that off-street parking supply provided by the project, combined with existing nearby off-street parking, far exceeded demand, and parking availability was therefore not an issue. The 541 parking spaces provided on site were never at full capacity and the lot was typically less than half full for major events such as basketball games. This was due, in addition to high transit mode share, to the availability of many nearby parking lots and garages that had capacity after the workday was over, as well as free and low cost on street parking. Many of the same conditions are present at the

Warriors site and therefore I do not believe parking availability will be an issue here either. I will mention one negative impact associated with parking in Brooklyn -- there has been some concern from residents about parking becoming more difficult in surrounding neighborhoods as a result of arena patrons parking on street. The investigation into Residential Permit Parking zone expansion referenced in the EIR will be important if this type of impact is to be minimized in Mission Bay.

Third, inappropriate staging and idling by for-hire vehicles was a major community quality of life concern that the Barclays Arena plan did not in my opinion adequately address. Subsequent to the arena opening, a curbside area was designated for staging in response to this concern and efforts were made to reach out to the for hire vehicle industry. However, limousines and other vehicles idling in bus stops, no standing zones, etc. continues to remain an issue well after the arena opening. With this in mind, I was pleased to see that the SDEIR calls for a specific plan to stage these types of vehicles. Early and thorough communication with the for-hire vehicle industry will be important to ensure that utilization of the designated staging areas actually occurs.

Fourth, emergency vehicle access, which has been raised as a potential concern by some with this project, was effectively accommodated in Brooklyn, where police and fire stations are located immediately adjacent to Barclay's Center. There were no significant issues that I am aware of with fire or police vehicle response. However, close coordination between these agencies and the project owner was necessary to ensure things went smoothly.

Fifth, management of pedestrian flows, especially immediately after events, can be challenging. Barclay's Center has an excellent pedestrian safety record; however, there was a need to make adjustments after the opening, which in addition to pedestrian management by operational personnel, included creating more effective sidewalk space, adding crosswalks, and installing barriers to prevent midblock crossing. The SDEIR is correct to propose solutions to prevent mid-block crossings to the southbound light rail platform at 3rd Street, and to acknowledge that the intersection of 3rd Street and South Street requires active operational management. I would suggest in addition to this that permanent physical infrastructure to adequately accommodate pedestrian flows, especially at 3rd Street and South Street, be included in the project. It is much easier to implement measures such as pedestrian bulbouts and additional crosswalks as part of the project than trying to create retrofits after the arena has opened.

Finally, the phased nature of the buildout of the Atlantic Yards/Barclays Arena project led to prolonged and repeated construction impacts that overlapped with arena events. This including suboptimal temporary conditions for pedestrians, cyclists, and motorists. I was therefore pleased to see that the plan here is to complete all construction on the site including the office towers prior to the opening of the arena, and I would urge that course of action be maintained.

Having recently lived through the planning, construction, and operation of an urban arena, I hope these observations and lessons learned are instructive. Thanks again for the opportunity to provide comments and best of luck with the project.

From: Brynn Hurlstone
To: Warriors, PLN (CPC)
Subject: Comments about Warriors Stadium Plan.
Date: Thursday, July 23, 2015 4:14:20 PM

Aren't things bad enough already? How can you consciously decide to add yet one more traffic creating, system clogging stadium to an area already mired by traffic jams. It should not take us 1.5 hours to get to the east bay during game time, or an hour and a half to get to the embarcadero from the Bayview if there is a game at any point that day, but it does and we endure. Now you're going to add to the infrastructural nightmare? And for what? We already know that the residents of the Bayview neighborhood factor the least in all city planning decisions, but to essentially ensure gridlock along the only pathway from it to the main segment of the city, and along the least efficient public transit line to boot (the T?) When do the concerns of the constituents finally stack up against the dollar signs? Where is the city planner who has chosen to do this to our city? Have they been to the neighborhood during game time? Have they commuted to and from the Bayview during a 6:00 Giants let-out? Only 2 months ago it took me two and a half hours to make it from the Bayview to the Exploratorium for a presentation, attempted arrival time 5pm. The game had let out at 3! If this city does not have the wherewithal to make it stop and improve our already laughable traffic conditions, can we not at least stop actively making it worse? Please, don't shut down transit for all. Find another location!

Brynn Hurlstone

From:	Richard Hutson
To:	Warriors, PLN (CPC)
Subject:	Warriors Arena
Date:	Monday, June 29, 2015 8:09:24 PM

Via Email: warriors@sfgov.org

Brett Bollinger

City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

I have serious concerns regarding the environmental impacts of the proposed Warriors Arena, which are not fully disclosed or fully analyzed in the Draft EIR.

I have lived on Potrero Hill for a long time, and while it is perhaps a better place to live now than it was 50 years ago, recent development has drastically increased traffic and threatens to make parking impossible for residents. Building the Warriors Arena in this neighborhood will only exacerbate these problems. We already have serious gridlock at certain times of the day at the bottom of Mississippi Street where 7th and 16th Street come together. Soon we will become prisoners in our own neighborhood.

Overall, I am disappointed in the City's approach to environmental review of this project, which fails to fully assess the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR. Specifically, reliance on the 1998 EIR prepared for entirely different land uses for several important impact areas defies common sense and CEQA's review requirements. Moreover, the Draft EIR does not reflect a commitment to in innovative and sustainable development, and rather represents a step backward from environmental stewardship.

Thus, I ask that the City of San Francisco avoid the disastrous impacts of the proposed entertainment center on the Mission Bay community, including the health and welfare of patients, families, employees and neighbors. The City should consider alternative sites, other than Mission Bay, for this environmentally damaging project and conduct a new and complete environmental review process before any decisions are made. Additionally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City with respect to this project.

Sincerely,

Richard Hutson

347n Mississippi Street

San Francisco, California 94107

From: Kathryn hyde
To: Warriors, PLN (CPC)
Subject: My comments: Warriors Stadium
Date: Wednesday, July 15, 2015 8:08:13 AM

Dear Mr. Bollinger-

I am a long time resident of San Francisco and I have worked in the Mission Bay/ Dogpatch area over the course of 7 years.

To be brief and to the point, I am totally opposed to the Warriors Stadium being located in San Francisco for these reasons:

OAKLAND
Oakland needs the Warriors and the jobs.
BART goes to Oakland, it is efficient and has long term sustainability
The City of Oakland and the Warriors can easily enhance the stadium with activities, shops, museums, and other businesses.

SAN FRANCISCO
SF does not need more congestion and traffic problems
Parking lots and a new bus line will not solve the problem
Do not build on landfill
The traffic has changed dramatically for the worse at Mission Bay
Regular events at the stadium will have a negative impact for the neighborhood, businesses and UCSF hospitals in the area.
We do not need more sports and events in that area of the city.

If for some reason you are not able to keep the Warriors in Oakland, I encourage to build the stadium at the former Candlestick Park site. That neighborhood is growing and changing, they need jobs, activities, more businesses and the T - Line trains can be increased. The Warriors would receive recognition for improving the schools, sports activities in the area, and they could add museums and local light manufacturing businesses near the site.

Thank you,

Kathryn Hyde
Resident of San Francisco
94118

From: Jadeinsf
To: Warriors, PLN (CPC)
Subject: Fwd: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors" Stadium
Date: Thursday, July 23, 2015 4:03:46 PM

Hello,
Please see my message below:

Warriors owner Joe Lacob admits that SF waterfront arena is 'going to be a challenge'

and **"waterfront arena starting in 2017 might not be ... can not comply with the public trust doctrine . "** https://www.ecosia.org/search?q=An+arena+can+not+comply+with+the+public+trust+doctrine+governing+waterf
---------- Forwarded message ----------
From: **Alex Doniach** <alex@singersf.com>
Date: Thu, Jul 23, 2015 at 12:28 PM
Subject: RE: REMINDER! Monday July 27 is the Deadline to Voice Your Concerns About the Proposed Warriors' Stadium

"An arena can not comply with the public trust doctrine governing waterfront development in the state, which requires public benefits and maritime use, and San Francisco has far better inland locations, opponents say."

Has an EIS been reviewed?

environmental impact report

n. a study of all the factors which a land development or construction project would have on the environment in the area, including population, traffic, schools, fire protection, endangered species, archeological artifacts, and community beauty. Many states require such reports be submitted to local governments before the development or project can be approved, unless the governmental body finds there is no possible impact, which finding is called a "negative declaration." (See: EIR, negative declaration)

http://www.sfgate.com/warriors/article/A-look-at-alternative-locations-for-Warriors-arena-5099137.php

Another persistent issue with the arena proposal is how to deal with **traffic on the Embarcadero**. Although the site is in close proximity to BART and Muni, a planned 500-space parking lot on-site would be for VIPs only. The arena could bring an additional 18,000 people to the waterfront on game days.

http://blog.sfgate.com/warriors/2014/01/23/warriors-owner-joe-lacob-admits-that-sf-waterfront-arena-is-going-to-be-a-challenge/

https://www.ecosia.org/search?q=An+arena+can+not+comply+with+the+public+trust+doctrine+governing+waterf

On Thu, Jul 23, 2015 at 11:45 AM, Alex Doniach <alex@singersf.com> wrote:

Dear Concerned Resident:

An important deadline is only four days away! **Monday, July 27 is now the final day to submit your comments and concerns about the proposed Golden State Warriors' Arena and Events Center at Mission Bay.** The deadline was extended by one full week, giving the public more time to submit their feedback. Please ignore this email if you've already submitted your comments.

If you have not yet submitted your comments, this is your last chance to join us in letting the City of San Francisco know that the arena is not a welcome addition to the neighborhood.

Need help? We're happy to provide assistance. Email me (Alex) or call at 415-227-9700 for more information.

These public comments are incredibly important as any comment submitted by Monday, July 27, 2015 will become part of the City's decision-making process. Plus, submitting your comment is easy. Either we can submit your letter on your behalf, or you can email a comment of any length directly to:

Brett Bollinger of the San Francisco Planning Department at warriors@sfgov.org.

You can also submit your comments by mail at:

Brett Bollinger

San Francisco Planning Department

1650 Mission Street, Suite 400

San Francisco, CA 94103

Thank you for your continued help and support. Every voice counts!

Sincerely,

Alex

415-806-8566

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Stewardship, in the Christian tradition, implies protection. Man should exist in harmony with the earth, not work against it as is noted in Colossians 1:16-17

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Stewardship, in the Christian tradition, implies protection. Man should exist in harmony with the earth, not work against it as is noted in Colossians 1:16-17

From: Lauris Jensen
To: Warriors, PLN (CPC)
Subject: Oppose!
Date: Monday, July 13, 2015 1:23:12 PM

I think the Warriors need a new home outside of SF...it wasn't okay to over-develop at the waterfront/ exceeding height limits, and it's not okay to bring huge crowds into an area that is rapidly becoming overcrowded and already houses a major new hospital, the access to which could easily become compromised when traffic backs up. I'm a native San Franciscan and a big fan but enough! The City needs to function as more than a playground. Sincerely, L. Jensen

From: Jackie Jones
To: Bollinger, Brett (CPC)
Subject: My comments re; Mission Bay
Date: Wednesday, July 01, 2015 4:17:39 PM

Dear Brett Bollinger - Here's the copy of my letter tp you.

Dear Planning Department - My comments in regard to the proposed Warriors stadium, and the UCSF Hospital.
This is an incompatible combination and should be allowed to proceed. The UCSF Medical Center is there already. Adding a sports stadium next to it would be detrimental to UCSF. It would be wiser to seek another location for the Stadium, not nextdoor to UCSF Medical center hospital. Sports games tend to attract a loud and rowdy crowd, which can be aggressive and sometimes violent. Also it monopolizes the waterfront. I object to this choice of location. It would best be put somewhere else. Let's stop it now before the trouble begins.
Please record me as being against the Warriors Stadium at the Mission Bay location. Thank You.
Jackie Jones, 82 1/2 Manchester St. San Francisco, CA 94110 jjonesaw@yahoo.com.
414-648-0117

From: Jennie Kajiko
To: Warriors, PLN (CPC)
Subject: Objection to the Warriors Stadium Complex
Date: Saturday, July 25, 2015 2:14:27 PM

I would like to register my opposition to the planned Warrior Stadium Complex in Mission Bay. I work at UCSF and am a nurse in the outpatient department. I am concerned about the impact on traffic and access for our patients. I also live in the area and feel that one sports complex in a crowded urban area is enough. I am disappointed that the land set aside for this is not being used for the biotech or health science industry rather than entertainment. Thank you for reading this.

Sincerely,

Jennie Kajiko
690 Long Bridge St.
San Francisco, CA
94158

University of California
San Francisco

UCSF

Cardiovascular Research Institute
Department of Biochemistry and Biophysics

THOMAS KORNBERG, PHD
PROFESSOR
tkornberg@ucsf.edu
PHONE: (415) 476-8821

SMITH BUILDING, ROOM 252Z
555 MISSION BAY SOUTH
UNIVERSITY OF CALIFORNIA
SAN FRANCISCO, CA 94143

July 17, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center draft Environmental Impact Report

Dear Mr. Bollinger,

I have serious concerns regarding the traffic flow projections for the proposed Warriors Arena, which appear to not have been adequately analyzed in the draft Environmental Impact Report (dEIR).

Unmanageable Traffic Flow
Based on the dEIR, I have significant concerns about how the traffic will be monitored, handled, and directed around the proposed stadium. The idea that busses will transport people from more distant parking structures ignores the immediate problem of the complete gridlock in the area that blocks all movement in and around Mission Bay for 2-3 hours after Giants games. In looking at another recent stadium example that was also executed poorly, the busses that transport people to the train station from the 49ers Levi's stadium are overcrowded, infrequent and delayed by gridlock, making the trip between Santa Clara and San Francisco a four-hour journey after events. I fear that the proposed Warriors stadium will devolve into a similar unmanageable outcome.

I believe that two dedicated traffic lanes will be insufficient to handle the surge of traffic to this small, landlocked site. I recall all too well that the traffic lanes at Candlestick Park that were specifically directed and reconfigured to handle pre- and post-game traffic did not solve the problem of gridlock and congestion. And Candlestick had direct access to the freeway with no traffic contributing other than game traffic. In contrast, traffic along 3rd Street is already a problem. There is a major traffic flow every afternoon through the area along 3rd Street toward the Giants stadium that contributes significantly to the gridlock that follows every afternoon Giants games. Traffic congestion in the Mission Bay area is certain to continue to worsen as other already approved construction projects are completed and is likely to be devastating to our environment if the Warriors project is approved. I am aware of businesses that have already moved from the area to escape the existing traffic problems, and it is certainly not wise public policy to contribute further to them.

The dEIR appears to assume that scheduling events in the evening will avoid traffic issues, but this seems unlikely if projections of traffic flow have not considered the contributions of all the approved projects that bring new residents and new businesses to the area, or the many occasions when there are coincident events at both the Giants and Warriors stadiums. Does the planning anticipate that attendees will arrive earlier and earlier as traffic and parking problems increase, so that the traffic to night games will inevitably encounter afternoon rush hour traffic? Does the planning address whether TV networks will be able to require earlier than normal Warriors game times? Will there be a stipulation that no event can be scheduled earlier than a certain night hour?

Other major cities with stadiums and sports arenas in urban centers have infrastructure to handle traffic. Madison Square Garden in New York City is serviced almost entirely by public transport. Cincinnati, which has adjacent football and baseball stadiums in its downtown, has adjacent ample parking lots with direct freeway access. By contrast, Mission Bay has no infrastructure to support the increased traffic. The claim recently made on the Michael Krasny forum that the number of attendees to Warriors games is 20% of Giants games does not compute—18,500 is closer to 50% of 42,000. The notion that Warriors' games would only overlap with Giants games on rare occasions ignores the larger number of other events the facility will host – and the combination of other events happening in the City in large spaces such as the Moscone Center that draw traffic through this area. It is not just the Giants games that impact the area and must be considered.

It must be understood as a given that traffic and parking issues will reduce access for emergency and urgent care for patients seeking health care services and will add to the existing commute challenges for the nurses, doctors and medical staff who work at the Mission Bay medical campus. The dEIR ignores the health and safety impacts of interfering with access to essential medical facilities.

Additionally, the project will further hinder access to other parts of the City and the Bay Bridge to Mission Bay. Even with the improvements promised by the City, Mission Bay cannot handle a surge of up to 18,500 fans, especially when both stadiums have games. Parking will be a nightmare, with less than 200 dedicated parking spaces for the 18,500-seat entertainment center. While restricting the number of parking spaces may be considered a means of traffic management under the City's regulations, the practical effect will be yet more gridlock and unhealthy air emissions.

I am disappointed by the City's failure to realistically consider the inevitable traffic problems and the compatibility of the project with the homes, businesses and hospitals already located in the area. There is already a major problem with traffic that the City has not addressed and the modest improvements to public transport and efficiency of existing traffic lanes that have been proposed solution seem to be woefully insufficient. Certainly, the claim that there is already ample infrastructure and public transport to handle traffic is false, and the problem will only be exacerbated by the growth that is already approved.

No new major projects should be approved unless and until a solution to the existing problem is solved.

I ask that the City of San Francisco recognize the health and welfare of patients, families, employees and neighbors of the Mission Bay area and avoid the disastrous impacts of the proposed entertainment center. The prudent course would be for the City to consider alternative sites other than Mission Bay for this quality of life damaging project, and conduct a new and complete review process before any decisions are made. Additionally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City with respect to this project.

Sincerely,

T Kornberg

Thomas Kornberg, Ph.D.

From: dmlsf94109@yahoo.com
To: Warriors, PLN (CPC)
Subject: Warriors Stadium at Mission Bay
Date: Thursday, July 23, 2015 1:13:38 PM

The stadium would impact the already overloaded traffic/parking and level of crime in the city. Regardless of proposed income incentives from this project, I feel we have too many outsiders coming into the city and they only add to the traffic/parking and crime level.

I have lived in the city for over 40 years and it has only gotten worse with the addition of sports venues.

Thank You,

Donna Lange

Sent from Windows Mail

From: Michelle Lanting <claypotmassage@comcast.net>
Sent: Monday, July 20, 2015 7:47 AM
To: Warriors, PLN (CPC)
Subject: Keep mission bay clean

To Brett Bollinger of the San Francisco planning department,

The Golden State Warriors have given new inspiration to sports fans this year.

This inspiration will be even more appreciated when the team decides to build their arena elsewhere, rather than at Mission Bay.
That is an unwelcome addition and will supersede the needed protection of the bay.
Please ask the warriors to choose another site and leave Mission Bay alone.
Thank you,
Michelle

Sent from my iPhone

From: Amy Laverdiere
To: Warriors, PLN (CPC)
Subject: Warriors should not come to SF without proper traffic and parking mitigation
Date: Monday, July 27, 2015 2:55:21 PM

Hi there,

I fully agree with John deCastro's position on the Warriors project (I've pasted a copy of his letter below). I am already concerned with the level of traffic and congestion in our neighborhood and on the highway exits that bring us home. The city has not presented solutions to our current problems, and so I have no confidence in any action in the future. Also, these traffic and parking troubles won't only affect the residents here, they will affect the potential ticketholders and event-goers. If the arena develops a reputation of being difficult to get to and relentlessly hard and expensive to park at the attendance numbers will be affected. I currently oppose the new arena because of the lack of planning for transit.

Thank you for taking my concerns into account.

Amy

John deCastro's Letter:

As a long-time resident of Potrero Hill that will be impacted by the unmitigated effects of

****
Amy B. Laverdiere
Sr. Manager, Commercial Planning
Cytokinetics, Incorporated
280 East Grand Avenue
South San Francisco, CA 94080
(p) 650-624-3026

From:	Leavitt, Rachel
To:	Warriors, PLN (CPC)
Subject:	Comments on Warriors DSEIR
Date:	Monday, June 29, 2015 9:56:39 AM

To Whom it May Concern,

I am writing you today to express my concerns regarding the proposed Warriors stadium on 3rd Street in San Francisco.

I am a Registered Nurse at UCSF Benioff Children's Hospital, and I love the Warriors. I do, however, value the safety and well-being of my patients, and their families more than a new sports arena directly across from the hospital.

The infrastructure is not in place to accomodate the immense increase in traffic to the area, if a new stadium is built in the proposed location. I am concerned that staff, patients and families will have an undue amount of stress and increased travel time to and from the hospital on game days (already experienced on Giant's home game days). It took more than an hour to go 2 miles on the last Giant's home game day, and I would expect this issue to occur routinely if the proposed stadium is built.

Having a sick child is stressful enough, I would hope that adding this extra burden to families and staff caring for them, is something you would consider as a serious negative impact that the stadium would have in its current proposed location.

I hope that the children and their families would hold a higher priority than a "nice to have" new stadium.

Thank you for your time, and thoughtful consideration of the impact of this proposal.

Sincerely,
Rachel Leavitt, RN
UCSF Benioff Children's Hospital
San Francisco

P.S. Go Warriors!!

From: Jeremiah Lee <mass@jeremiahlee.com>
Sent: Monday, July 20, 2015 11:13:45 PM
To: Warriors, PLN (CPC)
Cc: info@missionbayalliance.org
Subject: Another stadium will make Mission Bay unliveable

I lived in Mission Bay for two years at the Radiance Building on Mission Bay Blvd and recently moved out of the neighborhood. I left Mission Bay primarily because AT&T Park and its crowds wrecked havoc on the burgeoning neighborhood. Anytime there was a Giants game, it became impossible to get home using the inbound T line. Fans would transfer to the T line starting at Civic Center and fill it beyond capacity. Working in SoMa, it became impossible to board a train home.

Driving was also impaired. Just trying to leave my home or return to it during a game sometimes meant planning an additional half hour to get through the few blocks of traffic.

After games, the neighborhood sidewalks were covered in trash, vomit, and urine of drunken fans.

Adding a basketball stadium to Mission Bay would make this nightmare a year round nuisance. Stadiums don't belong in urban centers. Don't let the Warriors ruin the neighborhood with the most potential in San Francisco.

Sincerely,
Jeremiah Lee

July 27, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

California Nurses Association has serious concerns regarding the environmental impacts on patient access, safety and health of the proposed Warriors Arena, which are not fully disclosed or fully analyzed in the Draft EIR, and show a fundamental incompatibility between the project and Benioff Women and Children's Medical Center located across the street.

Unmanageable Traffic and Incompatible Land Uses

The Draft EIR shows that the project would cause severe traffic gridlock, noise and air pollution in Mission Bay, right next to UCSF and other medical facilities. A new massive entertainment center is inconsistent with these current and previously planned future uses, previously proposed under the carefully developed Mission Bay Plan. Yet, the Draft EIR does not even discuss the land use impacts of the project, which were not analyzed in the Mission Bay Plan EIR.

Parking will also be a nightmare, with less than 200 dedicated parking spaces for the 18,500-seat entertainment center. While restricting the number of parking spaces may be considered a means of traffic management under the City's regulations, the practical effect will be yet more gridlock and unhealthy air emissions. For the nurses who work at the Medical Center, parking access looms as a major concern, unsatisfied by the parking provisions of the project and the implementation of the Muni transit plan or the timing of the event start times.

The traffic and parking impacts will reduce access for emergency and urgent care for patients seeking health care services and add to the existing commute challenges for the nurses, doctors and medical staff who work at the Mission Bay medical campus. The Draft EIR also ignores the health and safety impacts of interfering with access to essential medical facilities.

Health Concerns

The project's traffic new massive gridlock and parking problems will also cause significant and unavoidable impacts on air quality. Increased car and truck emissions in the area will be unhealthy for residents, workers and hospital patients. This will have a severe impact on the health and welfare of Mission Bay residents and patients and families who rely on UCSF and other lifesaving services in Mission Bay. The Draft EIR fails to address and mitigate these health impacts, relying on vague plans and purchases of emissions offsets rather than effective mitigation measures as required by CEQA. This concern includes the construction phase, which though temporary, occurs next to a health care facility that has large numbers of sensitive receptors.

Overall, we are disappointed in the City's approach to environmental review of this project, which fails to fully assess the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR.

For example, the assertion that there will be no significant impact on access to Emergency Services during events at the project lacks plausibility given the traffic volume and restricted road network. Traffic patrol officers will not be sufficient to identify non-ambulance patients coming to the Medical Center with an emergency, including women in labor. The ambulances themselves may be delayed, which is of course a matter of life and death.

Given these impacts, which the SEIR fails to identify and/or mitigate, and which may not be possible to mitigate, point to the incompatibility of locating the project across the street from a hospital serving some of the most sensitive patients in the region.

Sincerely,

Michael Lighty
Director of Public Policy
California Nurses Association

From: Denise Lowe
To: Warriors, PLN (CPC)
Subject: Warrior Stadium
Date: Sunday, July 26, 2015 1:06:08 AM

I signed the petition to try and stop the stadium but it was a mistake. I honestly do not find any problem with building a new stadium even if it is near a hospital. I want to change my vote and I support the stadium project.

Thank you.

--
Denise Lowe

From: Tina Ly
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Thursday, July 02, 2015 9:06:01 PM

To Whom This May Concern,

Wow, What a season for the Warriors! and for Oakland, the Bay Area, and Warriors fans everywhere. I was born and raised in San Francisco, recently moved to Oakland, and working at UCSF Benioff Children's Hospital where the proposed Warriors stadium sits across. Part time, i work as a real estate agent at Climb SF in Potrero Hill.

While i am happy that San Francisco has grown and flourished so much since i was a kid, i am also troubled at the rate and way in which it is all happening. I am seeing my co-workers, great nurses and doctors, leave the Bay Area because they just can't afford to live here anymore. Most recently, a nurse on our unit who has been vital to our Neuro Neonatal ICU program and her husband who works as a special ed teacher. Portland now gets to benefit from their hard work and dedication in their fields of work.

Having the Stadium built across from the medical center will surely impact the quality of life for all the employees in how they get to and from work. I commute across the Bay Bridge, which isn't bad now (30min average commute), but am very afraid that the numerous game days will extend this. Public transportation is not efficient enough to get me to work in the same amount of time or less. I work 12-hour night shifts from 7pm to 7:30am the next morning and when i get off work, i just want to be home and in bed.

While the Medical Center has a heli-pad, we are limited in the hours we are allowed to use it because of the noise it would create for our resident neighbors. Therefore, we need to rely on efficient ambulance transfers of sick patients in order to get them care. When you are THAT sick, EVERY MINUTE COUNTS.

And what about Oakland? Sure, we can think about all the benefits this has for Oakland, but taking 20 steps back and looking at the bigger picture, we are taking away a positive force from Oakland. A city that needs more positivity in the community. San Francisco has the Giants, we have the techies, we have the city that everyone wants to be in, why not allow Oakland to keep the Warriors and provide them with a new stadium? Because after all, they are our neighbors and as San Francisco continues to grow and spill over, our communities will be shared. Let's allow the Bay Area to grow and flourish together so people have more incentive to stay close and not feel like SF is the ONLY option. Because THAT is what makes people move to other states.

Thank you for giving me this opportunity to speak my mind. I trust that the decision made will be one that sees not only monetary value, but the value of all humans living in this area.

I appreciate your time and consideration.

<3 tina.

From:	dennismackenzie@roundthediamond.com
To:	Warriors, PLN (CPC)
Subject:	Draft SEIR Comments:Warriors Arena & Event Center/Mission Bay
Date:	Sunday, July 26, 2015 10:13:36 PM
Attachments:	EIR-RESPONSE.TO.DRAFT.SEIR-OCII-T.BOHEE-PLANNING.7.20.15.docx

July 26, 2015

Ms. Tiffany Bohee, OCII Executive Director
C/o Mr. Brett Bollinger
San Francisco Planning Department
1660 Mission Street, Suite 400
San Francisco, CA 94103

Re: DSEIR Comments for Response to Warriors Arena & Event Center - Due by 7.27.15

Dear Ms. Bohee and Mr. Bollinger,

Please review and include the enclosed Attachment with my comments regarding the Warriors Arena & Event Center and Mixed-Use Development at Mission Bay Blocks 29-32, Draft Subsequent Environmental Impact Report.

Thank you for all the work you and both the OCII and Planning Department staffs do to put together such detailed and comprehensive reports.

Sincerely,
Dennis MacKenzie

July 24, 2015

Ms. Tiffany Bohee, OCII Executive Director
C/o Mr. Brett Bollinger
San Francisco Planning Department
1660 Mission St, Suite 400
San Francisco, CA 94103

Re: Draft Subsequent Environmental Impact Report (SEIR)
Event Center and Mixed-Use Development at Mission Bay Blocks 29-32
Office of Community Investment and Infrastructure Case No. 20114-919-97
San Francisco Planning Department Case No. 2014.144IE

Draft SEIR Public Comment Period: June 5, 2015 – July 27, 2015

Dear Ms. Bohee and Mr. Bollinger,

I am writing to share my thoughts and comments in response to this Draft Subsequent Environmental Impact Report regarding the Warriors Arena & Event Center proposed to be built in San Francisco's Mission Bay neighborhood in relation to the following issues.

Please study and respond to my following comments addressing the potential impacts that the construction of a Warriors Arena & Event Center can have for San Francisco and Mission Bay.

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Chapter 7 – Alternatives
Page 7-20

7.3.1 – Alternative A: No Project

As required by CEQA Guidelines Section 15126.6(e), the No Project Alternative is evaluated to allow decision-makers to compare the environmental effects of approving the proposed project with the effects of not approving the project. The No Project Alternative represents what would reasonably be expected to occur in the foreseeable future if the project is not approved.

7.3.1.1 - Description of the No Project Alternative

Under the No Project Alternative, the Golden State Warriors organization would not relocate to San Francisco, and Blocks 29-32 in the Mission Bay South Plan area would not be developed with the proposed event center and mixed-use development described in Chapter 3 of the SEIR. Instead, it is assumed that in the short term, the Warriors organization would exercise its option to stay in Oakland, and accordingly, the team would continue to play its home games at Oracle Arena and lease their management offices and practice facility at the Oakland Convention Center in Oakland. Oracle Arena, built in 1966 and remodeled in 1996, is the oldest facility still in use by the NBA. Therefore, under this alternative, it is likely that the Warriors organization would either build a new arena at its current location or relocate and build a new facility in the long term in the Bay Area or elsewhere.

7.3.1.3 - Impacts of the No Project Alternative
Page 7-23

The No Project Alternative would result in similar impacts to those disclosed in the Mission Bay FSEIR and would be subject to all mitigation measures identified in the Mission Bay FSEIR applicable to Blocks 29-32. Impacts of the No Project Alternative would also be similar to those of the proposed project. This is because many of the impacts would result from the conversion of a vacant parcel at this same location to a fully developed City block, regardless of the size of the development, and the same or similar mitigation or improvement measures identified for the proposed project would apply to the No Project Alternative. The impacts of the No Project Alternative as compared to those of the proposed project are summarized below by resource topic. The reader is referred to Initial Study (Appendix NOP-IS) and Chapter 5 of this SEIR for the full analysis of impacts similar to those of the proposed project.

The environmental impact analysis of the No Project Alternative considers only the hypothetical development scenario on Blocks 29-32 described above and does not consider any effects associated with building a new arena for the Warriors basketball team at another location. However, it should be noted that in March 2015, the City of Oakland certified a Final EIR on the Coliseum Area Specific Plan 3 which discloses the environmental impacts of a new sports venue at the current location of Oracle Arena and the surrounding area.

****
My comments and perspectives in relation to these above Chapter 7 items:

One of many potential impacts that a "No Project Alternative" would have if the construction of the proposed Warrior's San Francisco Arena & Event Center is not built at this Mission Bay location, is a fact that has become crystal clear; that is, the Warriors would not be able to return to San Francisco in order to build a new state-of-the-art Arena & Event Center. This option would also prevent the opportunity to offer an indoor multi-purpose facility that would provide not only Warriors professional NBA basketball games, concerts and a variety of sports tournaments and games for numerous college, high schools and other youth programs, but it would also prevent the potential creation of an innovative Model indoor Education & Career Development Classroom within this facility capable of offering a wide range of social-economic benefits including education, career development programs and new businesses for an untold amount of public and private sector organizations, students and youth, young adults, families and our entire San Francisco-Oakland Bay Area Community as a whole.

This is a unique opportunity to build an Event Center and Mixed-Use Development at Mission Bay on Blocks 29-32, that can offer unique and invaluable incentives, inspiration and real-world career guidance and skills development and leadership training opportunities for our youth that would disappear if this Warriors Arena project does not get built. This project can also inspire and create new jobs and careers, as well as build education and career development programs that will not be possible in any other central location in San Francisco, Oakland or other Bay Area cities. I believe it would be an unfortunate failure of our collective responsibilities if we do not cooperate as a city and community and demonstrate the successful leadership necessary to construct an NBA Arena in San Francisco at the Mission Bay location. This is a once in a life time opportunity for San Francisco leaders to collaborate effectively in order to build a professional sports facility integrated with a model visionary, innovative and strategically located indoor Classroom facility capable of enhancing and expanding our capacity to establish effective wide-ranging and healthy socio-economic growth and opportunities for our entire diverse, cross-cultural San Francisco community. At the same time, I believe our public and private sector agencies, corporate leaders and Non-Profit Foundations and officials can work together in collaboration with the Warriors in order to benefit, support and share their professional knowledge and experience inside this Arena & Event Center environment for all our San Francisco, Oakland and our Bay Area schools, youth, teachers, families and communities all year-round.

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Chapter 6
Other CEQA Issues

6.1 - Growth Inducing Impacts

6.3 - Effects Found Not to Be Significant
Page 6.3 – 6.4

Public Services -The project would not create impacts associated with the need for new or altered schools, parks, or other services.

7.3.1.3 Impacts of the No Project Alternative
Public Services / Page 7-41

Schools, Public Health, Childcare, Library, and Street Maintenance Services. Like the proposed project, the No Project Alternative would not result in increased demand for schools because it would not include residential uses. Other public services, such as demand for public health, childcare, library, street maintenance, and emergency medical would be within the assumptions provided for in the overall Mission Bay Redevelopment Plan and analyzed in the Mission Bay FSEIR. These impacts would be less than significant and no mitigation would be required.

****

My comments and perspectives in relation to these above Chapter 6 and Chapter 7 items regarding Schools:

Once again, the failure to build this Arena & Event Center - including the loss of socio-economic growth, enhanced and newly created business opportunities and a wide range of educational and career development programs, jobs, internships, practical real-world experience, leadership training and comprehensive support for our San Francisco, Oakland and Bay Area high school and college age students, non-profit youth and community organizations that can all be served year-round through visiting an indoor Warriors Arena Classroom - would be a huge loss for all sectors of our San Francisco, Oakland and the Bay Area Community; as well as the loss of creating an educational Model for our nations professional sports organizations and teams that would be worthy of emulation for future construction of Arenas and Stadiums throughout our country – and beyond.

The potential loss of building this San Francisco Warriors professional NBA Basketball Arena & Event Center, would also include the lost opportunity to create a model facility with the visionary capacity to initiate and develop an Education and Career Development Classroom in collaboration with San Francisco government, public and private sector officials and business leaders, the San Francisco Unified School District, non-profit youth and community organizations; while at the same time, create effective partnerships with public-private Non-Profit Foundations and philanthropists for financial support and matching funds as well.

The loss of this unique opportunity would also prevent enhancing and expanding much needed opportunities for our San Francisco-Oakland and Bay Area high schools and college students. This Mission Bay location also has the opportunity to inspire new businesses, and offer our public-private sectors and government leaders and agencies to work together in order to enhance and expand long-term, comprehensive socio-economic initiatives and cross-cultural, international sports and education exchange programs as well; if not, this will be instead - a huge and irreplaceable missed opportunity for our interdependent communities of San Francisco, Oakland and the entire Bay Area.

****

7.3.1.3 Impacts of the No Project Alternative
Public Services / Page 7-23

Public Services / Page 7-41
Schools, Public Health, Childcare, Library, and Street Maintenance Services. Like the proposed project, the No Project Alternative would not result in increased demand for schools because it would not include residential uses. Other public services, such as demand for public health, childcare, library, street maintenance, and emergency medical would be within the assumptions provided for in the overall Mission Bay Redevelopment Plan and analyzed in the Mission Bay FSEIR. These impacts would be less than significant and no mitigation would be required.

****

My comments and perspectives below address these above items contained within the SEIR, and the 'less than significant' impact, which will not require any additional schools to be built for our San Francisco Unified School District and family needs. With this in mind, I ask that our collective efforts envision this opportunity to build a Warriors Arena & Event Center in Mission Bay to be considered an invaluable opportunity for the Warriors, City and County of San Francisco's public and private sector officials, the SF Chamber of Commerce, Non-Profit Foundations and organizations – as well as business and community leaders to support the inclusion of an indoor Classroom to be built within this Warriors facility that can be accessible to all of our San Francisco Unified School District's high schools, students and teachers in order to initiate, create and establish an Educational Methodology Model 'Magnet Education & Career Development Classroom' within this Warriors Arena & Event Center in Mission Bay:

I believe the proposal I have shared with the Warriors and all San Francisco public and private sector officials, agencies and leaders can create a "Model Magnet Sports Management & Facilities Operations Pathway" studies, including the numerous multi-media, journalism, business and other curriculums I've shared with you, the Warriors, all San Francisco Unified School District leaders and San Francisco officials that can contribute to our current challenge to attract parents and families to raise their children in San Francisco, and attend our San Francisco public schools. The numerous jobs and careers associated with any professional Basketball Arena and NBA team, ownership and organization, could initiate tremendously inspiring incentives for high school age students to listen to and learn from all the professionals presenting their knowledge, experience and guidance within this proposed state-of-the-art Warriors Arena and Event Center High School-College Career Pathway & Field Study Classroom. I trust there would be tremendous interest throughout our San Francisco and Bay Area communities and schools to participate and become involved in an education system that included real-world experience and training within this Warriors Arena in San Francisco's Mission Bay.

This indoor Warriors Arena Classroom would have the capacity to create first-of-its-kind Model programs; including the ability to serve as a model for building future NBA Arenas throughout the country, and the Americas - as well as a unique opportunity to serve our community, city, state and country by establishing and building a National Model for other professional sports organizations and teams across the country for generations to come.

In addition to my comments above addressing these issues contained within the SEIR, I respectfully ask that you and your OCII and Planning Department staff and city officials take into consideration the details of the comprehensive programs and positive influential impacts of this Arena that I have shared with you through my previous communications and materials in writing and in public comments at both the OCII and Planning Commission hearings regarding this Arena & Event Center, my proposal to include a high school classroom within this Arena, and this Environmental Impact Report.

I respectfully ask that my proposal requesting the Warriors and SF city officials and leaders collaborate in order to include the far-reaching positive impact the construction of a High School-College Career Pathway & Field Study Classroom© within this SF-Warriors Multi-Use Arena & Event Center can have for San Francisco and this proposed project to be built on Blocks 29-32 in Mission Bay. I also ask that this Environmental Impact Report consider - and comment on - the immense potential loss that not building this Arena & Event Center would have; including the lost socio-economic benefits and educational programs and options lost through the failure to build this project would have without initiating a national Model Education and Career Development Classroom for the benefit of supporting our students, youth, young adults, families, communities and newly created business opportunities in the present - and for generations to come.

Thank you for your time, and the immense effort you and your staffs have dedicated in order to study and assess these numerous environmental and community issues and impacts that the construction of this proposed Warriors Arena & Event Center in Mission Bay will have for our entire San Francisco community – for generations to come.

Sincerely,

Dennis MacKenzie

From: Mason, Amber
To: Warriors, PLN (CPC)
Subject: comments on warriors DSEIR
Date: Saturday, June 27, 2015 12:25:21 AM

Hello,

I am a nurse at UCSF BCH. I have major concerns regarding the warriors stadium location proposal in San Francisco.

I have heard the debates both for and against the proposal. However, having two stadiums so close to the hospital would be detrimental to our patients, families, and employees.

I am less concerned with my personal commuting problems. More so, I am concnerned with the fact that critically ill patients will not receive the care and attention they deserve and are now able to receive. I have spoken with several AMR employees as well who have major concern regarding the transportation of patients to the hospital when there are events. I am also a transport nurse that works closely with AMR and I have seen first hand how badly traffic can impact our patient care.

Often patients are in a Code III situation, where lights and sirens are permitted. Most often, however, our patients are getting transported because they are very very ill and are near code status. It is imperative that we not sit in heavy traffic and get in and out of the hospital very quickly. Our resources are limited on the ambulance and we simply need to get back in a safe manner of time.

I am afraid that our paitent's safety will be compromised and also that patient and family satisfaction will dramatically decrease and therefore the hospital will eventually lose the funding we need to continue to be one of the top hospitals.

Please consider my deep concerns.

Thank you

From: Bruce McDougal
To: Warriors, PLN (CPC)
Cc: Bruce McDougal
Subject: Public Comment on Warriors Arena
Date: Monday, July 27, 2015 7:45:15 AM

Re: Case No.: OCII: ER 2014-919-97
Planning Dept.: 2014.1441E

Thank you for the opportunity to comment on the proposed Warriors Arena project and related office buildings in Mission Bay. As a local resident (I live by the Ballpark at 2nd and King) I strongly support the proposed development as a sport and entertainment destination for our neighborhood. Please see my thoughts below:

1. Traffic. The original proposal to locate the Warriors Arena at Pier 32/34 was far preferable from a traffic perspective as it would have permitted visitors to the Arena to use the multiple public transit lines that pass within a few blocks of that location. However, in view of the significant politics and expense associated with that proposal, I feel the current proposal is the "next best thing" while still providing our neighborhood the benefits of the vibrancy and activity that will be generated by the Arena. I call on Muni and Caltrans, in particular, to take whatever steps they can to enhance service in and around the proposed arena and understand that the Arena would use extra traffic-control officers during events in the same way that Giants games do.

2. Aesthetics. The Arena, with its round, gleaming design, will be a striking presence on the waterfront and in the neighborhood. The Mission Bay neighborhood has been built, for better or worse, with a very standardized, stucco-box and concrete aesthetic, and the proposed arena will shake that up quite a bit. When the building is empty, which will be most of the time, it will be an enhancement to have a modern building in our midst. Also, the landscaping of the waterfront park will help extend the beautiful jogging/bike trail that's been started further north.

3. Neighborhood benefits. Just as with the Giants ballpark, the presence of the Arena in Mission Bay will attract and encourage the development of restaurants, bars, and other entertainment facilities, more than would be drawn to the simple residential and office neighborhood that's been built around UCSF. As in the South Beach neighborhood, those bars and restaurants will attract more residents to the area and will generate taxes and activities even when the Arena is dark.

Thank you,

Bruce McDougal

From: Rusty Mills
To: Warriors, PLN (CPC)
Subject: Golden State Warriors' Arena
Date: Monday, July 13, 2015 2:25:16 PM

Mr. Brett Bollinger:

We don't need or want another congestion-producing sports palace in San Francisco. This city has a very limited geographical area which is already far too built-up. Please think about the consequences to the residents of the city -- instead of catering to the money-grubbers who would gladly turn the city into a dysfunctional ants' nest if they can make money from it.

~Russell Mills
115A Noe Street
San Francisco

"The past, like the future, is indefinite and exists only as a spectrum of possibilities."
~ Stephen Hawking

From: Jani
To: Warriors, PLN (CPC)
Subject: The Warriors stadium
Date: Monday, July 27, 2015 2:45:09 PM

Dear sir or madam,

I have lived here on Potrero Hill for over 20 years.

I AM 100 PERCENT AGAINST THE IDEA OF BUILDING A WARRIORS STADIUM ON 3RD ST AND 16TH STREET!!!!!!!!!!!!!

WE DO NOT WANT THAT STADIUM BUILT HERE IN SAN FRANCISCO!!!!!!!!

KEEP YOUR TEAM IN OAKLAND!!!!!!

The Oracle arena in Oakland is a PERFECT place for that team!!!

WE HAVE BEEN BOMBARDED WITH AN INSANE AMOUNT OF DEVELOPMENT HERE IN THE EASTERN NEIGHBORHOOD. PLEASE GIVE US A FLIPPEN BREAK!! FOR GOD'S SAKES!!!!!!!

Thank you,
Jani Mussetter

From: KimOsborn2
To: Warriors, PLN (CPC)
Subject: Strongly Opposed to New Arena in Mission Bay
Date: Monday, July 27, 2015 12:18:58 PM

Dear Arena Planners,

We who work in Mission Bay already face many days a year in which a normally 35 minute commute home takes 60 minutes or more due to traffic congestion from Giants' games. Even if we like baseball, it makes us glad whenever the Giants are away or baseball season is over. For those away or off season days we actually get a sensible commute time.

The original city plan for the area included more EVENING entertainment space, not a massive new stadium with hundreds of events at all times of day, all year long. If the traffic were more congested after dark, that would probably be fine. During the day time, however, the Giants' stadium congestion is already enough of a challenge.

I signed UCSF's WinWin petition because it is better than total surrender, but I would really vastly prefer that you put the new stadium somewhere else entirely.

It really isn"t fair to take a neighborhood already seriously damaged by the congested traffic around AT&T ballpark events to endure a doubling of the traffic with the Warriors' stadium.

We could use a lot more retail establishments around here, and smaller restaurants would do well. The thousands of us working out here don't have a lot of choices to walk to at lunch time. That would be a welcome addition. And that is the type of thing that was on the original plan I believe.

Ah well,
I hope the project goes somewhere else,

Kim

From: Steven Pelly
To: Warriors, PLN (CPC)
Subject: Stadium
Date: Thursday, July 23, 2015 7:08:19 PM

New York City went through the same process when a stadium was proposed for Manhattan .
It was defeated, sensibly, as incompatible with Manhattan.
Same logic-different city, it doesn't belong in the Mission .

From: Mary Pezzuto
To: Warriors, PLN (CPC)
Subject: don"t gut the Warrior"s base!!
Date: Monday, July 13, 2015 2:16:36 PM

Dear Mr. Bollinger,

I'm writing to offer my perspective on the proposed Golden State Warriors Arena and Events Center at Mission Bay.

The Warriors have been Oakland's team for decades, and they belong here. This is where the heart is. You will lose a significant portion of your regular ticketholders with the move, and derail the (current and ongoing) accessibility of East Bay youth and community to continue to afford and gain access to the team we love.

Moving to SF may seem strategically great from a financial/investment perspective, but that's not everything. It's not that I dislike change, it's that if you saw the turnout that came to the parade, or the energy in the playoffs and the finals, you know that Oakland doesn't just support, Oakland needs and loves this team. And Oakland needs a team to love.

I was born in SF, and my family has been here for 5 generations. I love the city. It's not about that. San Francisco has plenty of reason to party and celebrate, with all the attractions and civic and community pride. I'm thinking Pride Parade, BatKid, St. Paddy's day parade, not to mention the Giants and the 49ers (Okay, so they've left or may leave. You'll still have their parades in SF, and ATT park will continue to be a hip destination and tourist destination.) SF doesn't need more congestion to already overstressed transit, street parking, and street and ramp traffic. It also doesn't need the kind of regentrification that displaces hundreds or thousands of hardworking San Franciscans who keep the lights on and do much of the heavy lifting in the local economy. It needs to fine-tune the garden it's growing, by helping the homeless, supporting underserved neighborhoods, cleaning up the urine-soaked streets and entryways, and providing more grassroots community events to engage the public and energize neighborhood continuity.

Oakland deserves to keep the Warriors. The spirit of connection and civic pride that's evolved from this championship is beyond compare. People here are talking to each other in supermarkets, gas stations, banks, cafes. It's such a happy vibe, and it's pulling Oakland together. Don't hijack one of the most significant bright spots this east bay community has seen in years.

Sincerely,
Mary Pezzuto
Bay Area Native, Oakland & Visitacion Valley

From: elaineyoga1111@aol.com
To: Warriors, PLN (CPC)
Subject: Arena at Mission Bay
Date: Thursday, July 23, 2015 12:04:18 PM

Dear City Planners:

I am writing to plea that you do not approve construction of the planned sports arena at Mission Bay. Such a facility
would have a devastating impact on the Mission Bay Environment and the workers who must travel there to go to work and home again, as well as to the accessibility of U.C. Medical Center.

Thank you for your consideration.
Elaine Pierce
1262 Hampshire Street
San Francisco, California

From: Robert P
To: Warriors, PLN (CPC)
Subject: warriors stadium mission bay
Date: Thursday, July 23, 2015 4:42:44 PM

I object to the construction of this stadium at this location because:
1. Traffic to stadium may occasionally during game days impede or interfere with traffic flow to SF Hospital nearby
2. The water frpnt view belongs to all, and the stadium will deprive us of this pleasure

Robert Pollak
Mountain View, CA 9443
500 W. Middlefield Rd Apt 86

From: Ramsdell, Kay (Catherine)
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Wednesday, June 24, 2015 9:29:00 AM

To whom it may concern,

I am a nurse practitioner at UCSF Benioff Children's Hospital, and I am strongly opposed to building a new Warriors stadium at Mission Bay.

It is already very difficult to commute in and out of the area, so much so that some co-workers have resigned their positions since we left the Parnassus campus. I will also likely resign if this stadium is built. I work in an Intensive Care Unit, and cannot withstand the additional stress of negotiating gridlock at the end of my workday.

The report that traffic can be managed in the area when the new stadium is built is not realistic, and leads me to suspect financial motives/bias in the 'experts' generating this report.

I also cannot imagine adding to the stress of parents with sick children, who already find it difficult to travel to the new Benioff campus.

Ill children matter more than money.

Sincerely,
Kay Ramsdell, RN, NNP, MSN

From: Jana
To: Warriors, PLN (CPC)
Subject: stadium
Date: Friday, July 24, 2015 9:09:56 PM

ABSOLUTELY NOT!!!!!!!!!!!!!!!!!!!!!!!!!!!

From: Rowitch, David, MD, PhD
To: Warriors, PLN (CPC)
Subject: FW: MB and Warriorts
Date: Thursday, July 23, 2015 12:54:31 PM

>To whom it may concern:
>
>As a medical practitioner, I think it is important to ensure that there
>are adequate provisions for traffic to and from the Mission Bay hospital
>site in normal and emergency conditions, that parking for hospital
>employees and patient-families is prioritized and that there is attention
>to very sensitive environment of a high-acuity hospital, where many
>patients and their families are under terrific stress. In this regard,
>behavior of attendees leaving sports or concert events in the
>neighborhood of the hospital vicinity is an important concern.
>
>I think that clear plans to address these issues are needed to determine
>suitability of the Warriors Stadium located across the road from a busy
>hospital.
>
>Yours truly,
>
>David Rowitch, MD, PhD
>Professor of Pediatrics and Neurological Surgery UCSF

From: Gavin R
To: Kim, Jane (BOS)
Cc: Yadegar, Danny; Warriors, PLN (CPC)
Subject: Concerns about Warriors Arena & 5M Development
Date: Monday, July 27, 2015 4:13:08 PM

Dear Ms. Kim,

I've never taken the time to contact anyone at City Hall but two huge developments currently under consideration demand responses.

I work at UCSF Mission Bay and am convinced that the proposed arena development is a huge mistake. I am fortunate to be able to walk to work, but for my colleagues game days at AT&T Park already involve forward planning, changes to schedules, or work from home. Traffic is awful and the already glacial Muni cars are further slowed. The arena development is completely ill-suited to a university campus and medical center location--not to mention a prime waterfront site. The scale is ill judged and and it just does not fit with a world class research institution. The site is poorly served by public transport, just two routes--it only functions now because of extensive private shuttle links.

Secondly I recently learned of the so-called 5M development two blocks from my home (Russ St). I am horrified by the inappropriate scale of the plans. Retail and service businesses are already being squeezed out of Soma, extending the FiDi westward will not help. The plan strikes me as intentionally vague, with promises of retail and art space, that just don't add up financially. Retail even in the Westfield is struggling to survive, and arts organizations don't stand a chance. Witness the Mint building which has sat closed--when that project for a museum (or a gallery, something?) should have been a city priority.

While I'm taking the time to write I'm curious to know what is being done about the vacant lot that used to be a car park on 7th St at Minna. It's been ripped up and become a eyesore, at night it's positively apocalyptic. I can only imagine what the tourists in the 3 nearby hotels make of it. Surely the owner has a responsibility to maintain even a vacant lot?

I could continue, but I won't.

Yours Gavin Rynne

From: Christoph Schreiner
To: Warriors, PLN (CPC)
Cc: Tom Lippe; Samuel Barondes
Subject: Vibration sensitive equipment at Mission Bay
Date: Monday, July 27, 2015 2:44:03 PM
Attachments: Vibrationexamples.pptx
ATT00001.htm

Dear Ms Bohee:

The following statement is provided in addition and as complementary information to the comments provided to you by Tom Lippe (Law Offices of Thomas N. Lippe APC, 201 Mission St., 12th Floor, San Francisco, CA 94105) on behalf of the Mission Bay Alliance regarding the Warriors Arena Project.

Surveying the vibration-sensitive equipments that are mostly used at the UCSF Mission Bay (MB) by members of the Neuroscience research community, there appear to be two groups of equipment that fall under different criteria when considering vibration design/tolerance features for buildings (according to the ASHRAE Handbook).

The main category (VC-B) relevant for MB includes: Microsurgery, eye surgery, neurosurgery; bench microscopes greater than 400x magnification; optical equipment on isolation tables such as two-photon microscopes. Tolerance vibration velocities (in microns/sec) are indicated as the yellow line in the two attached figures from a study in another building (not at MB but relevant as general reference for vibration-sensitive equipment used here). Acceptable values for vibration velocities above 8Hz vibration frequencies are 25 microns/sec (max) and up to 50 microns/sec for lower frequencies, especially those in the range of walking-induced vibrations (~2Hz). Actual values of measurements should fall below those lines (as in the example measurement in the second slide; again not made at MB) for equipment to work error free.

The next category (VC-C) deals with ultrahigh vibration requirements (< 6 microns/sec Max.) for electron microscopes (TEMs, SEMs). However, I did not hear from any of the Neuroscience faculty whether those currently are in use.

The EIR considers vibration-sensitive equipment not to be ‘sensitive receptors’ but we would disagree with that since those pieces of equipment are indispensable for performing our research, largely supported by the National Institute of Healths. The EIR indicates that, during construction, research buildings may experience vibration velocities that exceed 0.008 in/s (or 203.2 microns/s), 5 to10-fold the values considered acceptable for operating the equipment (although the affected vibration frequency range is not indicated). Additionally, the EIR does not indicate by how much those velocities may be exceeded. Without a more thorough assessment of the potential vibration levels and spectra to be expected during construction and usage of the facility the impact on vibration-sensitive equipment is not possible. Even from the few points mentioned in the EIR it appears that vibration levels would be significantly above the VC-B criteria and, thus, may constitute intolerable interference with ongoing research or medical practice.

Sincerely,

Christoph Schreiner, PhD, MD

Examples of vibration measurements and standards in a research building

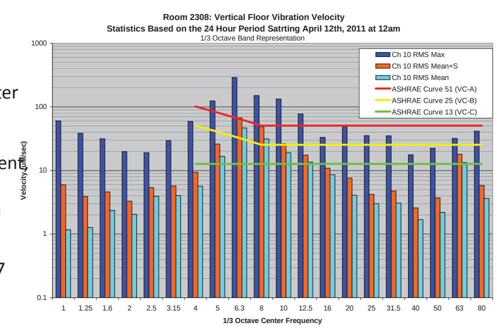
Floor Vibration Criteria

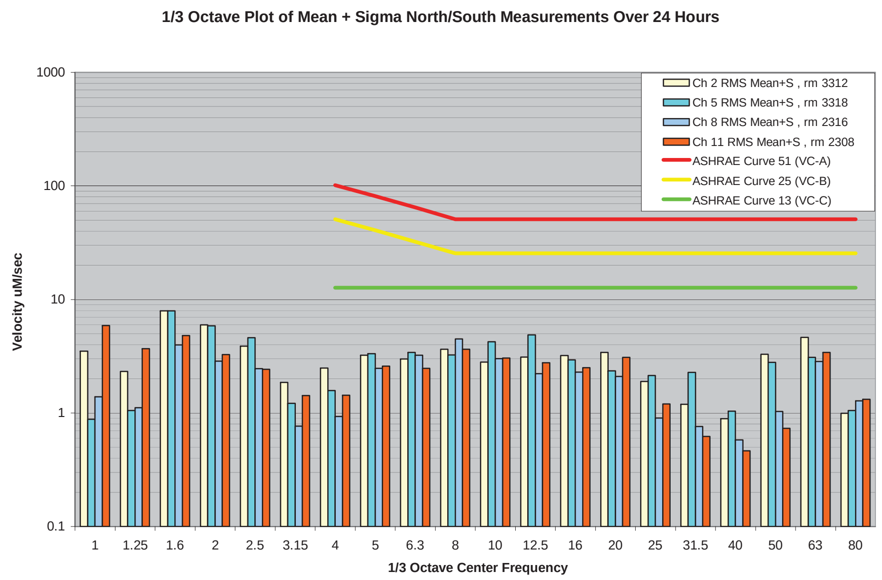
The 2007 ASHRE Hand Book (Section 47.39, table 46) provides a set of floor vibration criteria (VC) as a function of vibration frequency that are often used when the actual tool sensitivity has not been quantified. The frequency axis is broken in to bands each of which is 1/3 of an octave wide called a 1/3 octave band plot. The curves are plotted in floor vibration velocity units of microns/sec.

The yellow line across the 1/3 octave band plot of the vertical floor vibration corresponds to the ASHRE VC-B criterion.

VC-B – Microsurgery, eye surgery, neurosurgery; bench microscopes greater than 400x magnification; optical equipment on isolation tables; microelectronic manufacturing equipment such as inspection and lithography equipment (including steppers) to 3 um line widths.

From section 47.39 table 46 of the 2007 ASHRAE Handbook.





3

From: Mark Shull
To: Warriors, PLN (CPC)
Subject: The water front is a national treasure. Put the stadium some place else!!!
Date: Tuesday, July 14, 2015 11:25:23 AM

The San Francisco water front is a national treasure. We don't need an ugly visually polluting stadium or the cluster of bars and fan excesses that go along with the highly commercialized and hyped up nature of professional sports today.

Stadiums can go anywhere. There is only one San Francisco Bay. It should be a place where anyone can walk, enjoy sweeping views and feel the power and healing nature of the ocean and tides. Do not ruin this national treasure by giving into crass commercial interests who what to take this treasure from all of us, to put up a massive building that cannot but be ugly, polluting, noisy and the equivalent of trading paradise for a parking lot.

Save the water front for all. Put the stadium someplace else.

Mark Shull
Palo Alto, CA
650-521-0351

From: David Siegel
To: Warriors, PLN (CPC); Cohen, Malia (BOS)
Subject: Traffic Mitigation in Dogpatch
Date: Tuesday, July 14, 2015 10:08:03 PM

I am VP and founder of the Dogpatch Neighborhood Assc. We have been living at 917 Minnesota St.since 1986. We are supportive of the Warriors development if proper steps are taken to guarantee parking and traffic will be mitigated in the Dogpatch neighborhood.
We are concerned about the negative impact the new stadium will have on our already over taxed neighborhood parking.
Hospital workers and patients at the newly opened UCSF Hospital are currently parking on Minnesota and Tennessee streets further taxing street parking already at capacity. This is happening in spite of UCSF promising to provide traffic mitigation for 5 years prior to the hospital opening. In addition to the hospital, Giants fans are also parking in the neighborhood during games both day and night.
The addition of the Warriors stadium and other events planned at the site will only worsen an already untenable situation.
The Warriors and the City must take the necessary steps to limit further street parking in Dogpatch. Muni and Caltrain and the City must commit in writing upgrading existing public transport to accommodate increased traffic and pressure on Dogpatch parking.
Sincerely,
David Siegel
917 Minnesota St.

--
David Siegel

From: Todd Simpson [mailto:todd.g.simpson@gmail.com]
Sent: Thursday, June 18, 2015 10:16 AM
To: Warriors, PLN (CPC)
Subject: Feedback on EIR

Hi,

I am a (concerned) resident of the Radiance (corner of Terry A Francois and Mission Bay Blvd North). I have raised this with several stakeholders, without any response yet.

Here is my concern. I would appreciate your feedback asap.

- The post-game traffic planning involves shutting down 3rd Street to northbound traffic. This is justified to allow pedestrian traffic to get onto Muni.
- Therefore, all northbound traffic will go on TAF northbound.
- The Giants development plan calls for closing TAF north of Mission Rock Street. TAF is currently often closed at the north intersection with 3rd.
- The Police and Fire station limits cross traffic on Mission Rock and China Basin Streets. They limit traffic when there are ball games; it is reasonable to expect that they will do likewise during arena events.
- Thus, **all northbound TAF traffic will need to funnel through Mission Bay Blvd North.**
- Mission Bay Blvd North is a single lane road adjacent to residences and a park. It is the only reasonable ingress/egress point for residents of the Radiance and the Madrone.

My question: Has this untenable situation been discussed, and accepted as the correct approach? Or, has this not yet been fully considered? If the later, I hope to raise awareness and effect a change to this plan.

How can I raise the priority of this issue?

Regards,
Todd Simpson
415-676-1682

COMMISSION ON COMMUNITY INVESTMENT AND INFRASTRUCTURE

SPEAKER'S CARD

(Please Print)

NAME Todd Simpson

AFFILIATION Radiance (Mission Bay Resident)

AGENDA ITEM (OR SUBJECT YOU WISH TO SPEAK TO) Post event traffic plan (see back)

SPEAKING FOR THE ITEM ☐

SPEAKING AGAINST THE ITEM ☑

(See Agency Secretary for Speaker Regulations)

SPEAKER'S TIME LIMIT

Please be advised a member of the public has up to three minutes to make pertinent public comments on each agenda item unless the Commission adopts a shorter period on any item. It is strongly recommended that members of the public who wish to address the Commission should fill out a "Speaker Card" provided by the Commission Secretary, and submit the completed card to the Commission Secretary.

All northbound traffic after arena events will end up on a one way one lane residential street (Mission Bay Blvd North) as all other connectors to 3rd street from Terry A. Francois are blocked or closed (due to Giants and/or PSB).

This is unacceptible.

From: Smith, Christine G.
To: Warriors, PLN (CPC)
Subject: Comments on Warriors DSEIR
Date: Friday, June 19, 2015 11:08:38 AM

To whom it may concern,
I am a Neonatal Nurse Practitioner, specializing in emergency newborn care that includes transport of these complicated, high acuity, critically ill infants. My job involves helicopter, airplane and ambulance transport of medically fragile infants. My greatest concern regarding the proposed development of an arena in such close proximity to the hospital is that is would prevent the ambulances/personal cars transporting patients from reaching the hospital in a timely matter, potentially creating life threatening situations for a mother or child that is in urgent need of medical care. The importance of this cannot be understated.

I have personally witnessed the traffic jams from an afternoon game getting out from SF Giants Stadium, which is actually further away than the proposed stadium would be. I was outside the UCSF Benioff CHildrens Hospital after a day of work at approximately 430 pm, waiting for muni. There was complete gridlock, no T train was able to easily move and people in their independent cars were stuck, people were acting aggressively, honking, yelling, and actually driving up on the designated muni sectioned off train path to break out of the gridlock. UCSF Shuttle buses downloaded their passengers to get on the T train towards downtown since they were unable to move for at least 30 minutes. Although I was frustrated to not to be able to get home from work, I was feeling relieved that I wasn't in the back of an ambulance providing life sustaining care to a child that needed further care that I cannot provide in the back of an ambulance. To say that we have a helipad, transports will fly in, is an inaccurate statement. Contact our transport team and you will see that the majority of our tranports are ambulance based, some from even here within our own city. Children often need life sustaining treatments that only UCSF can provide, such as ECMO. In fact, there are limitations on the number of helicopter landings we can do per month per the community board. I remember also thinking, I hope there is not a laboring mother in any of these cars, because I certainly wouldn't want to be in her shoes. Now what if there was an event at this new proposed arena and an event at Giants stadium? It is already so bad as it is! Not to mention there was not one security or police presence in the entire area near UCSF. It is literally an accident and lawsuit waiting to happen!

I am from NY City, I realize change happens, areas get rejuvenated! There needs to be thorough and realistic approach to any considerations of any further developments. Quite frankly, lives are at stake. The area already has enough congestion and lack of insightfulness around how to alleviate the already cramped roadways in the Mision Bay area. The impact of such a large stadium in this hospital area would be multifold. I am writing this letter in hopes for more to gain insight into actually what we are doing here everyday at UCSF, this isn't about money, getting stuck in traffic on the way to /from work, this is about providing efficient, reliable, state of the art healthcare. The city of SF needs to reevaluate what its primary goals are and be thoughtful about how major decisions such as an arena could single handedly increase the mortality and morbidity of its citizens. Is this really worth it?

Please feel free to contact me with any further questions
Christine Smith, NNP

From: Springer, Matt <Matt.Springer@ucsf.edu>
Sent: Thursday, July 16, 2015 6:54 PM
To: Warriors, PLN (CPC)
Subject: comments on Warriors arena draft SEIR

Dear Ms. Bohee,

I would like to submit the following comments regarding the DSEIR for the Warriors arena in Mission Bay. For disclosure, I am a Mission Bay resident, I am on the Board of the South Beach / Rincon / Mission Bay Neighborhood Association, and I am a UCSF professor. My comments do not necessarily reflect the views of the Neighborhood Association nor UCSF; they are my own.

1) Use of third-party parking structures: In Figure 5-2 in the Transportation Management Plan, it appears that several UCSF or residential parking structures are being provided as examples of where fans might park. A note in accompanying text states that the figure does not reflect actual third-party agreements, but residential parking garages should not be used for fan parking, and while perhaps the UCSF parking garage closest to the arena could potentially be incorporated into a deal of some sort with the university, the parking structure on the other side of campus in the Rutter Center should not be used as a preferred fan parking structure because that would result in a horde of fans, sometimes drunken fans, pouring through the campus. This is not acceptable at any time of day, as the research mission of the university is not confined to business hours.

2) Page 5.2-68 states that preferred performance standards include that "event traffic does not block access to the UCSF emergency room entrance for emergency vehicles or patients on Mariposa Street between I-280 and Third Street" and says "In the event that ongoing monitoring shows at any time that the performance standards outlines above are not being met,..." It is crucial that lack of blocking of patient access to the UCSF hospital will never be a performance standard that isn't being met. That is, monitoring of the blocking of access to the hospital to identify a problem is not sufficient; rather, monitoring should be in place to prevent that from ever occurring and to actively control event traffic to allow patient access at all times.

3) The funding must be guaranteed for the mitigations outlined in the SEIR. Whether it comes from the City or the Warriors, the mitigations must not be reliant on there being sufficient funds; those funds should be identified and secured before the project is approved, or else the EIR is irrelevant.

4) Egress from Mission Bay South to the west occurs via the traffic circle and via 16th/Mariposa corridors. The arena attendees will be encouraged to use the 16th and Mariposa corridors or to exit to the north, but I suggest that they be actively diverted away from Mission Bay Blvd. MB Blvd doesn't show up as a preferred route but it is hard to interpret from the maps whether the traffic will be kept away from it. The residents of Mission Bay South, and those of Mission Bay North via the west end of Berry St, will rely on the traffic circle to be able to get in and out of their homes during pre- and post-event times. If arena traffic is pouring westward through the traffic circle, the residents will be trapped in Mission Bay or prevented from reaching it, especially as the Caltrains come through. The traffic circle should be reserved for non-event traffic. Please note that from my experience on Berry St before the west end was completed through Mission Bay Drive to 7th St, we were trapped on Berry whenever there was pre- or post-AT&T Park traffic, and we had to plan to not leave home or come home during those times via car or transit. If the traffic circle becomes held hostage to event traffic as well, then everyone in Mission Bay will experience unacceptable access limitations to their homes.

Respectfully submitted,

Matthew L. Springer
matt.springer@ucsf.edu
(415) 369-9295 (Home)
(415) 502-8404 (Work)
(415) 218-5155 (Cell)
http://www.matthewlspringer.com

From: Amy Steiner
To: Warriors, PLN (CPC)
Date: Thursday, July 23, 2015 5:21:13 PM

Building the stadium at Mission Bay is a bad idea. Many of us think so and we vote. Please find somewhere else or send them back to Oakland.

Sincerely,

Amy A. Steiner

From: Kaylah Sterling
To: Warriors, PLN (CPC)
Subject: Please don''t build the stadium
Date: Monday, July 13, 2015 2:55:02 PM

I'm against building the Warriors stadium at its proposed site:

I'm not in favor of:
More traffic near the UCSF hospital/medical offices
More traffic in SOMA
More traffic on the bay bridge
Parking issues

Please don't allow the Warriors stadium to be built at the proposed site

Kaylah Sterling
(Sent from my iPhone)

From: Michael Stryker
To: Warriors, PLN (CPC)
Subject: Comments on Warriors Entertainment Center Draft Subsequent Environmental Impact Report
Date: Sunday, July 26, 2015 6:17:06 PM
Attachments: Warriors-letter-Stryker.pdf

To Brett Bollinger

City of San Francisco

Dear Mr. Bollinger,

Please consider my comments on the proposed Warriors Entertainment Center Draft Subsequent Environmental Impact Report , which are presented in the attached letter.

Michael P. Stryker, Ph.D.

William Francis Ganong Professor of Physiology

Center for Integrative Neuroscience

675 Nelson Rising Lane, Room 535

University of California

San Francisco, CA 94143-0444

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

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MICHAEL P. STRYKER, Ph.D.
W.F. GANONG PROFESSOR OF PHYSIOLOGY
Voice: (415) 502-7380
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SCHOOL OF MEDICINE
CENTER FOR INTEGRATIVE NEUROSCIENCE
675 NELSON RISING LANE, ROOM 19A-415B
UNIVERSITY OF CALIFORNIA
SAN FRANCISCO, CALIFORNIA 94143-0444

July 25, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

As a professor at UCSF-Mission Bay, I believe that the proposed Warriors Arena will have a devastating impact on the faculty and students of UCSF and on the health care professionals and patients in our hospital. The impact of this project on traffic and transportation is not appropriately analyzed in the portions of the Draft EIR that I have read.

We who work at UCSF Mission Bay and use public transportation (the T line and the Golden Gate ferry) know that the transportation system frequently fails during Giants games, extending commute times unreliably often by hours as a result of missed connections in the intermodal travel. The overall impact of the Giants home games on public transportation (and on alternatives like Uber and taxis) are such that I personally, along with many others, choose to drive a car back and forth to Marin when there are events at AT&T Park during the times I would travel. The failure of public transportation can not be remedied when the Muni shares right of way with cars and the intersections are blocked. The proposed Warriors Arena would exacerbate this situation beyond measure.

The idea that there would be more than 225 traffic-generating events per year at the proposed Warriors Arena, which is much closer to our campus and hospital than AT&T Park, is a nightmare that can not be alleviated by having policemen direct traffic. The fact that events at AT&T Park and the proposed Warriors Arena would coincide more than than 30 time a year is truly horrible. No one will be able to go to or from work on those days, or get to our hospital, without delays that are completely unreasonable.

Access to the Bay Bridge and to the south, as well as to the hospitals, will also be tremendously compromised by the gridlock that will ensue when fans come to the stadium. Bay Bridge commuters have to go north, and 3rd and 4th streets will be impassible or perhaps closed to cars in order to allow the Muni to run. The Mariposa freeway entrance and exit can take only very low traffic flows, nothing like the freeway entrances and exits at the present Warriors arena in Oakland.

The proposed parking restriction, with 200 spaces for 18,000 fans at the proposed Warriors Arena, is also ludicrous, and will result in further gridlock and air pollution as fans cruise the neighborhoods in search of a place to park.

Finally, the traffic situation will surely impair ambulance access to our hospitals. I have seen this happen during occasional Giants game gridlock, as ambulances get stuck on 3rd Street for more than 5 minutes through 3 lights. This problem will be unimaginably worse with the addition of the proposed arena. The Draft EIR ignores the health and safety impacts of interfering with access to essential medical facilities.

None of the assessments of traffic take account of the huge increase in the residential population of the Mission Bay community that will take place when the many apartment blocks under construction are occupied. The transit-first philosophy of the City assumes, I suppose, that the public transit system that is already overburdened and frequently dysfunctional can accommodate the thousands of additional patrons without further deterioration. Given features like the transit constriction at the 4th street bridge, such a view is unreasonable. The transit system and traffic will surely become worse even before the proposed Warriors Arena is in place. No reasonable assessment of the traffic impact of the proposed Arena can be made without measuring that of the new residential developments, something that will be possible only in a year or two.

I ask that the City of San Francisco avoid the disastrous impacts of the proposed entertainment center on the Mission Bay community, including the health and welfare of patients, families, neighbors, and university students and employees including faculty members like me. The City should consider alternative sites, other than Mission Bay, for this environmentally damaging project and conduct a new and complete environmental review process before any decisions are made. Finally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City concerning this project.

Sincerely,

Michael P. Stryker, Ph.D.
William Francis Ganong Professor of Physiology
Center for Integrative Neuroscience
675 Nelson Rising Lane, Room 535
University of California
San Francisco, CA 94143-0444

From: Jim Sullivan
To: Warriors, PLN (CPC)
Subject: Comments on Draft SEIR
Date: Thursday, July 09, 2015 9:24:05 PM

I have three comments:

1) The planned event center will hold less than half of AT&T Park's capacity and by far the majority of events at the new arena will be held on days/times when the Giants will not be playing.

2) As at AT&T Park, the arrival times of attendees will be occur over a longer period than at other venues in the country because of the various attractions and amenities (food and otherwise) that will exist around the arena site. Traffic of all types (autos, public, walking) will not all occur right before the start of the events easing the various traffic flows.

3) I believe that this event center will be a very positive addition to San Francisco.

Thank you for your consideration of these items.

Jim Sullivan
825 30th Avenue
San Francisco, CA 94121

From: Tan, Judy
To: Warriors, PLN (CPC)
Subject: Unmanageable and Unhealthy!
Date: Monday, July 27, 2015 11:15:44 AM
Importance: High

July 27, 2015

Via Email: warriors@sfgov.org
Brett Bollinger
City of San Francisco

Re: Comments on Warriors Entertainment Center
Draft Subsequent Environmental Impact Report

Dear Mr. Bollinger,

I have serious concerns regarding the environmental impacts of the proposed Warriors Arena, which are not fully disclosed or fully analyzed in the Draft EIR. I do not believe that the most recent announcement from UCSF (WinWinSF) would adequately address the following points:

Unmanageable Traffic and Incompatible Land Uses
The Draft EIR shows that the project would cause severe traffic gridlock, noise and air pollution in Mission Bay, right next to UCSF and other medical facilities. A new massive entertainment center is inconsistent with these current and previously planned future uses, previously proposed under the carefully developed Mission Bay Plan. Yet, the Draft EIR does not even discuss the land use impacts of the project, which were not analyzed in the Mission Bay Plan EIR.

Additionally, the project will further hinder access to other parts of the City and the Bay Bridge to Mission Bay. Even with the improvements promised by the City, Mission Bay cannot handle up to 18,500 fans at 225 events per year, especially when both stadiums have games. Parking will also be a nightmare, with less than 200 dedicated parking spaces for the 18,500-seat entertainment center. While restricting the number of parking spaces may be considered a means of traffic management under the City's regulations, the practical effect will be yet more gridlock and unhealthy air emissions.

The traffic and parking impacts will reduce access for emergency and urgent care for patients seeking health care services and add to the existing commute challenges for the nurses, doctors and medical staff who work at the Mission Bay medical campus. The Draft EIR also ignores the health and safety impacts of interfering with access to essential medical facilities.

Health Concerns
The project's traffic new massive gridlock and parking problems will also cause significant and unavoidable impacts on air quality. Increased car and truck emissions in the area will be unhealthy for residents, workers and hospital patients. This will have a disastrous impact on the health and welfare of Mission Bay residents and patients and families who rely on UCSF and other lifesaving services in Mission Bay. The Draft EIR fails to address and mitigate these health impacts, relying on vague plans and purchases of emissions offsets rather than effective mitigation measures as required by CEQA.

The current health care and research center is a hub of care and innovation, the future of this world-class medical center should not be jeopardized by billionaires seeking to double the value of the Warriors as a sports franchise on the backs of San Francisco residents.

* * *

Overall, we are disappointed in the City's approach to environmental review of this project, which fails to fully assess the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR. Specifically, reliance on the 1998 EIR prepared for entirely different land uses for several important impact areas defies common sense and CEQA's review requirements. Moreover, the Draft EIR does not reflect a commitment to in innovative and sustainable development, and rather represents a step backward from environmental stewardship.

Thus, we ask that the City of San Francisco avoid the disastrous impacts of the proposed entertainment center on the Mission Bay community, including the health and welfare of patients, families, employees and neighbors. The City should consider alternative sites, other than Mission Bay, for this environmentally damaging project and conduct a new and complete environmental review process before any decisions are made. Additionally, please place my name on the notice list for this project so that I may receive notice of any future actions by the City with respect to this project.

Sincerely,

Judy Tan, Ph.D.

19B Beaver Street
San Francisco, CA 94114

--
Judy Y. Tan, Ph.D.
Assistant Professor
Department of Medicine
Division of Prevention Science
550 16th Street, 3rd Floor, Box 0886
San Francisco, CA 94158-2549
Voice: 415-476-6052
Fax: 415-476-5348

From: JoAnn Trossbach
To: Warriors, PLN (CPC)
Subject: Warriors Stadium
Date: Friday, July 24, 2015 5:41:10 AM

Attn: Brett Bollinger

I think it would be another great enhancement to and for the City of San Francisco to have the stadium here in the City
Sent from my iPhone

From: Tsai, Richard
To: Warriors, PLN (CPC)
Subject: concerns for new warriors stadium
Date: Thursday, July 23, 2015 2:58:36 PM

Hello,

I am a physician at UCSF Mission Bay (research buildings, not the recently opened hospital) and am concerned about the impact to traffic a new Warriors stadium will bring to the area. I commute daily to Mission Bay by car and have already noted a significant increase in traffic since the hospital opened. On days with Giant's games or other events, traffic is pretty much a stand still.

There are currently only really 4 options into and out of Mission Bay for the vast majority of people coming from the city, or bay bridge. When one consults a map, you can see that you need to take either 16th street west, Mariposa West, or you can take 3rd or 4th street north. The entire Portrero Hill area cannot exit west unless at 16th, 17th street or all the west south to Cesar Chavez. This creates huge bottle necks at 16th and Mariposa, which are at times only single lanes due to construction or people making left turns.

7th street or Owens street to 7th street will NOT be a viable option. The intersection of Owens to 7th Street is very complicated, spanning 2 lights and a busy Cal Train crossing. People who want to turn onto 7th from Owen often cannot because during rush hours, 7th street is a parking lot and the Cal train is frequently passing by.

Let's not even try using 3rd and 4th street to exit/enter Mission Bay during a Giant's game, let alone a Giant's game and/or other events at the proposed Warriors stadium.

The ability for patients and healthcare givers to access Mission Bay in a timely manner is of paramount importance, and another giant, busy public venue such as the Warrior's stadium will certainly impede that.

Thank you,
Richard Tsai

Richard Tsai MD MBA
Behavioral Neurology Fellow
Clinical Instructor, Department of Neurology
University of California, San Francisco
Memory and Aging Center, MC 1207
675 Nelson Rising Lane, Suite 190
San Francisco, CA 94158

Tel: 415-502-7627
Fax: 415-476-4800

Email: rtsai@memory.ucsf.edu

From: TuiFam
To: Warriors, PLN (CPC); alex@singersf.com
Subject: proposed Golden State Warriors' Arena and Events Center at Mission Bay.
Date: Tuesday, July 14, 2015 10:49:38 AM

Hello,

Mission bay is a beautiful area where I go on a regular basis to take loved ones to medical appointments and visits. The arena being built here is going to be a huge inconvenience to many residents, commuters, and especially hospital visitors and staff in general. More than that, I feel it poses a safety issue to the community's children.

I demand that the powers that be understand and truly consider the implications of building an arena in this area. The new children's hospital and its EMERGENCY ROOM are located there. The traffic that this arena will bring to the area will devastate any chances of parents, in a true emergency, being able to get to the hospital in time. By building this arena here, you are putting the lives of children unnecessarily at risk all so you can have one more sports team in the city.

Entertaining this idea is reckless and irresponsible. As the local SF government you have a responsibility to the health and public safety of the community and that MUST come first!

Blessings,

R. Tuialu'ulu'u

"Turn your face to the sun & the shadows fall behind you" - Maori Proverb

From: Vyas, Girish
To: Warriors, PLN (CPC)
Date: Wednesday, July 15, 2015 9:29:05 AM

Considering the new UCSF hospital and current traffic jams in the Mission Bay Area locating the Warrior Stadium in the area if absurd and should not be allowed by city. Certainly, the owners of the 12 acre parcel have a profit motive with utter disregard for the crowded development around the area. Hope that the civic minded authorities in the city hall will prevent this from happening.

Girish.
Girish N. Vyas, Ph.D., F.R.C.Path.
Professor, Department of Laboratory Medicine
Clinical Sciences Room C-224
521, Parnassus Avenue
San Francisco, CA 94143-0451
e-mail girish.vyas@ucsf.edu
Phone: 415-476-4678; Fax 415-476-5520
Emegency Cell Phone: 415-608-3841

From: Elizabeth Waldron
To: Warriors, PLN (CPC)
Subject: New Arena
Date: Monday, July 13, 2015 3:09:59 PM

An arena is not a welcome addition to the neighborhood in which it is proposed to be located. It does not fit well into an areea where families reside and should be placed in a more business dedicated locale.

Elizabeth Waldron

-----Original Message-----
From: joanne.watson@yahoo.com [mailto:joanne.watson@yahoo.com]
Sent: Monday, June 15, 2015 5:31 PM
To: Warriors, PLN (CPC)
Subject: Public Comment: concern about street parking for residents

I live 2 blocks away from the proposed site (18th and Tennessee). Street parking is already limited by the new hospital (why use the paid parking when street is free?).

I would like to see the restrictions extended later in the day for those without a permit to discourage game goers from using all the street parking before residents get home from work. (Some already happens with ATT, even though not as close.). Or maybe restricted sections on each street for only permit holders. Or some other solution.

People are not going to pay for parking in those "many" available spots if they can park on street. And that will cause untold problems for residents.

Joanne.Watson@yahoo.com
415 244-7535

From: Wheeler Priscilla
To: Warriors, PLN (CPC)
Subject: stadium
Date: Friday, July 24, 2015 8:19:23 AM

To: Planning Department
Please do not allow a stadium to be built next to the hospital. This is a crazy plan. The MTA says it will have solutions for traffic. Does anyone who lives in this city believe the MTA about anything? Just look at the job they are doing now with traffic 'solutions'. I am a native San Franciscan and enough is enough!!!
Priscilla Wheeler

July 24. 2015

RECEIVED
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

Dear Mr. Bollinger,

As a native San Franciscan, a homeowner and a tax payer I am writing to request that you do not approve a stadium to be built in Mission Bay right next to a busy hospital.

We are already experiencing gridlock on our streets and constant disruption from construction sites everywhere.

The idea that the MTA will come up with traffic solutions is laughable on the face of it.

Please consider that our city is small and already bursting at the seams.

Respectfully, Priscilla Wheeler

From: Johns Wife
To: Warriors, PLN (CPC)
Subject: Warriors should stay in Oakland!
Date: Tuesday, July 14, 2015 12:34:26 PM

I feel that the City is congested enough and that adding another arena will make it worse. Let the Warriors stay in Oakland!

From: Williams, Joanne
To: Warriors, PLN (CPC)
Subject: Warriors Stadium at Mission Bay
Date: Thursday, July 23, 2015 12:13:58 PM

Dear Mr. Bollinger,

I am a San Francisco native, a UCSF employee of 10 years at the UCSF Mission Bay campus and a Warriors fan. I am concerned about how traffic will be directed during Warriors games if the stadium is built at Mission Bay. We already have severe traffic congestion during SF Giants game time. How will the patients get access to the new medical center, especially in an emergency? What will happen when there is a Giants and a Warriors game during rush hour? I can't see how this will work, especially for the UCSF patients.

Thank you,
JoAnne Williams

300 Channel Street, #10
San Francisco, CA 94158-1520
Email: corinnewoods@cs.com

July 27, 2015

Tiffany Bohee, Executive Director, OCII tiffany.bohee@sfgov.org
C/o Brett Bollinger, SF Planning Dept. warriors@sfgov.org
Via e-mail

Re: GSW Event Center DSEIR OCII Case No. ER2014-919-97
Planning Department Case No. 2014.1441E

Dear Tiffany,

I have questions about the adequacy and accuracy of the DSEIR for the Golden State Warriors Arena project in Mission Bay South Blocks 29-32.

Transportation and Circulation, SEIR Section 5.2

Impact TR-1. While the SEIR states that the project would not result in construction-related ground transportation impacts because of their temporary and limited duration, the use of Terry Francois Boulevard for construction staging will have a significant impact on traffic flow to and from AT&T ballpark parking lots. Improvement Measure 1-TR-1 needs to be stronger. Where suggested mitigations "could" be required, the word should be changed to "shall", and enforcement must be incorporated in the plans. When there are events at AT&T Park, Terry Francois Boulevard needs to be vacated by construction staging and equipment to allow clear traffic flow, as is done by Mission Bay infrastructure developers to clear roads on event days to allow free traffic flow.

Impact TR-2 and TR-3. While parking in and of itself is not considered a significant environmental impact (based on SB743), the traffic caused by searching for (acknowledged inadequate) parking, or drop-off/pick-ups around the Arena, will create a significant and unavoidable impact, even with mitigation. If this neighborhood is to survive the impact of the arena in addition to the already unacceptable conditions that result from ballpark events, there needs to be effective mitigation of the unavoidable impacts. The SEIR suggests mitigation strategies that "could" be implemented "if feasible", but there are no teeth in the recommendations. Mitigation measures must be specific and enforceable through permits, conditions, agreements or other measures. Mitigations contingent upon further (required) discretionary approvals may not be enforceable, and cannot be deferred. The SEIR mitigation strategies need to be tightened up so that "could" becomes "shall", and the necessary mitigations are stated as conditions of project approval.

Creation of a Transportation Management Plan and coordination and implementation of the TMP demand oversight and authority to enforce and if necessary, amend the plans to respond to "lessons learned", conflicts and changing conditions. While the Ballpark/Mission Bay Transportation Coordinating Committee (see Mitigation Measure M-TR-11b) has been helpful in both interagency coordination of traffic and transportation impacts of the ballpark and expression of neighborhood issues, the BMBTCC has no official authority or standing to enforce or amend plans, or ensure adequate funding for required mitigations. The OCII is in no position to become an enforcing agency, and leaving implementation to “the City” is too vague – there’s no authority or accountability. The SEIR should clearly designate a responsible authority to enforce, amend and access funding for mitigations.

It has been our experience that adequate funding and oversight of mitigations, and flexibility to amend the plan, is the key to success. While the project sponsors are supposed to be drafting a Special Reserve Account to set aside the operational costs of the impacts of the arena, there needs to be a specific and enforceable reference in the SEIR that funding of mitigations will be dedicated for the life of the plan and not subject to the vagaries of City General Fund budget cycles.

Impact TR-6, TR-21, TR-22 While the SEIR addresses active management of pedestrian flows, it needs to be tied to priority for transit. Pedestrians need to be controlled so that transit vehicles have priority over vehicles exiting garages and pedestrian movement.

The most important mitigation for traffic congestion is to reduce the number of private passenger vehicles attempting to access the arena through Mission Bay’s limited and congested street network. It is important that the SEIR require off-site parking, shuttle access to off-site parking, link ticket sales to off-site parking or transportation alternatives, create smart phone or other electronic links to available parking (including reactivation of SFPark), and actively discourage private passenger vehicle access to the Mission Bay neighborhood by providing better transit service. The assumption that UCSF or Alexandria (ARE) parking garages or private parking lots in Mission Bay will be available for Arena patrons is faulty. This incorrect assumption, which inaccurately overstates available parking in the neighborhood, makes it even more critical to discourage “at will” attempts by arena patrons to drive and hope to find parking or the congestion caused by ride-hailing services (TNC’s).

As an active participant in the development of Mission Bay, Chair of the Mission Bay Citizens Advisory Committee, 30 year resident of the neighborhood, and MBCAC representative to the B/MBTCC, I am very concerned that resources for mitigations are overestimated, enforcement and funding are underestimated, and authority and responsibility for implementation of mitigations is vague and unenforceable as expressed in the SEIR. Some of the proposed mitigations in the Mission Bay SEIR still haven’t been implemented, and without specific designated authority and responsibility for implementation, there is no assurance that important mitigations for the impacts of the GSW Arena will actually occur or be maintained.

Sincerely yours,

Corinne W. Woods

From: james woody
To: Warriors, PLN (CPC)
Subject: Warriors in SF
Date: Tuesday, July 14, 2015 11:02:58 PM

NO WAY!!! Look at the logistics!! Suppose there is a Warriors game and a Giants game going on at the same time!!
Uhhh.....think about the traffic and think about the parking nonsense......THERE IS NO MORE PARKING - ANYWHERE!!!!

ARE YOU KIDDING?

There is NO room to put up an arena for the Warriors! There are NO PARKING SPACES AVAILABLE!!! How would you expect an ambulance to transport a patient facing death to get to the UCSF Emergency Room at the Hospital there?

The Warriors, as spoiled as they are right now, are perfectly accommodated in Oakland right now! I don't care how much these rich, little whiners piss and moan about it - screw 'em! They are doing well enough, right where they are!!

DO NOT BRING THEM TO SAN FRANCISCO!! THEY DON'T BELONG TO SAN FRANCISCO!! THEY BELONG TO THE ENTIRE STATE! KEEP THEM PLAYING IN OAKLAND (in a fine, modern venue)! THEY ARE DOING VERY WELL, RIGHT WHERE THEY ARE.........

From: Dave Yost
To: Warriors, PLN (CPC)
Subject: No on the Warriors stadium
Date: Monday, July 13, 2015 12:23:08 PM

Don't ruin Mission Bay!

and certainly don't subsidize any stadiums!

Dave Yost

From: jfz723@yahoo.com
To: Warriors, PLN (CPC)
Cc: James Zboralske
Subject: Warriors Opposition Letter
Date: Monday, July 27, 2015 9:59:39 AM
Attachments: Warriors-Objection-Letter-Final Copy.docx

Hello,

I am a current resident of Mission Bay and am submitting the attached letter to voice my concerns and opposition to the planned Warriors Arena Project in my neighborhood.

Please acknowledge receiving this email and the attachment.

Regards,

James Zboralske

July 25, 2015

Ms. Tiffany Bohee
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Ms. Bohee:

I am writing and submitting this letter to voice my concerns and objections to the proposed building of the Golden State Warriors Arena in Mission Bay.

I am a longtime San Francisco resident and have lived in several different neighborhoods over a period that exceeds 25 years. I have lived in the Mission Bay area for the past three and one-half years. I moved to the area in December 2011 and lived in the Strata Apartments located at Fourth Street and China Basin. At that time, there was very little completed development in the area and little in the way of on-going construction projects. In August 2012, I moved into a newly constructed condominium building located on Mission Bay Boulevard North. I still reside there.

I am retired and have keenly followed the growth and development in the area. I walk between four to six miles about five times a week. These walks take me all around Dogpatch, Mission Bay, Lower Potrero Hill, Showplace Square, SOMA and the Embarcadero. I walk at various times in both the morning and afternoon hours. I walk before, during and after events at AT&T Park.

During these walks I am constantly evaluating vehicular traffic flow, pedestrian and bicycle traffic patterns, signal light timing, traffic signage effectiveness, the impacts of on-going construction projects and observing, when possible, traffic control and mitigation efforts by police officers, parking control officers and employees of construction companies.

Why do I take such a detailed and keen interest in these matters? Simply put, I'm a retired law enforcement officer with well over 30 years of municipal law enforcement experience and this stuff just fascinates me. I have extensive experience in all aspects of municipal policing. With respect to the development of the Mission Bay area my extensive experience with uniformed patrol duties, traffic enforcement strategies, traffic control measures, noise issues, parking enforcement, community policing and crime prevention, addressing quality of life issues and special event management is relevant. In fact, I would be considered a subject matter expert (SME) in these areas.

In addition to walking extensively, I also regularly take the Muni T-line and the new 55 bus. This allows me to adequately evaluate those services as well.

Over the past years things have changed significantly in Mission Bay and throughout a large portion of San Francisco. Specifically, in Mission Bay many large residential buildings have been completed and occupied. Others are in various states of construction. The new UCSF Children's Hospital project has been built and opened in early 2015. The new Public Safety Building has been completed and occupied. The San Francisco Giants' plan for significant development on Lot A is working its way through a process and has yet to be finalized. It does call for significant proposed changes on that parcel. Proposed changes to Pier 48 are in the works. High-profile businesses plan to build and locate their corporate offices in the area. A significant amount of newly planned residential developments are in the proverbial "pipeline" in Mission Bay, Dogpatch, Potrero Hill and Showplace Square.

Virtually all of these projects impact local residents by causing traffic congestion, noise pollution, taxing public transit and affecting important quality of life issues in the area. As the projects are completed, the influx of new residents living in the area has increased significantly and at a rapid rate. The influx of new workers (in significant numbers) also impacts traffic and public transportation ridership. This will only be accelerated over the next couple of years as thousands of new residential units and many large-scale new retail and commercial buildings will be built and occupied. The scope and pace of development in Mission Bay and its surrounding areas is astonishing.

New local residents use many services that draw additional traffic to our neighborhood. Many of these services use or even require the use of vehicles such as: taxis and ride share companies, delivery services (UPS, FedEx), moving services, pet walkers, house cleaners, nannies, home repair and remodel services and meal delivery companies. In my building alone there are 50-70 of these occurrences on most days. Many of the local businesses also receive deliveries and they face the same problem.

Few of the streets have any commercial loading zones or parking spaces for these vehicles and as a result vehicles frequently circle the area looking for parking, double-park, park in front of fire hydrants, block driveways, and illegally park in turn lanes and the like. This is a regular and predictable practice that is only going to get worse. Although most of these indiscretions last for short periods of time, there is a cumulative effect on the neighborhood and its residents.

Parking in the area is very restrictive. Some of the area is controlled by the Port Authority and metered on a sliding pricing model. Other streets have abusive (in my view) parking restrictions which include two-hour parking zones from 7 a.m. – 10 p.m. daily. On many weekdays (non SF Giant game days) after 6 p.m. and most weekend days, the immediate area around my building is a virtual ghost town. It is not uncommon to have dozens upon dozens of vacant parking spaces on nearby streets throughout the day. Terry Francois Street often has 50 – 75, if not more, open spaces alone. Yet restrictive parking restrictions are in place. The Port Authority does not make it a practice to offer residential parking permits in our area. Residents understand the need for parking restrictions, but in our area the two-hour parking hours should be relaxed to a more realistic timeframe of perhaps between 8 a.m. – 7 p.m. on non-event days.

The new Public Safety Building recently opened and already residents are experiencing problems as police vehicles park illegally, drive too fast and have been observed committing a variety of California Vehicle Code violations. I recently attended a community meeting with police officials where these issues (among others) were brought up and discussed. The meeting went well and the police department will be looking for ways to mitigate these issues.

City officials and the public have long recognized that the City's public transportation system is not as efficient, effective and robust as it needs to be. Complaints about the system have been occurring for decades. Former Mayor Willie Brown vowed to fix Muni within his first 100 days in office and we all know how that turned out.

Ironically, in a July 22, 2015, article published in the San Francisco Chronicle titled, "Housing boom fee could boost Muni," written by J.K. Dineen and Michael Cabanatuan, Mayor Lee is quoted as saying, "As our city grows, we must ensure that our transportation network grows along with it." The article further states San Francisco has added over 100,000 jobs since 2010 and is growing by 10,000 residents a year. It references the hot-bed issue about the proliferation of high-end residential towers in areas that have not been accompanied by adequate improvements in open space, transit and affordable housing.

The article did not mention the proliferation of commercial and retail developments and their significant impacts on San Francisco over the last five years. It is the cumulative impacts of all of these changes that affect our daily lives, our health and our outlook on the City.

I choose not to belabor the historical problems and proposed fixes to our public transportation system. I choose to not focus on the increased advocacy for bicycle riders and pedestrians. I choose to not focus on homelessness and the mentally ill. I choose to not take up the issue of affordable housing and open space. I choose not to evaluate future proposed changes that may never be funded or built. I truly understand these issues and the interests of various advocacy groups.

I choose to look at the project(s) and simply evaluate it based on my extensive professional experiences. Can a project be developed and ultimately function in an efficient, effective, cost-effective and safe manner without causing significant disruptions and degrading the quality of life for nearby residents, workers and visitors? Can it be developed and be successful in the present? Can it work now?

As a longtime San Francisco resident, I understand the interests of many of the City's residents. Having worked in law enforcement has given me a unique perspective and insight into many issues that truly matter to residents, workers and visitors alike.

Residents want to live in a clean, safe and well-maintained environment that offers exceptional public services and infrastructure; a city in which both our elected officials and city staff are responsive and willing to focus on quality of life issues; a city that plans for, and manages, change in a thoughtful, orderly and well-conceived manner; a city that is open and transparent. Simply put, we want to work in a city "that works well at a high level." The expectations are high, but very straightforward.

With regard to quality of life issues, they are of great importance and can be described as:

Those issues which affect the residents, businesses and visitors to the area by creating fear or adversely impacting their health, safety, and welfare.

Some typical quality of life issues in Mission Bay and our surrounding areas include, but are not limited to:

- Aggressive panhandling
- Ticket scalpers hassling people and/or stepping into traffic
- Chronic public intoxication
- Drinking in Public and open containers
- Litter, graffiti and public nuisances such as urinating and defecating in public
- Incidents that involve the mentally ill
- Illegal encampments
- Illegal dumping
- Chronic noise complaints
- Illegally parked vehicles
- Dust and grime associated with on-going construction projects
- Significant numbers of California Vehicle Code violations being committed by motor vehicles, bicycles and pedestrians.
- Constant and often poorly designed and implemented road and/or lane closures and traffic modifications disrupt all modes of both public and private transportation with regularity.

In order to make an assessment of the project I did extensive research, conducted site visits, spoke with local residents, local employees, delivery drivers, a variety of City workers who work special events and several construction workers.

I also spent significant time directly observing traffic flow (all modes) both during Giants games (pre and post-game) and on non-Giants game days at many intersections. I walked and observed over a period of several months.

I have reviewed many sections of the proposed Environmental Impact Report, Planning Department Case No. 2014.1441E for an Events Center and Mixed Use Development at Mission Bay Blocks 29-32.

Based on my direct observations, review of the EIR and my prior experience, I have many concerns and do not believe the City should allow this development to proceed as designed.

The construction of the Warriors arena is only one piece of the local puzzle. Multiple major projects are in various states of planning and/or development. These include:

- Expanding UCSF – Several projects
- Developing Pier 50 – Anchor Steam
- Building a hotel in Mission Bay
- Developing Seawall Lot 337 – Lot A – A massive project
- Pier 70 – A large mixed use development
- The Eastern Neighborhood Program
- The Uber Headquarters Project
- Realignment of Terry A. Francois Boulevard and Mission Bay Park
- The construction of many new residential complexes that will contain several thousand new units in Mission Bay, Dogpatch, Potrero and Showplace Square

In congested urban areas like San Francisco, no new development can be evaluated in isolation. For that reason you need to consider the total cumulative impacts these projects will have. The Warriors Arena was never originally intended to be built in Mission Bay. It was never included in any previous plan for Mission Bay. It would, however, be arguably the biggest and most impactful project ever built in the area. It was thrust and forced on San Francisco when the owners of the Warriors went into contract to buy parcels of land in Mission Bay. This was after the failed attempt to build the arena along the Embarcadero.

The report fails to adequately address many of the actual event usage plans. The Warriors intend to have up to an additional 200+ events at the site. In total, the arena may easily host more than 250+ events a year. This is only an estimate. This number of events is excessive. The area cannot handle these events without significant negative impacts affecting local residents and other people that work in the area.

The plan focuses on the Warriors games and potential overlap with some San Francisco Giants home games. It refers vaguely to other events, but offers no specificity on the types of events, the days or hours of the events and/or any realistic estimate of

the number of people expected to attend. Possible events seem to have a classified threshold of whether they expect to attract over 12,500 attendees or not. This is pure guesswork.

The Warriors, to my knowledge, have never publicly released any demographic information about their season ticket holder base. It would be easy for them to acknowledge, for instance, how many of their season ticket holders reside or work in various postal codes in the Bay Area. This measure, would at least offer a starting point to evaluate the efficiency and effectiveness of current public transportation options for their large base to use as many presumably would need to travel to San Francisco from other communities. The following issues could, at least, preliminarily be looked into:

- Are viable public transportation options currently available?
- How would the scheduling work for transferring between agencies?
- Would it be convenient for those individuals to take public transit?
- How many transfers would the average rider to need make?
- What would the average cost for a round-trip fare likely be?
- How long would a sampling of journeys take each way on average?
- Would the transit options run late enough for attendees staying in the area after a game to still use public transportation to get home?

Vagueness is not my friend.

The Warriors have a huge financial incentive to use the site extensively in order to generate revenue and help pay for the project and ultimately make more profits.

The City should be a staunch steward of City resources and funds, taking appropriate measures to ensure we do not over-commit limited resources or over-spend for service delivery.

Section 5.8 – Public Services

This section evaluates if the project would require new or physically altered governmental facilities to maintain adequate public safety. This is a misleading measure. We should really be assessing the issues associated with providing the broad range of public services to the geographic area impacted by the project.

For example Table 5.8-2 addresses San Francisco Fire Department (SFFD) responses in the project area over a 12-month period. Staff at four fire stations responded to 10,702 medical responses and 4,968 fire calls. In total, SFFD responded to 15,670 incidents. For urban municipal fire departments, medical aid calls typically outnumber all other types of calls for service. Indeed, nearly 70% of the calls at the four stations were medical in nature. Should all the projects in the pipeline be constructed and occupied, the number of total calls will increase dramatically in the target area. With the increase of traffic congestion and associated factors of event management, SFFD response times under current staffing levels are likely to increase.

There is no way to evaluate if there are more or fewer calls on special event days compared to non-event days. There is no way to determine which days of the week and hours of the day are peak response times. Simple raw data does not give us the information we need to determine if the proposed arena project, along with all the other projects, will cause service delays or disruptions.

The San Francisco Police Department (SFPD) is currently understaffed by as many as 300 officers. Although they plan to aggressively hire recruits and increase staffing, this process is arduous and slow. SFPD intends to offer up to three (3) new academy classes with as many as 50 recruits per class over the next several years. Unfortunately, during the next three years they will lose other staff members to retirement, lateral transfer, disability leave and others who choose to transition into other career fields.

The process of recruiting, hiring and training an individual to become a fully functioning and solo officer can easily take up to 18 months. This means that even if you have staff "on paper" there are likely many officers in various stages of the employment and training process. Individuals, who are not yet fully trained and have not completed the FTO program and are not qualified to perform solo officer duties. A police department's current staffing level is merely a number. The more important number is how many physically able and qualified officers can actually be deployed to staff events and/or handle calls for service. These numbers are usually quite different.

Furthermore, if SFPD is successful in sponsoring an academy class with 50 recruits, it is unlikely that all new hires will pass the police academy. Others will fail to complete the rigorous Field Training Program and some will fail to complete their probationary period. This is the nature of police hiring and training programs. It is a predictable outcome that occurs in all local law enforcement agencies.

It is therefore highly unlikely that SFPD can achieve full staffing levels by mid-2018. Any new officers would be inexperienced. It can easily take several years or more for new hires to become truly skilled and competent in handling the broad range of police calls that occur in municipal jurisdictions after achieving solo officer status.

Because SFPD will not, in my view, ever reach its authorized staffing level it may be stretched to safely, professionally and adequately staff another 250+ special events each year. They may be required, at times, to have staff pull double shifts (working patrol and then stay over to work an event), require some form of mandatory overtime and utilize creative scheduling practices.

With respect to staffing levels at special events, the document indicates:

- Staffing levels are determined by SFPD's Event Commander in coordination with the event sponsor in advance of the event as well as by levels established in event security/operations plans. The Department of Parking and Traffic typically provides traffic control services for special events.

Without more specificity, I am not able to determine if adequate resources and being utilized for on-site security by sworn members of SFPD and parking control officers (PCOs).

I can tell you from my own personal experience that sponsors have a financial incentive for fewer personnel usage because they often pay for these services. Sponsors often try to supplant the use of sworn officers and trained PCOs with far less expensive "private security" personnel. Unfortunately, when things go bad – and they will at some point, the ultimate burden to respond and resolve an incident will rest with the sworn police officers and PCOs.

Private security guards can be a deterrent and provide valuable services, particularly inside venues, but for the most part they will not be arresting, citing or physically ejecting people from an event site. They will not be writing a detailed crime report, but rather are usually treated as "witnesses." They will observe, report on conditions and request assistance from uniformed sworn officers or PCOs in enforcement-related incidents or in any circumstance in which the personal safety of a patron or themselves is involved.

In Table 5.8-3 the Summary of Annual Crimes in Mission Bay Area does not specify how many of the crimes occurred on special event dates versus non-special event dates. It is not possible to make an accurate evaluation and/or comparison from the raw numbers supplied.

The numbers reported appear to be crimes that require reporting under the FBI's Uniform Crime Reporting Program. These are crimes that all police departments report annually. They serve as a basis to compare crime rates between jurisdictions in an "apples to apples" approach or crimes that occur year over year for comparison purposes.

While interesting you'll notice that there is no mention of any of the following:

- Actual police calls for service (CFS) in the area
- CFS types and frequencies on event days versus non-event days
- Number of self-initiated detentions, stops, citations issued and arrests made by SFPD
- Number of parking citations issued and vehicles tows by PCOs
- Statistics relating to the many **quality of life issues – previously listed**

- Vehicle collisions
- Disturbance calls
- Disorderly conduct calls
- Alcohol or drug-related calls and crimes
- Total number of crime reports taken
- Response times to crimes in the event area.
- Alarm calls
- Incidents occurring at public transportation facilities
- Incidents occurring on public transportation vehicles of all types
- Number of private person arrests made

Having accurate statistics relating to these types of incidents (in addition to the FBI UCR) gives you significantly more information to evaluate and determine accurate levels of overall police activity in any given area.

Critical information is not provided for analysis in the report. Simply put, utilizing the FBI Uniformed Crime Reporting for SFPD alone is a very ineffective way to gauge the actual level of police, parking and traffic related incidents in a given geographical area or associated with special events.

Given the location of the proposed project it would be prudent to obtain the more comprehensive crime statistics and information from the following agencies:

- University of California Police Department
- The California Highway Patrol
- Port of San Francisco Police Office
- Bay Area Rapid Transit Police Department (BART)

Once the appropriate information is gathered from all relevant sources a detailed analysis of the actual impacts to public safety could be evaluated.

With respect to emergency vehicle access (5.2.3.6) and parking conditions (5.2.3.7) the report is woefully lacking.

The report indicates the primary access for emergency vehicles would be 3rd Street because it has two lanes of traffic in each direction. Although 3rd Street has two lanes in each direction, they are separated by raised curbs and Municipal rail tracks. The lanes on 3rd Street are standard width and there are no shoulders, delineated bike lanes, loading zones, parking spots or any place to pull out of traffic between intersections.

Subsequently, should any disruption occur mid-block that impedes any lane of traffic, all vehicles behind it will be negatively affected and congestion will begin occurring almost immediately. In essence a “bottleneck” will occur. There are many scenarios in which

this could happen; a traffic collision, a stalled vehicle, or any type of police, fire or medical response to a fixed location along the corridor – to name only a few of the likely possibilities.

If a traffic collision occurred where an individual needed immediate medical assistance and transport to a hospital and/or have their disabled vehicle towed, it could easily take an hour or longer to clear the scene. The traffic back-up associated with this type of incident and closure would be stifling. Emergency responders, in vehicles, would have a difficult time getting to the incident. Police on motorcycles and bicycles would be able to get there, but they don’t have the ability to transport injured parties or move and tow disabled vehicles.

The existing parking was looked at in the parking study area. That area was defined to include off-street parking facilities located within a reasonable walking distance from the project site – one-half (.5) mile with easy access to major street corridors that provide access to Mission Bay.

Geographical constraints make access to the area problematic already. To the east is the Bay. To the north there are only two access routes, namely 3rd and 4th Streets.

To the west, the Mission Bay Boulevard extension to 7th Street has not been completed. Sixteenth Street also runs east/west. It crosses the railroad tracks at 7th Street and dead ends at Illinois. Much of the local traffic uses 16th Street to access retail establishments in Potrero, the Mission and beyond. Access to the new UCSF Medical facilities is accomplished by taking 16th Street. Seventh Street extends south, crossing 16th Street and becomes Mississippi Street. This is taken to access southbound Highway 280 from Mariposa Street.

Mariposa Street also runs east/west. It is a primary entrance and exit point for traffic using Highway 280. The ramp northbound frequently gets backed up for up to one-half mile during normal commute times. The ramp to southbound 280 is heavily used and traffic on Mariposa during normal days can be brutal during the afternoon commute. From the south, 3rd Street and Illinois Street allow access to César Chavez and Pennsylvania to access Highway 280 south.

In reality, there are limited points of ingress and egress to the project area. The streets are either one or two lanes in each direction. Many are controlled by signalized intersections and the freeway entrance and exit ramps are poorly designed to handle significant traffic. These ramps were built decades ago and have not been modernized to reflect current demands.

To make modifications would be costly and is in conflict with the City’s transit first policy. The old adage, “you can’t have it both ways” comes to mind. The City would resist making improvements and modifications that might actually increase vehicle traffic efficiency and effectiveness because it contradicts established policy.

The City would also have to coordinate with other local and state agencies to accomplish any improvements to freeway on and off ramps. It is unknown what funding sources would exist to do this type of work. Local community groups would surely oppose such measures. In short, this appears to be a non-starter, which bodes poorly for the proposed arena attendees, local residents in the area and other merchants or businesses that are reliant on the use of these public roadways.

In my opinion, the proposed number of parking control officers (PCOs) slated for deployment is not nearly sufficient.

The report identifies PCO controlled intersections during the various scenarios. Table 5.2-10 gives an example in which only six of 22 locations are staffed. There is no mention of how many PCOs are assigned to each location and no indication of what traffic control measures they will utilize to expedite the safe flow of all modes of traffic. My observations tell me that much PCO intervention focuses on monitoring traffic from a distance and/or controlling the signals via the override function. I do not see a lot of engagement and interaction. Pedestrians and bicyclists regularly do what they want on many of the local streets. The intersections of King Street and 3rd Street, King Street and 4th Street and King Street and 2nd Street are staffed with more personnel. The staff working those intersections appears to be much more engaged and interactive in their efforts to safely control the various modes of traffic. If you do not facilitate the flow of traffic all the way to freeway on-ramps and other major exit routes, traffic will always “bottleneck upstream” and clog its way back toward the event site.

Over the past three years, I’ve often observed one and sometimes two PCOs at intersections who were simply controlling the traffic signals (manual override) to facilitate vehicular traffic. They were not adequately engaging with pedestrians to prevent jaywalking, pedestrians crossing against red lights and people crowding into the roadway. They also weren’t able to control bicyclists that were weaving through traffic. The focus was on cycling the lights rather than a comprehensive effort to facilitate all modes of traffic. PCOs must engage with people to control the intersection and make it clear how the manual traffic flow cycle will be handled and monitored. Each mode of transportation must be addressed independently, but within the context of a master plan, during times of heavy congestion to promote safe traffic movement for all modes.

Traffic control duties can be quite difficult and require significant resources and constant engagement. Simply standing at a signal light control box and manually controlling the light cycle at signalized intersections is not sufficient to ensure the safe movement of vehicles, bicyclists and pedestrians. Active engagement and proper use of traffic control devices (cones, barricades, signs, flares, reflective sleeves and message boards) is also required. Many of the intersections listed in the report indicate “a PCO” will be used. In my opinion, most of these intersections would require between two-three PCOs to safely facilitate the movement of vehicles, bicyclists and pedestrians.

Remember, many attendees may not be familiar with the area. Many events will conclude at night when it is dark. Some people leaving the venue will have consumed alcohol. Existing lighting at some of the critical intersections is not robust. There may be inclement weather. It is likely that with the ongoing construction of other projects that roadway modifications may need to be navigated, which only makes facilitating traffic more difficult. I view the plan as significantly understaffing the traffic control aspect.

According to the plan during overlapping events, due to restricted access on the 3rd Street and 4th Street bridges, it is assumed that no vehicles will travel north on either street during overlapping events. This will be a self-induced “double bottleneck” that will force traffic south and west. The plan calls for “a PCO to be stationed at the intersection of 4th and 16th Streets to “discourage the use of this street except for local access.” Good luck with that!

The intersection would require minimally two and maybe three PCOs to safely facilitate all modes of traffic and respond to inquiries made by individuals on congested days. People will stop and ask PCOs questions. When they do stop or at least slow down, traffic disruption occurs. This is predictable and inevitable to some degree.

The parking lot assessment in section 5.2.3.7 is flawed in my opinion. It claims the 15 off-street parking facilities are located in areas “with easy access from the major street corridors that provide access to the Mission Bay Area.” Unfortunately, given the geographical constraints in the area, and the limited points of ingress and egress, everybody that needs to access Mission Bay for any reason will be on the same few roads. There is no such thing as “easy access” in this area today. To claim “easy access to the major street corridors” is a blatant misrepresentation. Existing conditions do not warrant that description. In theory, by looking at a map, one would expect simple access. In practice this is simply not true.

Twice this last week, for example, between 2:00 – 2:30 p.m. I observed northbound 3rd Street backed up (bumper to bumper) from South Street all the way to King Street and beyond. In both instances it took vehicles over 35 minutes to traverse this short distance. Yes, I stayed, watched and timed a truck. Terry Francois Boulevard was no better, being backed up around the bend all the way to Pier 50. It was an absolute mess and the drivers were frustrated.

Oftentimes when the traffic lights at the signalized intersections turned green no more than a dozen or so cars could get through. This is because the signal light cycles are not long enough and may not be synchronized. The “bottleneck upstream” that was causing the congestion clearly wasn’t being handled properly. The “bottleneck upstream” in this instance was the temporary closure of King Street between 3rd and 4th Streets. One closure (or other incident that blocks a road) had the cumulative ripple effect of bringing an entire section of town to a virtual grind for a period of hours. I have gone out to this location on five occasions and spent an hour or two watching traffic, watching the efforts of traffic control personnel and have been unimpressed. It’s not uncommon for the traffic control staff to simply stand on the sidewalk and watch the gridlock. They only seem to intervene when somebody tries to do something unsafe.

At the intersection of 3rd Street and Townsend I found two PCOs manually overriding the signal in an effort to facilitate traffic flow. Unfortunately, neither was engaging and controlling the pedestrians and bicyclists in the area. At that location, 3rd Street has four lanes of traffic (one way) heading north. There were so many pedestrians in the area crossing the street that vehicles wanting to make left or right hand turns onto Townsend, Brannan or Bryant could not turn and had to wait. This means two of the four lanes did not flow. No efforts were being made to stop all pedestrians, at some point, and allow vehicles to proceed and turn. The City's effort to mitigate this street closure (planned for about a month during weekday hours) is pretty dismal.

All it takes is one incident to bottleneck and clog any of these arteries for hours. It is blatantly irresponsible and defies logic to believe that hundreds if not thousands of cars will descend on the Mission Bay, Dogpatch and Potrero areas over 260+ times a year without a level of congestion and disruption

To reiterate, traffic control duties can be quite difficult and require significant resources and constant engagement. Simply standing at a signal light control box and manually controlling the light cycle at signalized intersections is not sufficient to ensure the safe movement of vehicles, bicyclists and pedestrians. Active engagement and proper use of traffic control devices (cones, barricades, signs, flares, reflective sleeves and message boards) is also required.

With respect to the timeframes used to evaluate parking and occupancy rates, the evening hours used in the study were from 7:00 – 8:30 p.m. This timeframe is flawed. I have seen, with the San Francisco Giants games, fans are often arriving very early to the area. In fact, people come several hours early regardless of transportation mode; hang out, walk the waterfront, and frequent local eating establishments.

If this trend holds, the people looking to park in these 15 facilities will be arriving hours before the 7:00 p.m. threshold. Spots will not be available because day workers will not have vacated them yet. These people will circle the area looking for other options or decide to park further away in residential areas.

I do volunteer work several days a week between 3:00 – 4:30 p.m. at Market Street and 2nd Street. I regularly walk to and from this location. I walk along the Embarcadero to Market Street or walk up 2nd, 3rd, or 4th Streets. I return using one of the same four routes. I do this walk between 2:00 – 3:00 p.m. and 4:30 – 5:30 p.m. These frequent walks give me the great opportunity to observe all modes of traffic in the area.

I am amazed at the congestion and traffic gridlock trying to access the Bay Bridge. I also see Giants fans parking in lots and on the streets along the way. Once again, on a normal non-game day, the traffic gridlock on these streets is often remarkable. On

game days it can be worse. I see people in their Giants garb driving, parking and wandering the area hours before the opening pitch. There is no reason to believe Warriors fans and other event attendees will not come to the area hours before an event. When "newbies" to the area discover how bad navigating the City can be they will likely: adjust schedules to arrive even earlier, decide not to come as often or look at public transportation options.

At any rate, limiting the survey hours in the evening from 7:00 – 8:30 p.m. is flawed. The survey should look at parking supply and occupancy rates in the 15 lots beginning as early as 4:30 p.m. and starting no later than 5:30 p.m. to accurately assess parking availability.

The report indicates in section 5.2.3.7 that bicycle conditions were observed to be operating acceptably, with no conflicts, between bicyclists, pedestrians and vehicles. I dispute this.

It is actually fairly common for bicyclists to ride their bikes on the sidewalk northbound on 3rd Street from South Street up to AT&T Park. They choose to do this because the pavement is wide and 3rd Street has no delineated bike lane in the roadway. Apparently, shifting over to Terry Francois Boulevard or 4th Street, which both have established bike lanes is cumbersome.

As I continue to read through the report page by page, I'm amazed at how frequently problem areas are identified.

For example, the report openly acknowledged that many intersections would have significant traffic impacts that would remain "**significant and unavoidable with mitigation,**" under specified scenarios. Accordingly, the report says the City and the project sponsor should work together to seek feasible mitigation measures to reduce transportation impacts.

One strategy being considered is to use additional off-site parking lots south of the project (not within walking distance) and providing a free shuttle service to patrons.

The report says location sites (yet to be identified) that could provide up to 250 parking spaces for events drawing less than 12,500 patrons and up to 1,000 total spaces on days with overlapping events would be used to accomplish this. Working details regarding to this traffic mitigation option have yet to be specified and defined. Unfortunately, no sites have been identified as possibilities to date. There is no guarantee the sponsor and City could negotiate acceptable terms that would be feasible in the long term.

The report says the sponsor would need to provide, as needed, up to six (6) shuttle trips per hour both before and after the events. There is no mention of the types of shuttles being considered or their capacity. These shuttles would be required to navigate to and from drop-off and pick-up points and be subject to traffic disruptions like other vehicles. If, in the extreme, the maximum 1,000 cars were to use this service it is likely a minimum of 2,000 people (two people per vehicle average) would be shuttled to and from.

Most shuttles (airport rental car and hotel type) probably hold a maximum of 25 people. Doing that math, it could take up to 80 shuttle trips to accommodate the patrons. At six shuttle trips per hour there would be a significant capacity shortfall to move patrons in a timely fashion. Using a lower number of only 500 cars and 1,000 patrons would require up to 40 shuttle trips (given full capacity for each trip) and would also result in capacity shortages, delays and disruptions.

Given the lack of specifics and details about this option, I believe patrons using this mode of transportation will incur significant delays both before and after games.

As the report continues other notable references to traffic problems are aptly addressed. Some of these include:

Page 5.2-178 of the report addresses other factors that affect traffic mitigation efforts. These include physical limitations of the City's street grid and the City's Transit First policies and goals that seek to limit private vehicle usage.

Page 5.2-182 of the report specifically and clearly states, "for conditions without an overlapping SF Giants evening game, no feasible mitigations are available for the freeway ramp impacts because there is insufficient physical space for additional capacity without redesign of the I-80 and I-280 ramps and mainline structures, and which may require acquisition of additional right-of-way, and other potential measures would not adequately address the short term peak travel patterns associated with special events." Later it states, "Thus, for these reasons, the proposed project's impacts related to freeway ramp operations would be significant and unavoidable with mitigation."

It would require significantly more time and effort to for me to continue to cite other report sections that highlight problems with the plan and/or point out other deficiencies. I think my efforts thus far have been sufficient to highlight the many problems I see with the plan.

I sincerely hope that you and other members of San Francisco City Government will read the report in its entirety and in detail. If you do, you'll read about many other aspects that the report indicates would be problematic.

Interestingly, I have gone to great lengths to speak with many people who live, work and visit the area. I engaged them in conversation about the current state of life in Mission Bay, the rapid and substantial increase in development, the on-going disruptions

associated with construction, the reliability of public transportation and, of course, their thoughts about the proposed Warriors Arena complex.

These individuals included a broad spectrum of: local delivery drivers, US Postal employees, local technology sector workers, construction workers, employees of Impark, Mission Bay Shuttle employees, UCSF employees, dog walkers, cleaning service workers, San Francisco police officers, San Francisco parking control officers, Muni employees, food delivery services and random visitors to the area as they recreate and enjoy local food establishments.

The overwhelming majority of responses cite great concern about too much growth in Mission Bay. They raised concerns about inadequate public transportation and infrastructure, the immense scope and scale of the arena and all the other developments that are underway or planned. Specific objections usually involved: traffic congestion, noise and nuisance problems and some mention of one of the quality of life issues I referenced earlier.

The City's current infrastructure can't efficiently and effectively handle the large influx of people to an estimated 250+ yearly events in our neighborhood. The police and fire departments did not adequately address relevant issues in their sections of the report. The City's Public Works Department admittedly struggles now to deal with keeping our streets, sidewalks and neighborhoods clean.

Traffic mitigation options that include concepts like private shuttles, identifying and using new parking lots and increasing public transportation services lack details, specificity, funding sources and could take many years to build.

People living, working or visiting the area would be exposed to a tremendous increase in the number of quality of life incidents and upsurge in crimes. These increases would degrade our personal quality of life. Local residents and local workers often bear the unpleasant burden of over-development, poor infrastructure and the increases in crime, nuisances and disruptions that it brings.

The City may have admirable intentions by implementing a transit first policy. The City cannot, however, impose this policy on the region. There are about 26 different public transportation entities in the Bay Area. Oftentimes, their systems do not operate on schedule and delays occur. Any glitch on one system will negatively affect an individual's ability to make transfers. Until the entire public transportation system in the region is improved and integrated more cohesively, traveling throughout the region by linking multiple systems can be problematic.

Trying to force a transit first policy on people throughout the region is problematic. To try and impose your will, and policy, on people throughout the region will not be successful. In my view, the City is mistaken if it believes the transit first policy and existing public transportation system will be able to alleviate traffic congestion and disruptions in Mission Bay.

Many patrons attending events at the proposed arena will come from cities throughout the greater Bay Area. Most will want to see events with friends and family. People want to go together so they can socialize, hang out and perhaps dine before or after events. Many people have friends and coworkers that live in different cities, have different work hours and may not have robust public transportation options immediately available to them. In the end, much of what we choose to do or not do really involves details, logistics and convenience.

So what inevitably happens? Often groups of attendees make a decision to carpool and drive to the event together. This allows them to share costs. They can decide if they want to leave early or stay late without the constraints of an unpredictable transit schedule. They keep their options open. This is modern day life. This is what happens. This is predictable.

Although not related to the arena project, take a look at recent incidents at Dolores Park. Recently, newspaper articles have reported the park has been besieged by people on weekends, vandalized multiple times and is a filthy mess. Garbage has been strewn about and an inadequate number of trash receptacles were installed. Apparently, the City thought if they didn't put a significant number of trash receptacles in the park that park goers would responsibly haul their trash out and pick up their own mess. How did that work out?

The City is also grappling with measures to curb people urinating and defecating on City streets. So far that effort has not been successful. These issues are the types of quality of life issues that are so important to residents.

We need to focus on, and remedy, the current pressing problems that we face before embarking on additional major projects that will only exacerbate the situation.

In summary, I urge you to prohibit the Warriors Arena project in Mission Bay. The area simply cannot handle a project of this magnitude, especially given all the other major developments currently underway or on the drawing board. The over-all negative impact to the local residents, and ultimately the City, is very concerning. There are far too many unknowns, uncertainties and ambiguities in the report.

Sincerely,

James F. Zboralske

JFZ/et

CITY AND COUNTY OF SAN FRANCISCO

OFFICE OF

COMMUNITY INVESTMENT & INFRASTRUCTURE COMMISSION

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TUESDAY, JUNE 30, 2015

SPECIAL MEETING

REPORTER'S TRANSCRIPT OF PROCEEDINGS

FOR AGENDA ITEM No. 5(b)

PUBLIC HEARING ON THE DRAFT SUBSEQUENT ENVIRONMENTAL IMPACT REPORT FOR THE GOLDEN STATE WARRIORS EVENT CENTER AND MIXED-USE DEVELOPMENT AT MISSION BAY SOUTH BLOCKS 29-32

CITY HALL

1 Dr. Carlton B. Goodlett Place, Room 416

San Francisco, California 94102

REPORTED BY: KATY LEONARD, CSR
Certified Shorthand Reporter
License No. 11599

I N   A T T E N D A N C E

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COMMISSION ON COMMUNITY INVESTMENT & INFRASTRUCTURE

CHAIRPERSON MARA ROSALES

COMMISSIONER MARILY MONDEJAR

COMMISSIONER DARSHAN SINGH

COMMISSIONER MIGUEL BUSTOS (NOT PRESENT)

EXECUTIVE DIRECTOR TIFFANY BOHEE

DEPUTY DIRECTOR SALLY OERTH

DEPUTY CITY ATTORNEY ROBERT BRYAN

DIRECTOR OF COMMISSION AFFAIRS CLAUDIA GUERRA

ORION ENVIRONMENTAL ASSOCIATES

JOYCE HSAIO, PRESIDENT

ENVIRONMENTAL SCIENCE ASSOCIATES

PAUL MITCHELL, SENIOR MANAGING ASSOCIATE

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I N D E X O F
P U B L I C S P E A K E R S

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I N D E X O F
P U B L I C S P E A K E R S (Continued)

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I N D E X   O F
P U B L I C   S P E A K E R S   (Continued)

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I N D E X   O F
P U B L I C   S P E A K E R S   (Continued)

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P R O C E E D I N G S

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TUESDAY, JUNE 30, 2015 1:22 P.M.

AGENDA ITEM No. 5(b)

EXECUTIVE ASST. GUERRA: The next order of business is Regular Agenda 5(b), Public Hearing on the Draft Subsequent Environmental Impact Report for the Golden State Warriors Event Center and Mixed-Use Development at Mission Bay South Blocks 29 through 32, Discussion.

Agenda Item 5(b) is a Public Hearing on the Draft Subsequent Environmental Impact Report for the Golden State Warriors Event Center and Mixed-Use Development Project at Mission Bay.

The purpose of this hearing is to receive comments on the adequacy and accuracy of the Draft SEIR in identifying the potential impacts of the project -- proposed project on the environment.

Members of the public wishing to make comments are asked to please limit your oral comments to two minutes and try not to repeat points already made by other speakers. More detailed comments may be submitted

in writing until July 20th, 2015.

Please be advised for safety reasons standing is not allowed due to room capacity. We have open overflow rooms in Room 400, 408, and in the event that fills up, Room 421 will also be available.

Once you have made your public comment, please make your way to the overflow rooms to allow other individuals to make their public comment. Thank you.

Madam Director.

EXECUTIVE DIRECTOR BOHEE: Thank you, Madam Secretary.

Good afternoon, Commissioners and good afternoon to the members of the public. Thank you so very much for joining us.

Commissioners, this is a public hearing. There is no proposed action on the proposed Golden State Warriors mixed-use project. Today, again, the sole purpose is to receive comments on the EIR.

So, with that brief introduction, I'd like Sally Oerth, OCII Deputy Director, to provide context and outline a process and procedures. Then the Commission will receive public comment.

DEPUTY DIRECTOR OERTH: Thank you, Director Bohee.

Good afternoon, Commissioners. Again,

Sally Oerth, Deputy Director.

So, this item before you is to -- is a hearing to receive comments on the Draft Subsequent Environmental Impact Report, or SEIR, for the Golden State Warriors Event Center and Mixed-Use Development at Mission Bay South Blocks 29 to 32.

The Draft SEIR was published on June 10th, and the comment period runs through July 20th, 2015. Written comments may also be sent via E-mail to warriors@sfgov.org or to the Planning Department, which is assisting OCII with the Draft SEIR, and the specific mailing address for submitting written comments to the Planning Department is listed on page 2-9 of the SEIR.

Comments provided will be transcribed and responded to in a Responses to Comment document, which will respond to all verbal and written comments received and make revisions to the Draft SEIR as appropriate.

This is not a hearing to consider approval or disapproval of the project, therefore staff is not here to respond to comments today. That hearing will accompany the final certification of the SEIR later this fall.

Comments today should be directed to the adequacy and accuracy of information contained in the Draft SEIR. Commenters are asked to state their name

and to speak slowly and clearly so that the Court Reporter can produce an accurate transcript.

After hearing comments from the general public, we will also take comments on the Draft SEIR by members of the Commission.

And with that, that concludes my presentation. I'm available for any questions. Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Members of the public, please come to the podium in the following order and state your name for the record: Anna Fernandez, Neal Ushman, Ray Nyden, Esther Stearns, and Matt Prieshoff.

CHAIRPERSON ROSALES: Can you repeat those names?

EXECUTIVE ASST. GUERRA: Esther Sterns, Ray Nyden, Neal Ushman, Anna Fernandez, and Matt Prieshoff.

RAY NYDEN: Hello, Commissioners. My name is Ray Nyden. I have lived in Potrero Hill and South Beach for the past 15 years. I also have two businesses nearby, and I'm a board member for the South Beach Mission Bay Merchants Association.

The Warriors have shown an impressive commitment to collaboration and community input in planning the arena, in my opinion. They regularly brief community stakeholders, present updates to the Mission Bay Advisory Committee meetings, and gather feedback from small businesses such as myself in the neighborhood.

One of the many reasons I support the project is because it's -- it is so pedestrian friendly. I will be able to actually walk to the arena events from my home, as well as be able to take dogs the new green area that's going to be developed because of this arena.

I also like the fact that they're gonna have year-round retail as well as restaurants for local residents. So, it's going to be a new meeting place and a place for us to enjoy.

With that short set, I would like to just thank you for your time today, and the City, for taking the time to do the Environmental Impact Report. Thank you.

CHAIRPERSON ROSALES: Thank you.

NEAL USHMAN: Good afternoon, Commissioners. My name is Neal Ushman, and I'm a resident of Mission Bay.

I was originally going to address how impressed I have been with the way the Warriors have been working with the community in addressing our

concerns regarding the new arena. At the many community meetings I have attended, concerns by residents were voiced, and potential solutions to these concerns were explained in great detail. However, after reading this morning's Chronicle, I would like to address another topic.

Thus far, the major opposition has come from the Mission Bay Alliance, and while most of the membership is anonymous, none of those publicly-named members even live close to Mission Bay, and as most thinking-people realize, this group is made up of U.C.S.F. donors and biotech executives who are upset that the land is not going to be used for biotech. After all, they know what's best for San Francisco.

Now, the California Nurses Association comes out against the arena with concerns about access to U.C.S.F. Mission Bay. Have any of these representatives attended any of the CAC meetings where these items were discussed? No.

And according to the Chronicle, when asked about the Warriors' plans, all of the speakers admitted they were unfamiliar with the EIR. And while they claim to have no affiliation with the Mission Bay Alliance, their news conference, conveniently timed for coverage on the same day as this meeting, was organized by the same public relations company that represents the Alliance.

I'm an educator, and as I remind my students about the duck test, if it looks like a duck and quacks like a duck, it probably is a duck. I would give much more credence to the nurses' concerns if they were brought up earlier, and even if one the speakers yesterday had taken the time to actually read the relevant sections of the EIR.

As a grandparent, my granddaughter was a patient in the U.C.S.F. neonatal unit at Parnassus. Access and parking at that location was a challenge. I find it difficult to believe that the Nurses Association believes that the City, U.C.S.F., and the Warriors have turned a blind eye to the legitimate traffic concerns surrounding the new arena and have not taken steps to deal with this issue. After all, we are talking about approximately 200 events per year.

Salesforce would have brought in at least that number of people into the area five days a week, 52 weeks a year.

Let's not use traffic concerns that have been or are being addressed as a foil for other people's agendas.

Thank you.

ESTHER STEARNS: Good afternoon. My name is Esther Sterns. I am a resident of Mission Bay, where I've been a homeowner since 2010.

I'm very excited about the arena's bike and pedestrian access, which I hope will really encourage people to get out of their cars and walk more in our neighborhood, which is something I would like to see.

My wife and I are raising three teenage children in Mission Bay. Until recently, I think they were the only teenagers in Mission Bay. But -- so, when we moved to Mission Bay, when we crossed the creek and moved South, we knew there would be more development, more traffic, more density. And so, we're not surprised that there's new development on this lot. We don't expect there to be empty lots anyplace in a valuable part of San Francisco.

We think the arena is an unexpected bonus for our neighborhood, with the bike paths, with the new parks, with the holiday ice arena as a possibility. All of these things are things that we think enhance our neighborhood for families in a way that few alternatives really could achieve.

So, in that sense, we are excited about the arena. Of course, we support the Warriors, but we're also excited about what the arena can mean for our neighborhood, and particularly, children in our neighborhood. And there are now 250 new children in our neighborhood. We're very excited for them to have access to all of this.

So, that's the basis for our support. I thank you for your attention today, and I hope you'll take into consideration these neighborhood needs as you make your decision.

Thank you.

CHAIRPERSON ROSALES: Thank you.

MATT PRIESHOFF: Good afternoon. My name is Matt Prieshoff. I'm the chief operating officer for Live Nation in the State of California.

As many of you know, Live Nation is one of the world's largest entertainment companies, putting concerts on all across the world.

We're strong supporters of the proposed arena in the Mission Bay area, in large part because there's no major arena in San Francisco, and this great city deserves a great arena, and we know the Warriors have planned for one.

As San Francisco's first ever multipurpose arena, the Warriors will attract people from around the Bay Area, from around the state, and around the world for major events.

As a city, we should be pushing transit first, and we believe that the Warriors EIR plan does that. We believe that this is a transit-rich area and -- that they've done a phenomenal job studying all the potential parking areas around the arena as well.

We want to go on record to you to voice our enthusiastic support of this arena plan, and we hope you will consider our recommendation throughout this process.

Thank you very much.

EXECUTIVE ASST. GUERRA: Anna Fernandez, Alyssa Kies, Alejandro Madi, Alex -- and I'll spell the last name -- it's D-O-N-I-A-C-H -- Damion Scott, Andrew Battàt, please come to the podium.

ALYSSA KIES: My name is as Alyssa Kies, and I'm here representing SPUR.

We've been involved with planning in Mission Bay for many decades, and while we understand that the idea of putting an arena in Mission Bay is a change, we think it's going to be very positive overall for the neighborhood. It's how cities work.

Over the years, different people bring you ideas, and places evolve through the layering process of each generation contributing something different. It's going to make Mission Bay a more interesting place than have it all being one thing.

And on the issue involving transportation impacts, we believe the Warriors are doing pretty much everything we could hope for. Between the transit investments, the existing transit infrastructure, and the fact that some people will be able to walk from Caltrans or from their neighborhood, the impacts are going to be manageable. The City is making the proper investments in transportation infrastructure to support the project.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

ANNA FERNANDEZ: Good afternoon. My name is Anna Fernandez, and I work at the Pediatric Emergency Department in Mission Bay.

I care for very sick children who need continual monitoring and devoted, hands-on care. I am here today to convey my concerns and the concerns of my colleagues, the 3,000 registered nurses represented by the California Nurses Association at U.C.S.F., including the 900 registered nurses who work at U.C.S.F. Mission Bay.

We are not here today to protest the Golden State Warriors. We are here today for one reason: To advocate for our patients and their family members.

As you know, the area around the hospital and clinic facilities at Mission Bay is almost like a small island unto itself, with a very narrow corridor between the Bay and the highways. It is an increasingly dense community with little public transportation that can become easily congested.

A major additional project such as this will undoubtedly increase congestion during the events it is intended to house. We know that the games or other special events -- in those narrow corridors, the traffic can result in gridlock and can limit access for everyone, and that is our major concern.

What will the City do to ensure the patients who need the highly specialized care that we provide, and other patients coming to Mission Bay -- will they have access in a timely manner when they need it -- 24 hours a day, every day of the year, including during games, concerts, or other special events?

What will the City do to ensure the parents of the children I care for and members of other patients -- will they be able to get to the hospital to be by the side of the -- of their loved ones?

What will the City do to ensure that nurses like myself and doctors and other healthcare professionals and personnel will be able to get to the hospital and clinics at Mission Bay to care for our patients?

In a small, densely-packed city such as ours, congestion that affects public health and safety must always be addressed, and the needs of the whole community, not just the wealthy developers, must always be addressed.

Many of us raised similar concerns during the review process for the California Pacific Medical Center facility --

CHAIRPERSON ROSALES: I'm sorry, but your two minutes is up.

ANNA FERNANDEZ: Thank you for your time.

CHAIRPERSON ROSALES: Thank you.

ALEJANDRO MADI: Hello. My name is Alejandro Madi, and I'm a research analyst for Unite Here Local 2. We are the union that represents more than 14,000 hotel and food workers in San Francisco.

I'm here today to express our union's strong support for the Warriors project. From the prospective of creating good, quality, working-class jobs, the proposed arena is probably the most important development we have seen in San Francisco in the last 15 years.

At a time when working-class families are

being squeezed out of our City through a combination of stagnant incomes and rising rents, we should be doing everything we can to promote projects like this one.

As you may know, our union represents 800 concession workers at the AT&T park. While we struggle hard to raise wages and benefits at the ballpark, those remain very part-time jobs because of the nature of the baseball season.

The prospect of a basketball and event center close by holds out the possibility that food service workers could string jobs at these facilities together to something that gives them a real pathway to middle-class jobs. That would be a game changer for food service workers in San Francisco.

The Warriors reached out to our union early on to ensure that workers who currently staff their concessions are guaranteed a place at the new arena, and that the addition of positions created here will be the kind of jobs that raise the bar in San Francisco. That's exactly the kind of development that our City should be investing in.

Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Will the next person please come up?

ALEX DONIACH: Good afternoon. Thank you. My name is Alex Doniach, and I am speaking on behalf of the Mission Bay Alliance, the coalition of U.C.S.F. staff, stakeholders, and residents concerned about the proposed stadium in Mission Bay.

Since we've launched our efforts, we've been out talking to employees and residents in the Mission Bay neighborhood. We've heard from hundreds, if not thousands, of people who are concerned about this project and its significant impacts on traffic, parking, access, and quality of life in Mission Bay.

We've also launched a petition, calling for the City to reject this project. In the past few weeks alone, we've collected more than 4,600 signatures from residents, U.C.S.F. healthcare workers, employees, and neighbors who are concerned about the impact of this 18,500-seat arena.

I am submitting that petition today. We have received letters, too, which we're also submitting, from neighbors who are concerned about the impacts of this project on parking, access to hospitals, traffic, and air quality -- letters that ask the City of San Francisco to consider alternative sites other than Mission Bay for this environmentally-damaging project.

Just yesterday, the California Nurses

Association expressed their concerns about this project. In the weeks and months to come, more people will be joining the growing numbers who are coming to understand just how bad this will be for the neighborhood, U.C.S.F. access to emergency care, and traffic throughout the entire east side of the City.

We hope you'll take these residents and their strong opinions into consideration when reviewing this project.

Thank you.

EXECUTIVE ASST. GUERRA: Please come to the podium.

DAMION SCOTT: Good afternoon. Thank you very much for this opportunity. I am speaking on behalf of Allison Heath, who could not make it here today.

She writes:

> "I have serious concerns regarding the environmental impacts of the proposed Warriors arena which are not fully disclosed or fully analyzed in the Draft EIR.
>
> "The Draft EIR shows that the project would cause severe traffic gridlock, noise, and air pollution in Mission Bay, right next to the U.C.S.F. and other medical facilities, yet the Draft EIR does not even

discuss the land-use impacts of the project. They were not analyzed in the mission of the planned EIR.

"Additionally, the project will further hinder access to other parts of the City and the Bay Bridge to Mission Bay. Even with the improvements proposed by the City, Mission Bay cannot handle up to 18,500 fans and 225 events per year, especially when both stadiums have games.

"While restricting the number of parking spaces may be considered a means of traffic management under the City's regulation, the practical effects will be yet more gridlocked and unhealthy air emissions, and traffic and parking impacts will reduce access for emergency and urgent care for patients and add to the existing commute challenges for the nurses, doctors, and medical staffs who work at the Mission Bay medical campus.

"The Draft EIR also ignores the health and safety impacts of interfering with access to essential medical facilities.

"Increased car and truck emissions in

the area will be unhealthy for residents, workers, and hospital patients. This will have a disastrous impact on the health and welfare of Mission Bay residents.

"Overall, we are disappointed with the City's approach to the environmental review of the project, which fails to fully access the impacts of the project and fails to provide adequate mitigation for the impacts that are identified in the Draft EIR.

"Thus, we ask the City of San Francisco, avoid the disastrous impacts of the proposed entertainment center at the Mission Bay community, including the health and welfare of patients, families, employees and neighbors."

Thank you very much.

EXECUTIVE ASST. GUERRA: Sir, would you please state your name?

DAMION SCOTT: Oh, I'm sorry. My name is Damion Scott.

EXECUTIVE ASST. GUERRA: Would the following people please come to the podium: Blaise Gisslow, Annabel Ortiz, Vanessa Aquino, Curt Yagi, Alex -- and I'll spell the last name -- it's G-A-N-O-W-S-I-H-I.

ANDREW BATTÀT: Hello. My name is Andrew Battàt, and I'll be reading a letter on behalf of J. Huerta (phonetic), who was not able to attend this meeting.

"I am very concerned about the negative impact of traffic and parking in the neighborhood by the proposed stadium at 3rd and 16th Streets.

"Currently, when there is an event at the Giants Stadium, my commute to the Financial District is doubled, be it by car, T-train, or bicycle, due to the influx of people to the neighborhood. Furthermore, parking in the neighborhood is filled with fans, and makes it difficult for residents returning from work.

"While I appreciate these fans supporting our local Giants, I do not appreciate the out-of-town, In-N-Out Burger trash, nor the empty containers left in the streets. This speaks to the way that crowds rush into the games and are often not supporting the local" -- excuse me -- "and how the crowds are not supporting the local community since the games are already so

expensive.

"Adding basketball season to the event calendar for this neighborhood will definitely have a negative impact on the traffic and parking in the surrounding neighborhoods, and residents will be hurt, along with business development and growth.

"I am in favor of neighborhood growth, but unfortunately, I think this stadium will only profit the developer, and I would rather have long-term business growth that this neighborhood is already invested in."

Thank you again. That was J. Huerta, a San Francisco resident.

CHAIRPERSON ROSALES: Thank you.

BLAISE GISSLOW: Thank you to the board for putting on this meeting. I'm very happy to have an opportunity to voice my opinion.

My name is Blaise Gisslow. I'm a concerned citizen of San Francisco, and I'm pretty familiar with the EIR. And I know we've all heard a lot of statistics about parking and stuff, so I'm going to start with a quote I read from an SF Gate article. The quote was from a City official. It said:

"Will there be traffic?"

"Yes."
"Will we be able to handle it?"
"Yes."

Well, I look around the City, and I don't think it's been handled at all. I don't see the credibility in an official who says they know how to handle traffic in a city that's been overrun with traffic for years now.

A problem, I think, with the EIR and the public's opinion is, people are very uninformed about what's actually going on with the costs going into this arena.

Yes, the arena is publicly -- I mean, privately financed, but one thing they haven't talked about is the resulting public transportation improvements that will come along with this project.

So, Caltrans had a proposed and approved line going through King Station, but the Mayor wants to change that line going to the new arena he's proposing, and that would cost $2.5 billion.

That is not privately funded. That would be taxpayer money. And I think that's a huge problem that's not addressed in the EIR. That's a huge amount of money not accounted for, let alone the $40 million of proposed improvements to the public transportation, as

well as $6.6 million in annual upkeep fees to the public transportation.

These are all costs that are not addressed at all in the EIR. These are all under the radar that no one talks about or knows about, and I think that's a huge problem with this project.

Thank you.

CHAIRPERSON ROSALES: Thank you.

VANESSA AQUINO: Good afternoon, Commissioners. My name is Vanessa Aquino. I'm a native San Franciscan and have lived in Dogpatch for almost 12 years. I'm also on the board of the neighborhood Dogpatch Association, and I have witnessed firsthand how our community has grown and changed a lot.

I proudly support the Warriors mixed-used development, because it will serve as a community hub for performing arts, retail space, restaurants, and a wide range of community events, and the Warriors have outreached to us and communicate within our community.

Even better, the Warriors are privately financing it with no money coming from the City or the public, and no new taxes would be involved.

This is a huge win for our community and for all of San Francisco. Having the Warriors in our neighborhood and community will create and bring new needed businesses within Mission Bay, Dogpatch, and beyond, which would be Bayview, for me speaking.

Thank you for your time, and I hope you will take my support in consideration. Have a good afternoon.

CHAIRPERSON ROSALES: Thank you.

ANNABEL ORTIZ: Hi. Good afternoon. My name is Annabel Ortiz, and I am here to talk about the opposition, because we do not want the stadium to be built at the Mission Bay.

So, over the past two weeks, I have been canvassing the Mission Bay area, and I've been speaking with residents and employees, and I've been speaking to the relatives who are visiting patients at the hospital, and I've been asking them, What are your views on building the stadium in such a closed unit?

And overwhelmingly, the response that I received frequently was, Do not build it. I do not want the stadium here. We do not need the traffic. We do not have enough parking.

Again, you know, the BART station doesn't go in that direction, so more people are going to be driving in. So, number one, the concern is to definitely avoid the traffic congestion.

One employee said that when he's driving out

of the parking area to go home, and if there's a Giant's game, it takes him about 30 minutes just to drive one block, and it takes about two hours or two-and-a-half hours just to get out of the area and to catch the freeway. So, in thinking about that, the infrastructure is not suited for a stadium. It's not suited to bring 18,000 fans into this area.

A nurse also mentioned her concerns, which are, How are the emergency vehicles going to access? How can they come in and out of the area?

Well, there's really no plan, and if there is, it hasn't been communicated, and that's a problem.

And, lastly, I want to just leave you with a question about, What would responsible development look like in San Francisco?

You know, it's not just a problem with the stadium, but in San Francisco in general. What does that really look like for the council members? And, you know, we can't deny that traffic is a problem in the quality of life for all of San Francisco.

Thank you.

CHAIRPERSON ROSALES: Thank you.

CURT YAGI: Hello, Commissioners. My name is Curt Yagi. I'm the executive director of ROCK, Real Options For City Kids. We're a non-profit in

San Francisco's Visitacion Valley for over 28 years, serving children and youth there. I'm also a long-term Potrero Hill resident.

I'm a big supporter of the Warriors and their move to Mission Bay. I know the team and the City have worked really hard to take feedback from the community, address their needs, and put this into a plan. I think this is great for that community.

In addition, through my work at ROCK -- we have been working with them in partnership for well over about 10 years, probably even longer -- they're the one rare sports team in the Bay Area that really takes to heart what they want to do, gives back to the community, like organizations like us, does a host of things without the need for -- and expectations for PR. They're doing it for the right reasons.

I have no doubt they're going to look out for the community organizations such as ours, as well as the general community.

Thank you.

CHAIRPERSON ROSALES: Thank you.

ALEXANDER GRANOWSKI: Good afternoon. My name is Alexander Granowski. I'll be speaking on behalf of Harold M. Hoogasian, who could not make it today.

"Although I support the quest for an event arena that might serve as the Warriors' home in San Francisco, the site proposed to cross the U.C.S.F. Mission Bay is not appropriate.

"The lack of parking, coupled with the proximity to both the Medical Center and AT&T park is a recipe for congestion and a potential disturbance for the quiet care of patients at the Medical Center.

"I understand there's an alternative site available for consideration which has comparable transportation infrastructure support and is removed by some distance from the Medical Center and the ballpark."

Thank you for your time.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Will the following people please come up: Sebastian Conn, Kevin Carroll, Scott Van Horn, Pat Valentino, and Esther Stearns.

SEBASTIAN CONN: Good afternoon, Commissioners and Madame Chairman. My name is Sebastian Conn, and I'm here to speak in support of the project.

I'm a student here in San Francisco, and like so many San Franciscans, I rely on riding my bicycle everywhere.

I'm excited for the Warriors to move to Mission Bay, because I think this venue will have tremendous bicycle access, with the abundant bike parking as outlined in the EIR.

It has over 300 valet spots, over 100 secure bike parking spots in the office buildings, and dozens more around the site. Plus, this project will bring new bike lines on Terry Francois and 16th Street, making it simple and safe to get to.

Thank you for your time.

CHAIRPERSON ROSALES: Thank you.

SCOTT VAN HORN: Hi. I'm Scott Van Horn. Thank you for the opportunity to have me speak today on the Draft EIR.

I live in Dogpatch, just a couple of blocks from the site. I'm actually one of the very few that is going to get my view of the Bay Bridge blocked from my apartment by the project, however I'm not a NIMBY.

As others have talked about this document, this document is incredibly thorough, and I applaud the City for looking at all the issues so carefully and demonstrating attention to the impacts to my neighborhood.

I'm especially pleased about the new businesses and parks that will go in within walking

distance.

As you know, the Warriors and the City have been working very closely with neighbors like myself, listening to our feedback and incorporating the community suggestions into their plan. As a result, they've come up with a project that perfectly fits into the Mission Bay, Dogpatch, and other surrounding communities.

Most of the neighbors that I've talked about [sic] are extremely excited about it. I'd like to go on record that I am personally in support of the new arena.

Thank you.

EXECUTIVE ASST. GUERRA: Cathy Searby, Ace Washington, D.J. Brookter, and Nick Belloini, please come to the podium.

PATRICK VALENTINO: Good afternoon. My name is Patrick Valentino. I'm the vice president of the South Beach Mission Bay Merchants Association. I also live in the neighborhood, close to where the new event center will be.

I've taken some time to look at the Traffic Management Plan and the Draft EIR, and a couple of things, I think, are very important to point out.

Number one, if you start to compare traffic management plans of arenas that have been constructed in the recent decade, you'd see that this is probably one of the most in-depth and forward-looking plans, moving to a transit-first plan, as opposed to prioritizing the automobile, which I think is extremely important. This one talks about having the most bike parking spaces that we'll ever see for an arena.

Also, in discussions, as I understand it from attending a lot of the public meetings, is that there's talk about having direct right-of-way for hospital workers and emergency vehicles. And I think that's extremely important to consider.

It is not the case that the hospital and the emergency issues have been taken off the table. That is very much part of the discussions, and we should pay deference to that.

As far as quality of life goes, you know, we're evolving and finding out that cities are some of the greenest places that we can be, and this is where we have a chance to put housing next to work, next to play.

And the event center is a sense of place that can happen in Mission Bay. It can create a very new and exciting place for us that is environmentally very aware and sensitive to our surroundings.

It's going to be a LEED gold-certified construction -- that's significantly important -- with

offers to mitigate 100 percent of any greenhouse gas emissions.

Again, we shouldn't look through the lense of the automobile and what might have been construction in the 1950's, but look forward to what we're doing today.

I very much support this project, and so does our association.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

CATHY SEARBY: Thank you, Commissioners. My name is Cathy Searby, and I live in Mission Bay with my husband and daughter, and I live next door to the proposed arena site.

We're very excited as a family, not only to watch the championship Warriors basketball team in the arena, but we feel strongly that San Francisco needs this entertainment destination, with the family shows such as "Disney on Ice," the Globetrotters, and concerts we can attend together.

I'm also excited about the waterfront park as there's nothing like this currently in the south neighborhoods, and it provides a place for kids and families to enjoy the beautiful views, have fun in a safe environment.

The Warriors and the City have gone through thorough analysis of the project, including extensive meetings -- the Mission Bay CAC, U.C.S.F., and our neighborhood -- to address our concerns. They have made good progress with all of us, especially U.C.S.F., in coordinating their respective operations so both can function productively in our neighborhood.

As a result, the Warriors team have come up with a project that fits well in the community and that we, as neighbors, are very excited about, if you would put us down for three.

Thank you.

CHAIRPERSON ROSALES: Thank you.

D.J. BROOKTER: Good afternoon, Commissioners, Madam Chair, Director Bohee. My name is D.J. Brookter, and I'm the president of Bayview-Hunters Point, and I'm also the deputy director of Young Community Developers, which is in Bayview-Hunters Point, and I'm here to express my strong support for the Warriors and the arena at Mission Bay.

Pat actually stated -- I was extremely impressed on how green the project itself is based off the EIR. The arena emission rate will be LEED gold certified and will truly set a standard for sustainable building design, I think, here in the City.

And the Warriors are more than just a

basketball team, as we've seen, especially with the championship that we just had. And what the team will actually do is be a partner in the community.

I know just that Young Community Developers alone, within the past two seasons, we've been able to employ well over 200 individuals from Bayview-Hunters Point that we actually transported from Bayview-Hunters Point to Oakland to work in the arena. So, just imagine how many more folks, from an economic standpoint, that will be able to work once those guys are here in Mission Bay.

I just want to thank you all for the opportunity to speak on behalf of the EIR and for your time today in my support for the Warriors stadium.

Thank you.

ACE WASHINGTON: Good afternoon.

I apologize to the younger generation in the back here, but, you know, this is what happens down here at City Hall. I mean, this is something light.

But let me just go on. Ace on the Case. Who is gonna replace Ace is the Case, Community Assistance Service Enterprise?

See, what we do is analyze things -- think about the theme, the scheme, and the team. We analyze the team, find out what the scheme is, and we come back and analyze it.

Think about it, ladies and gentlemen. I'm not new to this; I'm true to this. Okay.

Let me just also go on and say, I don't need the permission, because I'm on a mission. You know, I've been doing this for 25 years, youngsters back there, so you all need to take note. My name is Ace, and I'll give you my numbers later.

But right now, let's talk about the players we've got here. The players. This is all about dollar bills. You know, you talk about the EIR. This is about dollar bills.

Right here. Let's talk about the players, the bases. Let's talk about who is representing who. One side is an ex-member of the Mayor's, and then you got a next side that's a -- what -- he's a community or -- he works for consultants for the big Lennar out there. So, you've got big two big consultants. We're talking about money now. We don't mention that in the EIR, but I'm here to tell you, that A-C-E has been studying it.

So, we're going got put all these things together and we're gonna up with a solution, Mr. Warrior. It's called "community reform," to get -- you know, flip-flop and drop all this other stuff.

We, as community people, must be involved with

the growth of this city for the next 10 years for the generation in the back. So, therefore, I've got a method to all this pollution.

You need to have some kind of conversations about how we're going to put things together. And the only way to do that is you've got to collectively deal with our legislators out here, with our supervisors -- London Breed and Cohen.

That's the only way, youngsters in the back, we're gonna change, so you, in 10 years, will be able to have some part of it.

My name is Ace, and I'm on the case.

Also, about the Warriors down at Mission Bay, my request is a simple one: For the blacks to note that we were part of the Mission Bay through Jim Jefferson.

My name is Ace, and I'm on the case.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: John Caine, Jon Ballesteros, Dianne Hartnett, and Kim Kobasil [sic], please come to the podium.

KIM KOBASIC: Good afternoon, Commissioners. My name is Kim Kobasic. I am a Potrero Hill resident and small business owner in the South Beach.

I'm also the copresident of the South Beach Mission Bay Business Association, and I am here to express my support for the Warrior's arena in Mission Bay.

After taking some time to review the EIR, I am excited about the open pedestrian accessibility in the arena. The walk is going to be flat. It's going to be easy and beautiful along the waterfront.

The venue's proximity to public transportation means that anyone who lives near BART, Muni, or a Caltrain line can walk to a stop or station and arrive at the arena's doorstep within minutes.

The new arena also triggers the construction of the new bayfront park, which will make Mission Bay more hospitable for runners, families, and allow people to enjoy the waterfront. Right now, that is not currently possible.

Thank you for your time today, and I hope you will take my feedback into consideration.

TIM PAULSON: Commissioners, good afternoon. my name is Tim Paulson.

I'm the executive director of the San Francisco Labor Council. We represent over 100 unions here in town, many of members who do live in the District 10 and 6 in the areas that have been revitalized over the last 30 years.

I can remember when there was an old shipyard

out there -- I should say an old train station -- out in that area, and there were many different plans that were put together to build a hospital, build new businesses and parks. There's so many different, exciting things that are going there. And I've been on record as saying that the Labor Council supports this arena to come to San Francisco.

The first thing that the Warriors did -- one of the first things they did when they first announced their intentions to come to San Francisco is to call the Labor Council, and there have been many, many meetings and discussions with the unions here in town, and that's where we moved.

And I'll tell you, even last night when I was coming back on the plane from New York City and I noticed that the California Nurses Association, which is a very wonderful union that's part of our Labor Council -- even before I saw that they had a press conference yesterday, there still were concerns that people had about traffic mitigation next to a hospital.

And we take that very seriously, and we take the nurses very seriously. But I've been assured by the Warriors and the City as we go through this ongoing process that those mitigations will take place.

Again, this is an evolving neighborhood, and it's a wonderful neighborhood, and it's exciting that the Warriors are coming here, and I think that we will get to the right place at the right time to make sure that this happens.

Thank you very much.

JOHN CAINE: Hello, Commissioners. My name is John Caine, and I'm a small business owner in Mission Bay and in South Beach.

I support the Warriors arena project in San Francisco, knowing that it will have a positive impact on our Mission Bay Community. I've reviewed the arena plan, and what really stands out to me is the steps that the architects have taken to minimize the impact that this project has on our environment.

Thank you for the opportunity to weigh in today.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Please come to the podium: Paul -- and I'll spell the last name -- it's O-B-I-D-S-M-O-N; Stefano -- and I'll spell the last name -- C-A-S-S-O-L-A-T-O; Ben Bleiman. Please come to the podium, Adam Gould and Curt Yagi.

JON BALLESTEROS: Good afternoon, Commissioners. Jon Ballesteros, San Francisco Travel Association, and I'm here today to express our strong

support for the Warriors arena in Mission Bay.

Throughout the EIR process, the City has done a thorough analysis of the project and every conceivable impact it could have on the city. The team has been above board and maintained complete transparency in their plans since they've been talking about this project many, many years ago.

We have confidence in the City's assessment that traffic be manageable, and we believe that the benefits of having a multipurpose arena that will serve all of San Francisco will far outweigh any potential impacts.

So, with that, I want to thank you for opportunity to weigh in today.

DIANNE HARTNETT: Thank you for your time. I'm Dianne Hartnett, and I'm here because I'm a real estate professional that's been working in the South Beach Mission Bay area since 1989.

I have been specializing in South Beach Mission Bay since 2005. I have worked with hundreds of people renting, purchasing, developing in the area, and I am here to support the progress.

I know change is difficult, and I believe, witnessing, attending meetings, talking to people that I have worked with, for the most part they're supportive of a responsible vote.

There is no place in the City that does not have a traffic headache at this moment in time, that I, too, have witnessed. I, too, live in a neighborhood with retail. That comes with some pros and cons, but the majority of the people with this vision for this neighborhood moved here knowing this change was inevitable. And I think that the outcome, if people will collaborate, could be very, very positive for the entire City, not just Mission Bay.

We thank you for taking so much time to really thoughtfully think and listen to everybody and all their opinions.

Thank you.

CHAIRPERSON ROSALES: Thank you.

STEFANO CASSOLATO: Good afternoon, Commission. My name is Stefano Cassolato. I'm a registered lobbyist in the City, but I'm here on a pro-bono basis.

I'm coming as a long-term resident. I'm 50 years old, and I was 10 years old when the Warriors won the championship. That really made me happy as a young child and really got me interested in the Warriors. And I'm 50 now, and I'm still very excited about what they brought to the Bay Area.

I would like to say this: When the Giants came, you know, to talk about putting a stadium on the water, there was opposition. There was many of the same opposing dis- -- opposing arguments that we're hearing today. However, this is a very thorough group, project sponsor, from the top down -- Mr. Wells, Lacob, Gruber. They pay attention to detail. They dot their I's. They cross their T's. They hire very, very skilled people, and they're very well prepared.

This City is going to have something that they've needed desperately for years. We have a big venue, we have many small venues, but we don't have a an arena. If we want to call ourselves a world-class city, we're going to need a venue that they're proposing today. More than just basketball. Concerts. Events.

I remember, in 2001, I worked with Bob Arum of Top Rank to bring Mayweather-Chavez before Mayweather was money. And we had that event at the Civic. And I remember how important that was. We can attract more venues like this.

This EIR is very thorough, well thought out, and this arena will be nestled in Mission Bay, which many people will embrace.

I think what's going to happen here is, we're going to make sure that all the steps are taken so that all these concerns are addressed.

Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Will the following people please come to the podium: Kevin Carroll, Cathy Searby, Andrew Goldstein [sic], and Nick Belloini.

BENJAMIN BLEIMAN: Hello, Commissioners. Thank you from having me. My name is Benjamin Bleiman.

I am the founder and owner of Tonic Nightlife Group, which has seven bars in San Francisco, as well as an event company. We employ over 75 people.

I'm also the founder and manager of the San Francisco Bar Owner Alliance. We have 220 elite bar owners in that group.

I'm also the chairman of the board of the California Music and Culture Association, which is the trade group called CMAC for short, that represents bars, nightclubs, music festivals, and music venues in San Francisco.

I want to talk today about the impact that this stadium, this arena, will have on San Francisco's nightlife.

It is -- all those groups that I spoke of, it's our job to support vibrant, world-class nightlife in San Francisco, and we feel that this arena will

contribute in a very meaningful way to bringing San Francisco up to a world-class city in terms of nightlife, not just from the events that will be there, from sporting events to A-list concerts and music events such as the Red Hot Chili Peppers or Beyoncé, which now have a chance of actually playing in our city, but also in all the people that it'll draw from the outside areas, who will then stay in the city, some of them, and go in the City and spend their time and their money and their joyous smiles at our nightlife venues. So, we're very excited about that.

They've outlined the existing parking near the venue and the extensive of public transportation that will serve the site, and the traffic management plan that I've looked at is very thoughtful and thoroughly done, and it gives us no reason for concern.

So, we want to go on record to support the arena in the strongest possible terms.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

NICK BELLOINI: Good afternoon, Commissioners. My name is Nick Belloini. I'm going to weigh in on this proposal.

I think that's it's a wonderful idea to have an arena here in the San Francisco. The area has gone through an extensive EIR early on, when it became the Mission Bay.

I remember hearing my dad's stories -- who used to be a part of customs, going through the warehouses that used to be there. And, trust me, there's some things you never want to hear that happened down that way.

But the issue is, it had that EIR that made it the great possible [sic] that it is now. And now we're doing a second EIR that is turning into making it so that the Warriors can have the arena here, which is a true gem for San Francisco.

It will complement the hospital, it will complement everything there, and it will be a great thing for San Francisco. So, I fully want to say I support this project and I support the arena with all of my existence.

Thanks, guys.

EXECUTIVE ASST. GUERRA: Please come to the podium: Sheryl Davis; Henry -- and I'll spell the last name -- it's K-A-R-H-O-L-O-W-I-T-Z [sic]; Jim Lazarus; Abe Evans, and Elizabeth Kirk.

ADAM GREENSTEIN: Good afternoon, Commissioners. My name is Adam Greenstein, and I'm a resident of San Francisco and business owner, and I'm

here to support the Warriors arena in Mission Bay.

I reviewed the plans, and what really stands out to me is the steps that the architects have taken to minimize the impact this project has on our environment.

They made a promise to offset 100 percent of the arena's greenhouse gas emissions by paying to the state's Carl Moyer program, which funds the upgrade of vehicles such as dirty school buses, in terms of getting clean, fuel-burning buses. This focus on climate-change mitigation is the future of responsible building, and I'm proud that the Golden State Warriors are leading the way.

I'd also like to point out there were similar concerns when the San Francisco Giants built their stadium, but I've witnessed how that stadium has revitalized the SOMA area. And as a future homeowner in Mission Bay, because I plan to buy a place this year, I'd like to see that same transformation happen in Mission Bay.

Thank you very much for your time.

CHAIRPERSON ROSALES: Thank you.

KEVIN CARROLL: Good afternoon, Commissioners. My name is Kevin Carroll. I'm the executive director of the Hotel Council of San Francisco.

I have the pleasure of working for an industry that employs 24,000 people, the majority of whom live and work it San Francisco. And I'm here to fully support the Warriors arena in Mission Bay.

We do believe that by having the arena there, we will continue to attract more events and other activities to the City that will help not only those who are participating in the events, but those who are working in industries like the hotel industry that will get extra hours and be able to work to be able to support the events as well.

The public space that's part of it, I know, is equivalent to the size of Union Square, and it's something that's adding public space to the project. And working with the project as well as it's done is something that would be important to both us and to our hotel guests as well.

Guests who stay at our hotels spend more money outside our hotels as they do inside. So, if we can attract more people to come in for the events that are part of the arena, they'll spend more money, which will benefit all those who not only work in the hotels, but those who have businesses around them and many small businesses that rely on the visitors as well.

So, again, I'm here to fully support the arena, and I really thank you for your time today.

CHAIRPERSON ROSALES: Thank you.

JIM LAZARUS: Good afternoon. Jim Lazarus, San Francisco Chamber of Commerce.

The Chamber of Commerce represents over 1,500 businesses of all sizes throughout the City, employing over 200,000 people, including the City's hospitals, including the Warriors, including many businesses in Mission Bay.

If the issue is traffic congestion, it can be managed. Hospitals throughout San Francisco are in locations that deal with access issues every day.

How many of us have driven by Saint Mary's Hospital on Fulton and Stanyan on an afternoon or when JFK Drive is closed? Or C.P.M.C. building a new hospital at Van Ness and Post? Or U.C.S.F. Parnassus, which for decades was a neighbor of Kezar Stadium, with 70,000 people going to 49er games, college and high school sports in that facility for decades before it was reduced in size about 30 years ago?

I took a look at the March 1996 voter handbook in San Francisco when the voters were asked to approve the ballpark. Some unnamed group called San Franciscans for Planning Priorities '96 had the ballot argument against the ballpark.

They opposed Prop B because, Millions of additional cars and no parking will drive jobs and businesses out of China Basin, will create gridlock over 200 days a year. Well, we all know within weeks of that ballpark opening in 2000 it was a gem on the waterfront that is supported by San Franciscans throughout the City.

The Draft EIR outlines a mitigation plan for traffic and congestion management that will work for U.C.S.F., it will work for the residents, and it will work for the businesses in Mission Bay, and we urge this Commission to support that EIR and to move this project forward as quickly as possible.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

HENRY KARNILOWICZ: Good afternoon, Commissioners. Henry Karnilowicz, and I am the president of the Council of District Merchants, which represents some -- over 2,000 businesses in the City.

I am in full support of the Warriors arena project in San Francisco, knowing it will have a positive impact not only on Mission Bay, but also on our gem of a city. I want to thank the City for taking the time and energy to create a world-class project that is deserving of a world-class city.

Thank you for the opportunity to weigh in

today. I hope you will take my support to consideration.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Please come to the podium: Matt Prieshoff, Drake [sic] Donaldson, Bruce Agid, and Celestino Ellington.

ABE EVANS: Hi, Commissioners. My name is Abe Evans. I'm a student here, and I live in Potrero Hill, and I'm really excited about this stadium and arena, because it's really bike-friendly, and I bike everywhere in the City.

I love that it is in line with the City's Bike Plan and the Transit-First policies.

I'm excited because it's going to add to the Blue Greenway, and it will be great to have a lot more of that bike path, especially somewhere where I can drop off and grab a bite to eat at some of the retail that's going to be open on the bike path.

Thank you so much for your time.

CHAIRPERSON ROSALES: Thank you.

ELIZABETH KIRK: Hello, and thank you, Commissioners. My name is Elizabeth Kirk. I'm also a student here and a Warriors fan.

I've come today to fully support the Warriors' plan to move to Mission Bay.

I'd like to express my support, mostly because of some of the environmental plans that have been made for this project. In reviewing those plans and by looking at many of the renditions, I'm impressed with the emphasis on landscaping and green space, as well as the incorporation of the natural environment with the site.

From trees and grass lawns and all of the green rooftops that have been designed, I think that this project will have a big impact on making our City more green.

Thank you.

CHAIRPERSON ROSALES: Thank you.

SHERYL DAVIS: Hello, Commissioners. My name is Sheryl Davis. I run a non-profit here in San Francisco.

And, first and foremost, I just wanted to thank you for the time and deliberation that you have already taken into looking at the EIR, and then also to express just gratitude for the way that the Warriors and the City have worked together to address some of the issues identified.

I know that we're talking about the Environmental Impact Report, and I just wanted to say

that for us, for me, specifically, in working with young people, really looking at the social impact and the possibility and potential of what the Warriors have already demonstrated as a great partnership, we actually brought young people out here today to be able to see the process.

They've been talking about the role of science and technology and engineering and mathematics, and all the different fields, and this has really afforded them to be able to look deeper.

But also looking at sports as more than just sports and the workforce development opportunities that the Warriors have provided -- the community development, the collaboration, the partnerships -- I think that those are all things to be highlighted and supported.

They have been amazing community partners for us, and I can only imagine how much more so that can happen with them here in the City -- the opportunity to actually visit the building and to see that it's more than just a sports arena, but to also see the people that are behind the scenes, even in things like this today, to understand that the Warriors is an organization and that there's a commitment for community giving and support and giving back and being able to learn that process.

So, I think, for me, it's much bigger than just the idea of the team, but it's really about the organization itself, and what they represent, and what they're doing for community, and allowing young people to be able to see that firsthand and see that happening in the City for a team that, right now, is being celebrated for the championship, but I think should be celebrated for work that they've already done with the community.

Thank you.

CHAIRPERSON ROSALES: Thank you.

BRUCE AGID: Good afternoon, Commissioners. My name is Bruce Agid. I'm the transportation rep and a board member of the South Beach/Rincon Hill/Mission Bay Neighborhood Association. However, today, I'm speaking on behalf of myself as a resident of Mission Bay.

I'm a supporter of the arena project and look forward to the Warriors coming home to San Francisco.

My comments today are focused on the transportation aspect of the EIR and the associated mitigation plans.

A review of the Draft EIR clearly indicates a detailed account regarding the traffic and transit impacts on Mission Bay. There is no sugarcoating of the assumptions, and all the impacts of the traffic and

traffic congestion appear to have been identified.

Those of us who live in the area understand the congestion that exists today, can anticipate the impacts of events at the arena, and the assumptions outlined in the EIR seem to align with my intuitive perspective on the subject.

With that said, I've attended public meetings and have reviewed the mitigation measures outlined in the Event Management Plan. Some of those included transit improvements, supplemental service, a robust Traffic Management Plan, and the bike and ped improvements, again, just to name a few -- and have confidence that with the appropriate event coordination, resource availability, and effective implementation of these mitigation measures, the traffic and transit congestion can be managed effectively.

Thank you.

EXECUTIVE ASST. GUERRA: Will the following people please come to the podium: Michael Sesich, David Siegel, Dennis MacKenzie, Jac Taliaferro, and Christopher Hrones.

DRAKARI DONALDSON: Good afternoon, Commissioners. My name is Drakari Donaldson.

I'm a student, I'm a bicycle advocate, and I'm very impressed by how bike friendly this venue will be.

Furthermore, the project promises to bring new bike lanes to Terry Francois Boulevard and 16th Street, making it simple and easy to get in and out of the area. By making the venue so accessible to bicyclists, they are reducing carbon emissions in cars and traffic congestion in the area as well.

Thank you for your time and consideration.

CHAIRPERSON ROSALES: Thank you.

CELESTINO ELLINGTON: Good afternoon, Commission. My name is Celestino Ellington.

Not only am I a San Francisco resident, but I'm also the sports and recreation director for the YMCA of San Francisco Bayview-Hunters Point branch. And we've been community partners with the Warriors. I started the program in 2006, and I can remember being a part of the Warriors ever since then. And they've been more than just a sports team to me and the families of our YMCA.

Through the years, we've been able to experience the whole Warriors organization, from inside out, outside of just the game of basketball. And, believe me, those are opportunities that people dream to be a part of, and they were in Oakland this whole time.

They've been amazing community partners who have proven that they will work to address the needs and

challenges, and implement strategies that are best for everybody. You know, the Warriors and the City have worked hard to address the concerns and listening to feedback and incorporating the community's suggestions into their plans, and as a result, they've come up with a project that fits very well in the Mission Bay community, and the community and the whole City is excited.

I'd just like to acknowledge my support on record that I do support this project, and if we'd been able to do this with a relationship across the Bay, imagine how many more organizations that the Warriors can affect right here in the City.

And I really do believe that the Warriors' mission, outside of basketball, is community. We've been a direct result and have been privileged to experience those things, and we're looking forward to those in the future as well.

Thank you.

CHAIRPERSON ROSALES: Thank you.

MICHAEL SESICH: Good afternoon. My name is Michael Sesich. I'm a native San Franciscan. I've lived in Mission Bay for the last three years.

I find the Warriors a good attraction to San Francisco. I'm not opposed to the team moving back to San Francisco or even a new arena in Oakland, but I do have concerns about the placement of the new arena in the Mission Bay neighborhood.

The proximity to the hospital, which the nurses' association is pointing out, makes it difficult to get to that location. And I know from living two blocks away from the proposed site how bad the traffic is now with just the AT&T traffic in that area.

One time, I was coming home with my wife in the car, and the traffic was so bad on Third Street, I got out and walked and got home before she did in the car. And I think that a woman, pregnant and going to a woman's hospital in Mission Bay, being stuck in traffic -- the problems that can create.

So, I'm deeply concerned. I've voiced these at local community meetings before.

And I must praise the organization of the Warriors too. I think they've done a good job of reaching out. But when I read the Environmental Report, I came across terms like "provide adequate," "various management strategies," "encourage," "should not," "commercially reasonable efforts." All that could be sidestepped and not get what you want.

When the AT&T park went in, we were told that people would take the train and people would take public

transportation, yet the parking lots of that park are overflowing, and they're looking for new space now that there's a building going in.

So, I'm very concerned about the project's impact on the neighborhood parking and traffic, but not opposed to the Warriors.

Thank you.

CHAIRPERSON ROSALES: Thank you.

DAVID SIEGEL: Good afternoon. David Siegel. 25-year resident of the Dogpatch and vice president of the Dogpatch Neighborhood Association.

The D.N.A. is not opposed to the stadium. However, the development will have direct and lasting impact on our neighborhood, and of course, is of grave concern to the Dogpatch Neighborhood Association and residents of the community.

Our small, beleaguered neighborhood is being severely impacted by the relentless encroachment of U.C.S.F., housing developers, and now, Warriors.

Today, specifically, I want to direct my remarks to the proposed parking lot at Crane Cove. There are a number of issues that we're concerned about regarding this parking lot location.

First of all, Illinois Street is the official route for trucks and bikes as part of the Transportation

Plan of the City. This street would be the nearest street to the proposed parking lot. The Port is also planning on having a 19^{th} Street extension serve as a BAE heavy large-truck route, and Muni is also planing a turnaround loop, as well, directly in that area. Further, Crane Cove is a small patch of green space on the waterfront that serves the community and needs to be protected.

Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Joe Boss, Jennifer Davis, Rudy Corpus, John Cornwell, and Silvia Johnson, please make your way to the podium.

DENNIS MACKENZIE: Thank you, Commissioners. I'm Dennis MacKenzie. I'm work in consulting and education, and I teach in the San Francisco public high schools, including at the Juvenile Hall.

I have made a proposal and shared with everyone, requesting the Warriors and all the City departments and leaders, including high school classroom, put a golf program inside the arena.

At the last meeting on May 19^{th}, I shared with the Committee and the other leaders in the City and the Warriors that one the things that I've been asking -- and first of all, I am wholeheartedly in

support of this arena and believe all City family leaders can get together and find solutions to this traffic part.

I introduced the idea of the Warriors collaborating with Juvenile Hall on what's referred to as Log Haven Ranch, which has the opportunity -- they have a small gymnasium. I just introduced that to the Warriors and the City, that that is an opportunity for this small gym to provide what I mentioned about golf-course training programs in Philadelphia, Pennsylvania -- I'd like to share this with you (Indicating). But the history of using the sports facilities can be a tremendous influence for kids at risk and all students.

So, in the minutes, I just wanted that to be corrected. I meant to say this earlier -- that there's a statement that I -- I admit I was a Giant -- I mean, the Warriors -- I had proposed to them -- have already done tremendous work in this entire Bay Area promoting education, and then the basketball and the community foundation.

So, in the minutes, it states that I was asking the Warriors to do something with the golf course. That was the not my intent. It was to use this golf-course training program as a model, which my proposal in the classroom is a model to use for future NBA professional or indoor arenas, which I believe is very tremendously valuable for our country.

Thank you very much.

CHRISTOPHER HRONES: Good afternoon, Commissioners, and thank you for the opportunity to comment on this Draft SEIR.

I'm a new resident of San Francisco, who has followed this project with interest. Prior to this year, I lived in Brooklyn, New York, where I had the opportunity to participate professionally in the planning and public discussion of the Barclays Center Arena and associated Atlantic Yards development. This saw the relocation of the Nets basketball team from New Jersey to Brooklyn.

Although there are obviously some differences between that development and this proposal, there are also some interesting parallels, namely the creation of an 18,000-seat multi-use arena in an urban infill site accessible by transit, but also, there are major concerns in both cases initially expressed by some about traffic and parking impacts. So, I have a number of observations I think are relevant.

In the interest of time, I'm going to focus on three things which seem to come up the most today, which

are traffic congestion, parking, and emergency vehicle access.

As far as traffic congestion goes, the impact feared by many of the Barclays Center site, for the most part, did not materialize.

As a transportation professional involved in the project from the government agency side, the biggest story for me was that the fears of congestion greatly -- were greatly -- were exceeded by -- greatly exceeded the actual impact, so that when the facility opened, traffic congestion was more or less a nonstory.

This was due to a number of factors, but the two most important were that transit utilization did not meet the project goals, and that vehicle arrivals to the arena were more spread out than projected.

In terms of parking, the main observation is that off-street parking supply provided by the project, combined with existing nearby off-street parking, far exceeded demands. And so, parking availability was not an issue there either.

And finally, for emergency vehicle access, which has been raised as a potential concern here, this was effectively accommodated in Brooklyn, where police and fire stations are located immediately adjacent to Barclays Center, and there are no significant issues that I'm aware of.

CHAIRPERSON ROSALES: Your time is up.

CHRISTOPHER HRONES: Thank you.

EXECUTIVE ASST. GUERRA: Sir, can you please provide your name for the record?

CHRISTOPHER HRONES: Yes. My name is Christopher Hrones.

JAC TALIAFERRO: Good afternoon, ladies and gentlemen. My name is Jac Taliaferro, and I own La Hitz Digital Media. I'm a San Francisco native, and I own a business here.

The tradition of building stadiums here in San Francisco is -- dates back to the first century -- or, two centuries ago, turn of the century. Robert Taylor, who you may not know, in the Polo Fields, was a gold medalist and also the world champion, and he was an attraction for the Polo Fields when it was built at the turn of the last century.

We know that tourism is the number one industry, and that's fueled by entertainment. So, right now we have one the best entertainers in the world, Bobby Ware, back there. He's helping the fight to get the Yoshi's back into our control.

But my main concern here is the business that the Warriors are or are not doing with black-owned

businesses, which is different than non-profits.

I haven't seen one black business come up here, except for myself, and I was born here. So, of course, when the Warriors won, I was here. And it was a great delight.

This time it was bittersweet, because before the Warriors season started, I was told by a Warriors staff person that he was going to keep my business, which is connected to other black businesses, from doing business with the Warriors. I honestly didn't like that.

So, I wrote this article about that and got a call from that person later, but the opportunity was gone for us to start at the beginning of the season and see them all the way through to the championship.

And I know this well because I'm in entertainment. I've been with groups that's went from obscurity to number one, winning Grammies, et cetera, et cetera, and dealing with people who were there before us to when, now, it is different.

So, my company has lost out on maybe from $700,000 to 1.5, an analyst said. This is a question of "Black Lives Matter." "Black Lives Matter" is not about crisis situation. It's about us flourishing, and we need to flourish with the Warriors.

They're welcome to come here, but you know, if there's an issue about planning, put them out at Candlestick.

EXECUTIVE ASST. GUERRA: Sir, your time is up.

JAC TALIAFERRO: Thank you.

This is -- this is the article that I wrote, and I would love the Commission to see that (Indicating).

CHAIRPERSON ROSALES: Thank you.

JAC TALIAFERRO: You're welcome.

Thank you.

JOHN CORNWELL: Hello, Commissioners. My name is John Cornwell, C-O-R-N-W-E-L-L.

I'm actually a third-generation San Franciscan. I have two young kids who will hopefully be long-term, fourth-generation residents. I've been a resident in the area for 20 years.

And, you know, I worked -- was around when the Giants negotiated with community impacts. The traffic density was a lot different back then.

I respect the Warriors. They're a good organization, but they're not this non-profit organization that should be exempt from smart urban planning; right?

If we had a bank headquarters that was going

to go in that spot with that traffic density as it now exists, and you're going to have 20,000-some-odd visitors, you would write that off immediately. That's awful urban planning.

They're not a non-profit. They're a multibillion-dollar asset and a very profitable organization. And it does not make sense for a company that is going to put that kind of burden on the community and the region; right?

I only ask that you guys go out to that area during commutes and see how bad the traffic is now. The Third Street corridor already is saturated.

And, you know, this isn't about the surface streets in the that area. That's bad enough. But you're talking about the Bay Bridge. We all know that the Bay Bridge rush hour starts at 2:30 and goes to 8:30. So, now are we ready to basically have there be no non-rush hour, for the morning rush hour to run into the afternoon rush hour?

Even if you have 80 percent traffic utilization, already traffic is at a breaking point in San Francisco. I think we all know that from everyday experience. It's not smart urban planning.

These EIR statements about, There will be adequate -- yeah, there may be transparency, but that still doesn't change the fact that it is a huge impact, and it's not a proper use. And you can do all the mitigation you want, but there's not the ability to add bandwidth and traffic capabilities around there. That's common sense.

So, you can offset carbon utilization and all the rest, but the bottom line is this is a really bad regional project.

CHAIRPERSON ROSALES: Thank you.

SILVIA JOHNSON: My name is Silvia Johnson and (Unintelligible) a lot of people would be jealous of me playing the guitar and be rich and famous right now.

I'm just (Unintelligible) you know, my priorities were -- over there in the mountains they don't have no (Unintelligible). You know, I think that's where we should be putting places where you can park. (Unintelligible) put the BART system to where it can go to the stadium, and that way, we would have a lot impact with our plans than when we go to see the Warriors.

And I think there's more solutions to those problems -- is that we need to agree with the Warriors, which would eliminate a lot of these impacts. Maybe put that in thought, that -- to build a BART over there behind the mountains there. You see on this picture

right there.

And I think that this is one of our main problems -- is that -- of course, jealousy is really bad out there. And this is one of the reasons why I haven't been able to build up my career with my guitar playing. And I had already 18 guitars already stolen from me. I went to Washington, D.C., played down there. They stole that too.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Will the following people please come to the podium: John deCastro, John Caine, Mr. Al Norman, Mr. Oscar James, Osha Meserve, and Paul Osmundson.

JOE BOSS: Good afternoon, Commissioners. And good to see you, Tiffany.

The -- I am not for or against the Warriors. They're doing a fairly adequate job with their EIR, but the thing is, what will happen with -- I live in Dogpatch. I've been here for 32 years, worked here since I was 16, so I hate to tell you how old I am. But at the end of the day, if the City wants to get something done, it just moves mountains.

They were trying to get a legacy here for someone -- I can't remember who -- keeping the Warriors in San Francisco, not on the pier, but it is in

San Francisco.

The Warriors actually are a very wonderful team and I love to follow them, and I would love to have them in the City.

We also have, right down the road, the Giants and the Giants attempting to build a rather large development. And being in Dogpatch and -- we've always been up with what's going on, and helped the Port and helped redevelopment in Mission Bay and so forth.

So, I just want to express the opinion that if we really, as a community at San Francisco, wanted to get something done, you would probably crack a whip and have the Warriors have to work with the Giants all on Lot A and B.

And, you know, maybe I'm whistling "Dixie," but you do not have a method of taking care of the traffic. You can say MTA is going to take care of it. MTA couldn't even, in a ten-year period, get a turnaround movement planned and executed. Very, very terrible.

Thank you.

EXECUTIVE ASST. GUERRA: Sir, can you please provide your name?

JOE BOSS: Joe Boss.

EXECUTIVE ASST. GUERRA: Thank you.

RUDY CORPUS: How you doing, Commissioners? My name is Rudy Corpus. I'm born and raised in District 6, South of Market, currently live there.

I run a youth program, United Players Violence Prevention Youth Program, with over a 150 kids run over the summer.

I'm here just in support for the Warriors to be here in our neighborhood and in San Francisco. It would create an enormous amount of opportunity for our people in the community.

South of Market, particularly while I've lived in District 6, has probably the lowest income-paid families in the whole city. I just -- you know, I just want the opportunity -- it would be good for the economy. It would be good for the community, and also, I think it would be good for the City.

I know originally the Warriors was in San Francisco back in the '70's. I think it was the San Francisco Warriors. Then they moved to Oakland, and that's why they called them "Golden State." And so, this gets rightfully their right place where they supposed to be, back here in San Francisco, the San Francisco Warriors.

Thank you.

CHAIRPERSON ROSALES: Thank you.

AL NORMAN: Madam Chair, Madam Director, Commissioners, Al Norman, Bayview Merchants Association, and we're here in support of the EIR for the Warriors, and we think it would be one big jewel of an anchor tenant for all small businesses in and out of the area, and we support it wholeheartedly and support the other associations who are in favor of you passing this EIR so we can go ahead and go to work and establish a relationship that will benefit everyone economically associated with this project.

Thank you.

CHAIRPERSON ROSALES: Thank you.

JOHN deCASTRO: Good afternoon, Commissioners. John deCastro from -- past president of Potrero Boosters Neighborhood Association back about 15 years ago. I'm a 37-year resident of Potrero Hill.

And my biggest concerns are, as I look at 6.2, "significant unavoidable impacts, specifically transportation and transit." Those are a mess today.

And I echo the other speaker that suggested that you might want to come down there between 4:00 and 6:00 in the evening and take a look at that 280 and Mariposa interchange -- Mariposa and Pennsylvania Street, 16th and 7th Street. It is a disaster four nights out of five, especially Thursday night. Every

time the Giants have a day game, the traffic starts backing up at 2:00 -- 1:30 or two o'clock and never quits.

We talk about a "Transportation Management Plan" in 6.5. Where is it? I don't trust the City or the MTA to come forward with a decent Transportation Management Plan when my wife and I tried to go to a Giants game on Sunday, and we waited -- we checked the next Muni -- 58 minutes to the 10. My wife is disabled. I had to call a taxi so we could make our ballgame. That was the only way we could get there, because she couldn't walk down to the T. It was way too far.

6.2 calls traffic "an unavoidable impact." Today, without a game, the traffic is backed up every night and almost every morning at the 280. I have learned ways around the neighborhood and some way to do that.

The transit doesn't work today. We need better plans in that area if the Warriors are going to come to Mission Bay.

I agree with the nurses. It is going to be a serious problem. And you're trying to route traffic, I believe, through the Minnesota Street area and through the Dogpatch neighborhood, to get people -- emergency vehicles to the hospital, or people that are in trouble that need to get to the hospital. That is not an acceptable alternative.

Thank you.

CHAIRPERSON ROSALES: Thank you.

OSCAR JAMES: Good afternoon, Commissioners. My name is Oscar James. I'm a native resident of Bayview-Hunters Point and a former Model Cities Commissioner, which this area covered.

The area that you have today, you're talking about doing development, we have a Memorandum of Understanding. Whichever comes into this area hires 50 percent community residents, 35 percent contractors -- minority contractors as a whole.

But I want to just thank the Warriors for doing what they have done. Prior to coming into our community, they've hired peoples in our community, and we hope and we really believe that they will hire minority contractors, 50 percent out of Bayview-Hunters Point, 100 percent citywide, following our Memorandum of Understanding we wrote in 1970, which had a grandfather clause in our community.

I support them 100 percent. I would like the U.C., since the nurses are talking about all they're talking about -- traffic and what have you -- is to come up with some scholarships that they should have done

getting that free property -- for scholarships in our community to train peoples in our community for nursing, being doctors, and what have you. Do the same thing that the Golden State Warriors are doing.

I was living and I was -- I once went to the games at Kezar Pavilion when the Warriors were there a long time ago, and I'm saying today welcome back to the San Francisco Warriors, and I support this 100 percent.

Thank you very much.

CHAIRPERSON ROSALES: Thank you.

PAUL OSMUNDSON: Good afternoon, Chair Rosales, Commissioners, Executive Director Bohee, Deputy City Attorney Bryan. My name is Paul Osmundson.

I am a partner in the East Street Ventures Restaurant, which is located at 295 Terry Francois Boulevard, with John Caine, one of the previous speakers.

I'm also the former Director of Planning and Development for the Port of San Francisco. I've worked with the San Francisco Giants and the Mayor's Office on the AT&T ballpark and on the Transportation Plan.

I've reviewed the EIR, and I can tell you that the -- when the City and MTA has made commitments to manage the traffic to and from the waterfront, these special-event venues, the Giants system works the way they said it would -- the way the Giants said it would, the way the City said it would. That system works. It has worked day in and day out, all 81 home games and the playoff games. It works.

The project is a perfect fit for this neighborhood. Mission Bay was envisioned as a mixed-use development project. The Port worked -- we worked on it for many years in the late '80's and early '90's. It's a mixed-use development project. It's not just a life science center. So, this is use fits into the City's plan for this area.

There's definitely going to be impacts that have to be mitigated or can't be dealt with -- unavoidable impacts. That's always the situation.

This a great use for this location. I urge you to approve the project, certify the EIR, and move forward.

It's a great -- we're very lucky to have an organization like the Golden State Warriors willing to come to this City and invest in our City.

Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: I have Ms. Susan Vaughan.

SUSAN VAUGHAN: Good afternoon, Commissioners.

My name is Susan Vaughan, and I am the current chair of the San Francisco group of the Sierra Club.

We will be submitting more detailed comments later. For now, I'm just going to be speaking for myself.

I'm very concerned that a piece of State legislation, AB 900, was extended purely for the reason just to get this project -- and apparently one in L.A. -- through the fast-track process so that there are fewer hearings, maybe, for the public. And I'm very concerned about that.

We don't know, additionally, in terms of the greenhouse gas emissions. It's my understanding that the project sponsors intend to purchase carbon offsets. We don't know what those offsets are, and we need to see that in the EIR.

To my knowledge, no greenhouse gas comparison has been done between this proposed project and just keeping the project in Oakland.

And on that line, I want to add that I think that probably most of the people who work that venue in Oakland right now work -- don't live in San Francisco. So, I'm wondering about the impact to BART, and I'm wondering about increased greenhouse gas emissions, because employees might be taking the bridge across the river -- or, not the river -- the Bay.

And I would add that I don't think a lot of public transit enhancements are happening in this project, and that really does need to happen. We're not interested in seeing more parking. It's got to be -- we're really serious about dealing with climate change. It's got to be public transportation.

Thank you.

OSHA MESERVE: Good afternoon, Commissioners. My name is Osha Meserve and I represent the Mission Bay Alliance.

The Alliance believes the proposed entertainment center will not work for the site and does not warrant the massive public investment planned by the State.

In particular, we're concerned about the compatibility of the center with the existing health and research facilities in Mission Bay, and while health and related biosciences was planned to expand under the Mission Bay Redevelopment Plan, this project takes this area in a completely new and incompatible direction.

In our review of the Draft EIR so far, we have found that the traffic, parking, and associated health impacts of the facility will be even more devastating than disclosed in the EIR, and there's inadequate

mitigation.

The project is also being mis-advertised as greenhouse gas neutral. Purchasing unverified assets from a broker for 4,000 tons per year of carbon dioxide is not mitigation and doesn't do anything to help the localized air pollution that will become so much worse under the gridlocked conditions.

With analysis scattered throughout the EIR and other documents prepared over the course of 25 years, the fast-tracking of this project's environmental review process is precluding meaningful public participation.

And the document is not -- because it is not thorough, in that people have said it's thorough, but there are important issues that are relegated to these other 1998 and 1990 documents that the public must also review in order to understand the project. Land use, geology, soils, recreation, and hazardous materials are some of those topics.

For this reason, we have requested an extension of the public review period to better match the complexity of this project, and we look forward to further informing the Commission to review this important project.

Thank you.

CHAIRPERSON ROSALES: Thank you.

EXECUTIVE ASST. GUERRA: Are there any others that want to speak?

DAVID PAN: Yes. Hi. My name is David Pan, and I'm here on behalf of a lot of people that really do not have a voice.

I live in an SRO. I live on S.S.I. Disability on 6th and Market Street right now. There are a lot of people that are in hardship in this City. We all know that. There is a very divisive line in the economics of the wealthy and the poor.

I have a dream of working on creating a non-profit that can create paid jobs for people coming out of hardship. The idea is to open a café, eatery, and meeting spaces, community spaces where people can use for meet-up groups, conferences, study groups, and have them adjoining a café so it's free, just buy some food and some drinks.

Making it a non-profit would allow people to have a reintegration into the workforce, would allow the community a place to gather.

And the idea of doing something like this would be hugely tremendous, because there aren't a lot of 9- or 10,000-square-foot plates that are available to be custom-built out in San Francisco. We all know the retail spaces aren't available.

So, I'm working on trying to propose this with the Warriors, and I've had some very good feedback from members of the community, from Urban Solutions to Cafe La Vie, to Hayes Valley Bakeworks, Delancey Street Crossroads Café, some of the non-profits that have succeeded on a business model similar to this, and others.

I've spoken with Jane Kim, District Supervisor, District 6. I'd like to say thank you very much for your time.

I very much support the Warriors coming to San Francisco. I think it would help a lot of people in a lot of different ways.

Thank you.

I'd like to leave this with you, if I may (Indicating).

CHAIRPERSON ROSALES: Yes.

EXECUTIVE ASST. GUERRA: Are there any others that would like to speak?

(No response)

CHAIRPERSON ROSALES: No.

Okay. Thank you, everyone, for giving us your comments. This is not an action item, but the Commissioners are allowed to also provide comment.

Do I have any comments from the Commissioners?

COMMISIONER MONDEJAR: No.

CHAIRPERSON ROSALES: The only comment I'd like to make is consistent with all the comments I have made in the prior workshops regarding this project, and it deals with two things: Primarily, the traffic impacts and the neighborhood impacts, which are related.

And we've heard a lot of concerns, and I will continue to read the document, but I want to make sure that the comments here regarding those impacts and the mitigation measures are kind of looked at in depth and to the extent of exploring funding mechanisms or recommended or suggested mechanisms, so that they don't go into the document -- that the Commission be told of potential funding mechanisms that we might be able to recommend to ensure that those mitigations are essentially guaranteed and those impacts are mitigated.

I think I can't say more on the record than just a comment. This matter will return to the Commission later this fall.

Should we repeat the opportunity for folks to submit written comments?

DEPUTY DIRECTOR OERTH: Thank you, Chair Rosales. I'll just repeat that if people would like to submit written comments, they can submit them via E-mail to warriors@sfgov.org or they may address them to the

Planning Department. The address of the person to contact at the Planning Department is on page 2-9 of the SEIR.

Thank you.

CHAIRPERSON ROSALES: Thank you.

I think Commissioner Mondejar would like to make a comment.

COMMISIONER MONDEJAR: Sally, can you just explain what the process is after you have -- after the office has received further comment, and also the process of all the public comments that we have received this afternoon?

DEPUTY DIRECTOR OERTH: Yes.

All of the comments provided today, as well as all of the comments provided in writing, will be gathered and responded to in a document called the "Response to Comments," which will be brought back before the Commission later this fall.

And so, we'll be reviewing those and working with the various members of the team to provide the responses, and look at any adjustments that need to be made to the Draft SEIR as appropriate.

COMMISIONER MONDEJAR: And all of these will be made public?

DEPUTY DIRECTOR OERTH: Yes.

COMMISIONER MONDEJAR: So, I just wanted to say that I hope that all of the comments will be taken into consideration and carefully examined. I know I have reviewed the documents that have been presented to us as Commissioners.

And one other thing that just occurred to me -- that the purchasing of carbon offsets is something that was new to me this afternoon. That, I didn't get out of -- I need a little bit more of an understanding of that, but I'm sure that you could respond to that.

I don't know if you can respond now, since we're not on a -- this is simply informational this afternoon, but it's certainly something that I think we should be communicating -- all of these issues and concerns and the responses to these issues and concerns -- to the public.

DEPUTY DIRECTOR OERTH: Thank you.

COMMISIONER MONDEJAR: Thank you.

CHAIRPERSON ROSALES: So, thank you, everyone.

With that, I think that closes this item. It will be again before us later in the year.

(Whereupon, at 3:02 p.m., Agenda Item 5(b) of the Special Meeting of the San Francisco Commission on Community Investment and Infrastructure was concluded.)

CERTIFICATE OF REPORTER

I, KATY LEONARD, a Certified Shorthand Reporter, hereby certify that the foregoing proceedings were taken in shorthand by me at the time and place therein stated, and that the said proceedings were thereafter reduced to typewriting, by computer, under my direction and supervision;

And I further certify that I am not of counsel or attorney for either or any of the parties to said matter, nor in any way interested in the outcome of the cause named herein.

DATED: July 5, 2015

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KATY LEONARD
Certified Shorthand Reporter
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