RESPONSES TO COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT REPORT

SOUTHLINE SPECIFIC PLAN

CITY OF SOUTH SAN FRANCISCO, CALIFORNIA
STATE CLEARINGHOUSE NO. 2020050452

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DRAFT EIR PUBLIC HEARING DATE: NOVEMBER 4, 2021
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Chapter 1
Introduction

The purpose of this responses-to-comments (RTC) document is to present comments submitted on the draft environmental impact report (draft EIR) for the Southline Specific Plan (Specific Plan) and associated off-site improvements (proposed project), to respond in writing to comments on environmental issues, and revise the draft EIR as necessary to provide additional clarity. Pursuant to the California Environmental Quality Act (CEQA), Public Resources Code Section 21091(d)(2)(A) and (B), the South San Francisco Planning Division considered the comments received, evaluated the environmental issues raised, and provided written responses that fully address the comments on significant environmental issues raised by the commenters. This RTC document also provides limited responses, for informational purposes, to general comments on the draft EIR received during the public review period that were not related to environmental issues. Where appropriate, this RTC document also includes EIR text changes made in response to the comments or at the initiation of the City of South San Francisco (City).

The draft EIR and this RTC document constitute the final environmental impact report (final EIR) for the proposed project, in fulfillment of CEQA requirements and consistent with CEQA Guidelines Section 15132.

1.1 Environmental Review Process

This EIR has been prepared by the South San Francisco Planning Division for the City of South San Francisco, the Lead Agency for the proposed project, in compliance with the provisions of CEQA and the CEQA Guidelines (California Public Resources Code Section 21000 et seq. and California Code of Regulations Title 14, Section 15000 et seq. [CEQA Guidelines]). The draft EIR was published and posted on the City's website on September 28, 2021. A Notice of Availability was distributed to state and local agencies, neighbors, and other interested parties to solicit public comment. The draft EIR was available for public comment from September 28, 2021, to November 12, 2021. The notice solicited comments on the adequacy and accuracy of information presented in the draft EIR. Comments were made in written form during the public comment period and as oral testimony at the public hearing on the draft EIR before the Planning Commission held on November 4, 2021. The comments received during the public review period are the subject of this RTC document, which addresses all substantive written and oral comments on the draft EIR. Minutes from the public hearing on the draft EIR as well as written comments are included in their entirety in this document.

The final EIR will consist of the draft EIR and this RTC document, which includes comments received during the public review period, responses to the comments on environmental issues, and any revisions to the draft EIR that resulted from staff-initiated text changes or text changes in the responses.

The information provided in the responses and the revisions to the draft EIR clarifies and amplifies the analysis presented in the draft EIR. No significant new information, as defined by CEQA Guidelines Section 15088.5, was added that would trigger recirculation of the draft EIR. Specifically, there are no new significant environmental impacts. No substantial increase in the severity of any

significant impact has been identified, and no new alternatives or mitigation measures were identified in the comments or responses that were not already identified in the draft EIR.

The City has distributed this RTC document to the Planning Commission and City Council. The Planning Commission anticipates to hold a hearing on June 2, 2022, to consider the adequacy of the final EIR. If the Planning Commission finds that the EIR has been completed in compliance with CEQA and that it reflects the City's independent judgment, pursuant to the requirements of CEQA Guidelines Section 15090, it will recommend certification of the document as a final EIR to the City Council. The City anticipates that certification of the final EIR will be considered by the City Council on July 13, 2022. The City decision-makers will consider the certified final EIR, along with other information received during the public review process, to determine whether to approve, modify, or disapprove the proposed project and specify the mitigation measures that will be required as conditions of project approval in a Mitigation Monitoring and Reporting Program.

If City decision-makers decide to approve the proposed project, even though significant environmental impacts identified in the final EIR have not been avoided or reduced to less-than-significant levels, they must indicate that such unavoidable significant impacts are acceptable because of overriding economic, legal, social, technological, or other considerations, as described in CEQA Guidelines Section 15093. This is known as a Statement of Overriding Considerations, in which the City balances the benefits of a proposed project against its unavoidable environmental risks. If the benefits of a project outweigh the unavoidable adverse environmental effects, the adverse environmental effects may be considered acceptable (CEQA Guidelines Section 15093). If an agency adopts a Statement of Overriding Considerations, the statement must be included in the record of project approval.

1.2 Document Organization

This RTC document consists of the following chapters:

- **Chapter 1, Introduction**, discusses the purpose of the RTC document, the environmental review process for the EIR, and the organization of the RTC document.
- **Chapter 2, Comments and Responses**, presents comments from the public hearing held on November 4, 2021 and written comments to the draft EIR. The comments are organized by agencies (A) and individuals (I) in alphabetical order and coded in the following way:
    - Comments from agencies are designated by "A-" and an acronym of the agency's name.
    - Comments from individuals are designated by "I-" and the commenter's last name.

  A number at the end of the code keys each comment to the order of the comments presented within each written communication or item in the Planning Commission minutes. Thus, each discrete comment has a unique comment code.

  Following the Planning Commission minutes and each comment letter are the City's responses. The responses generally clarify the draft EIR text. They may also reference revisions or additions to the draft EIR shown in Chapter 3, *Revisions to the Draft EIR*.
- **Chapter 3, Revisions to the Draft EIR**, presents text changes to the draft EIR made as a result of the responses to the comments as well as staff-initiated text changes identified by City staff members to update, correct, or clarify the draft EIR text. New text is <u>underlined</u> and deleted text is shown in ~~strikethrough~~. The final Water Supply Assessment (WSA) for the project which

replaces the draft WSA in Appendix 4.17-1 of the draft EIR is included as Appendix B in this document. This chapter also includes revisions to Chapter 5, *Alternatives*, of the draft EIR to include an analysis of a new alternative – the Reduced Underground Parking Alternative – which has been identified as the environmentally superior alternative and as the Recommended Alternative proposed for adoption. In addition, Appendix 4.15-1 of the draft EIR (Transportation Impact Analysis) has been replaced in its entirety with an updated Transportation Impact Analysis (Appendix A), Appendix 2.1, has been replaced with the Revised Southline Specific Plan (Appendix C) which reflects the Reduced Underground Parking Alternative.

- **Appendices,** including revised draft EIR appendices and a new appendix, as described above.
  - **Appendix A:** Revised Appendix 4.15-1, *Revised Transportation Impact Analysis* replaces Appendix 4.15-1, *Transportation Impact Analysis*, of the draft EIR.
  - **Appendix B**: Revised Appendix 4.17-1, ~~*Draft*~~ *Final Water Supply Assessment* replaces Appendix 4.17-1, *Draft Water Supply Assessment*, of the draft EIR.
  - **Appendix C**: New Appendix 2.1, *Revised Southline Specific Plan* has been added. (Specific Plan for Alternative D, Reduced Underground Parking Alternative).

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Chapter 2
Comments and Responses

2.1 Introduction

This chapter contains responses to the Commissioner comments from the November 4, 2021 South San Francisco Planning Commission hearing and to written comments received on the draft EIR. The City of South San Francisco received six letters or emails commenting on the draft EIR during the comment period and one letter commenting on the draft EIR after the comment period. No public comments were presented at the Planning Commission hearing.

The comments are organized by agencies (A) and individuals (I) in alphabetical order as follows.

- A-BART: Tim Chan, San Francisco Bay Area Rapid Transit District (November 22, 2021)
- A-PC: Planning Commission Hearing (November 4, 2021)
- A-PG&E#1: Plan Review Team, PG&E (September 30, 2021)
- A-PG&E#2: Justin Newell, PG&E (November 17, 2021)
- A-San Bruno: Hae Won Ritchie, City of San Bruno (November 12, 2021)
- A-SFO: Nupur Sinha, San Francisco International Airport (November 11, 2021)
- I-Lee: Samuel Lee (October 25, 2021)
- I- Richardson: Mina Richardson (October 29, 2021)

Where revisions to the draft EIR are appropriate to respond to comments, such changes are noted in the responses and shown in full in Chapter 3, *Revisions to the Draft EIR*. These include changes in response to comments and staff-initiated changes.

2.2 Responses to Comments

This section includes comments on the draft EIR and responses to those comments. Comments from the South San Francisco Planning Commission hearing and comments in letters and emails that raise environmental issues are bracketed and numbered; each comment is followed by responses to the comments raised.

Where revisions to the draft EIR are appropriate to respond to comments, such changes are referenced in the response and shown in full in Chapter 3, *Revisions to the Draft EIR*. Staff-initiated text changes regarding typographical and other minor errors are also presented in Chapter 3. In other cases, where not otherwise specified, the information provided in the responses is deemed adequate in itself, and modification of the draft EIR text is not necessary.

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT
300 Lakeside Drive, P.O. Box 12688
Oakland, CA 94604-2688
(510) 464-6000

A-BART

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9TH DISTRICT

November 22, 2021

Adena Friedman, Principal Planner
City of South San Francisco
Economic and Community Development Department
315 Maple Street
South San Francisco, CA 94080

RE: BART Comments on the Draft Environmental Impact Report for the Southline Specific Plan

Dear Ms. Friedman,

1 The San Francisco Bay Area Rapid Transit District (BART) appreciates the opportunity to comment on the Draft Environmental Impact Report (DEIR) for the Southline Specific Plan. We also appreciate that most of our previous NOP comments on the project impacts to the BART system and roadway users have been evaluated in the DEIR.

We do have one comment on the project impact on BART train crowding. Our passenger load threshold for "crowded" conditions is 115 passengers per car on average, which approximates passengers per square meter, or in this case, 5.4 square feet per passenger. On that basis, the development would not appear to cause 'crowding' on BART trains.

2 On the other hand, the DEIR is not clear on the trade-off of peak weekday travel via San Bruno Station. Does the report say that a majority of people entering at this station would actually travel southbound in the morning and northbound in the evening? We're not seeing support for that claim. Likewise, it does not address the effects of the project on the Richmond-Millbrae and Antioch-San Francisco International Airport line loading eastbound through downtown San Francisco in the AM and westbound in the PM. Please let us know if we missed this analysis.

In summary, we don't foresee a problem strictly based on the numbers of trips generated, but we would like to see more discussion in the Final EIR of the peak link loads on the Richmond-Millbrae and Antioch-San Francisco International Airport lines through San Francisco.

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

Sincerely,

Tim Chan
Group Manager – Station Area Planning
San Francisco Bay Area Rapid Transit District

Letter A-BART: Tim Chan, San Francisco Bay Area Rapid Transit District (November 22, 2021)

Response to Comment A-BART-1

The comment expresses appreciation from the San Francisco Bay Area Rapid Transit District (BART) for the opportunity to comment on the draft EIR and notes that most of the comments that BART provided on the notice of preparation (NOP) were addressed in the draft EIR. Comment noted. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment A-BART-2

The comment refers to the analysis in Impact TR-5a in Section 4.15, *Transportation and Circulation*, of the draft EIR (pages 4.15-47 through 4.15-49). The comment requests clarification on assumptions related to peak hour travel and states that the draft EIR analysis did not address the effects of the project on the Richmond-Millbrae and Antioch-San Francisco International Airport line loading eastbound through downtown San Francisco in the AM and westbound in the PM.

Impact TR-5a describes the project's effects on BART ridership. As an office development, the project would mostly generate BART ridership traveling southbound from San Francisco during the AM peak period, then returning northbound to San Francisco during the PM peak period. This travel pattern represents the reverse-peak commute direction for BART on the Peninsula, as most travel occurs northbound into San Francisco during the AM peak period, then returns southbound to the Peninsula during the PM peak period. Consequently, BART has available capacity to accommodate the project in its reverse-peak trains. This is described on page 4.15-48 of the draft EIR.

As stated on page 4.15-48 of the draft EIR, about 13 percent of BART passengers are anticipated to travel from the East Bay during the AM peak period and return to the East Bay during the PM peak period. These passengers would overlap with BART's peak direction of travel via the Transbay tube (westbound during the AM peak period and eastbound during the PM peak period); however, the project's contribution to passenger volumes in the Transbay Tube would be less than one percent.

The project's contribution to BART's traditional peak direction of travel on the Peninsula would be low: about 65 passengers during the AM peak period in the northbound/eastbound direction, and about 105 passengers during the PM peak period in the southbound/westbound direction, as shown in Table 4.15-11 on page 4.15-48 of the draft EIR. Consequently, the project's effects on the Richmond-Millbrae and Antioch-San Francisco International Airport lines in the southbound/eastbound direction through San Francisco in the AM and northbound/westbound in the PM would be negligible – about 8 to 13 passengers per train on average, which represents a fraction of a percentage of existing volumes.

No revisions to the draft EIR are required.

A-PC

Southline Specific Plan
Planning Commission Draft EIR Comment Hearing
November 4, 2021
Meeting Minutes

2:10:30 - Adena Friedman (AF) from Planning Division provides staff report on project.

- No vote tonight. City will provide response to public and Commission comments in the FEIR.
- Application is for specific plan for entire 26-acre project area.
- Draft EIR (DEIR) review period runs from Sept. 28 – Nov. 12. This hearing is for Commission and public comments on the DEIR.
- 3 areas (Air Quality, Noise, Transportation) had significant and unavoidable impacts.
- Recent precedent in Bay Area suggests that these impacts could be reduced to less than significant, but not guaranteed; thus impacts are determined to be significant and unavoidable.
- Staff's recommendation is to take public comments and provide comments to staff on DEIR.

2:25:45 - Marcus Gilmour (MG) from Lane Partners provides project introduction.

- Existing Conditions (2:27:25)
- Specific Plan Overview (2:31:12)

2:31:12 – Dawn Jedkins (DJ) provides Specific Plan Overview

- 2:38:45 – Project Renderings

2:41:39 – Chair Michele Evans (ME) opens floor to questions from the Commission.

2:41:50 – Commissioner Tzang, Commissioner Fernandez, Commissioner Funes, Commissioner Faria with hands raised.

1

2:42:00 – Commissioner Alex Tzang (AT) – "Thank you for presenting such a comprehensive project. I really like the end product, even though it's just the beginning. We're not here to make any recommendations, just to provide comments. As a commissioner, I cannot say yay let's do this without addressing the bigger questions which is the CEQA. Apparently the way the CEQA shows is there are 3 significant and unavoidable things (Noise, Pollution, Traffic). This tells me the project is too aggressive, too big, or too big in the short period of time it needs to phase out. I'm an architect myself, and I want to have the biggest project, but I see the CEQA telling me these kinds of things, I won't be able justify it without those coming close to resolvable. Again, in the report it says that yes, it's not guaranteed there might be methods we could mitigate to a less superior situation, I do understand, but definitely no decision can be made off of unproven comment or these kind of promises. Another thing that I want to make note, this site location is right next to our neighbor San Bruno. I'm very near where this site is. When we make a recommendation or if we make a recommendation that approves a fairly significant CEQA impact that is right adjacent to San Bruno, that is being a pretty bad neighbor as well. I do want to make this comment – I love the project, the mission, but the CEQA has to look a lot better before I can fully support. Today it's not about me supporting, but I have to spell this out. Normally I'm pretty supportive but this is alarming."

2

2:45:00 – Commissioner Luis De Paz Fernandez (DF) – "I don't want to be too redundant, commissioner Tzang hit on all of the points, beautiful design so I want to echo that. It's right next to the BART, so it

2 Con't would allow a better commute, and encourage public transportation. CEQA is very alarming, especially when we heard from staff that there are areas that can't be reduced to a lesser impact."

3 2:45:40 – Commissioner Sarah Funes (SF) – "I want to echo what previous commissioners brought up – I like that you guys are thinking about cleaning up the environmental issues on the site, if it were to come to fruition that is great. A lot of us on the commission care about the environment. I like that it's near public transportation, that there's retail, parklets, and the idea of food trucks. Trying to get local business in is important everywhere to get jobs for young people, either in high school, college, or after college would be very helpful. Those are my comments."

4 2:46:25 – Chair ME – "I would echo the commissioners' concerns – I don't think we're foreclosing on the project, it's the EIR that we would like to see some more definitive solutions that can be addressed and taken off the table so we can move forward with this."

5 2:46:58 – Commissioner Norm Faria (NF) – "Along the same sentiments, I do agree with what Commissioner Tzang said, it is a large project, it will clean up the area, but I have concerns because the property acquisition will be a major necessity, the EPA, the conditions of some of these existing properties would have to be taken into consideration. Such as Tanforan Avenue, we are talking residents of San Bruno, and there will be massive construction on a 2-lane road, which Commissioner Tzang did address. We have the surface streets that Adena addressed that are down in San Bruno, which will impact San Bruno. I was glad to hear that the developer has done public outreach to San Bruno on entities that will overlap into them. Again, I do have one question – have they been successful in acquiring this property and much of the existing buildings? Because I know some of those had been existing uses we did approve for their current use, maybe a few years back, and that will be interesting with how the project proceeds, because I know you only have two buildings planned right now."

2:48:20 – MG – "We currently own all 26.5 acres. So we have acquired all of the sites."

6 2:48:30 – NF – "That makes it easy, that makes it good. I'd be curious as you start evolving and what you find out there, the land and ground waste and what comes naturally as you start developing an area, but anyway it's cleaning up the area and it's good for the environment, but it is a large project. I'll be glad to see how this evolves."

7 2:48:55 – JulieAnn Murphy (JM) – "I had a question for staff, just because it's on my mind from our previous presentation, is that how does this align with our preferred land use map for the new general plan?"

2:49:15 – AF – "This is consistent with the existing general plan. The existing general plan designation I believe the zoning is business and professional office and the future general plan is as well. And what the applicant is proposing is consistent with both the existing and future general plan designation. The applicant would be proposing and what staff would be recommending is a rezone to a specific plan to enact development controls and design guidelines that align with this project. But the land use is all consistent with what is in place now and with the preferred land use alternative."

8 2:50:00 – JM – "And just thinking for developments we have entitled recently, we have a large amount of housing going off of Noor, I believe would be a nice companion to the plan we are seeing tonight. I wonder if the tides of research and dev needs change in the term of this phase project, if there's a way that a precise plan could address potentially offering more housing on the site in the future, if that's a

8 Con't

tool that could be used if that were to ever potentially be a possibility. I'm just thinking this location is great for transit, but adding 2 million square feet of research and development is also going to have an effect on the housing needs of South San Francisco."

2:51:00 – AF – "I can speak to that. Housing is currently not permitted in this location, and would not be permitted in the general plan. If the city in the future were to rezone this land to be residential, then a developer could come in and develop residential as well. As it's currently contemplated, the city doesn't envision that. The developer can speak better to this, but there are significant challenges with the cleanup that would be involved. And about half of the site is within the airport 70 dB noise contour as well. So there are some residential challenges there. That said we can't predict the future. But for now the site is zoned for commercial purposes."

2:52:15 – Chair ME – "There is no action for us to do. This is just a study session for us."

2:52:20 – Claire Lai (CL), Assistant City Attorney – "I'll just make it clear for the record, if there are any public comments, I do not see."

2:52:30 – Tony Rozzi (TR), Chief Planner – "there are no hands raised at the moment, no further emails or calls received than the ones transmitted earlier today via email or posted on our website."

2:53:10 – Chair ME commends developer for the scope of their project and what they are undertaking.

Letter A-PC: Planning Commission Hearing (November 4, 2021)

Response to Comment PC-1

The comment expresses concerns about the size of the project and the significant and unavoidable air quality, noise, and transportation impacts identified in the draft EIR. The comment inquires whether additional mitigation can be imposed to mitigate the project's significant impacts to a less-than-significant level.

The significant and unavoidable impacts identified in the draft EIR analysis are summarized in Chapter 6, *Other CEQA Considerations*. As discussed, the draft EIR identifies numerous rigorous mitigation measures that would mitigate all of the project's significant impacts to a less-than-significant level. For example, the following mitigation measures are required to mitigate the project's significant air quality and noise impacts:

- Mitigation Measure AQ-1: Require Fugitive Dust Best Management Practices (All Phases)
- Mitigation Measure AQ-2: Require at Least Tier 4 Final Engines on Construction Equipment (All Phases)
- Mitigation Measure AQ-3: Require Use of Diesel Trucks with 2010-Compliant Model Year Engines (Future Phases Only)
- Mitigation Measure AQ-4: Require Construction Fleet to Use Renewable Diesel (Future Phases Only)
- Mitigation Measure AQ-5: Require Low-VOC Coatings during Construction (Future Phases Only)
- Mitigation Measure AQ-6: Purchase of Mitigation Credits for Construction Emissions Exceeding BAAQMD's Daily Pollutant Thresholds (Future Phases Only)
- Mitigation Measure AQ-7: Purchase of Mitigation Credits for Operational Emissions Exceeding BAAQMD's Daily Pollutant Thresholds (All Phases)
- Mitigation Measure AQ-8: Limit the Number of Phase 1 Emergency Generators Tested to One Generator Per Day (Phase 1 Only)
- Mitigation Measure AQ-9: Require Future Projects within 1,000 Feet of Sensitive Receptors to Perform a Health Risk Assessment (Future Phases Only)
- Mitigation Measure NOI-1a: Construction Noise Control Plan to Reduce Noise Outside Standard Construction Hours in the City of South San Francisco (All Phases)
- Mitigation Measure NOI-1b: Construction of Temporary Noise Barrier along Tanforan Avenue (Phase 1 Only)
- Mitigation Measure NOI-1c: Mechanical Equipment Noise Reduction Plan (All Phases)

Analysis provided in the draft EIR establishes that implementation of these mitigation measures would potentially mitigate the impacts of future development under the Specific Plan to a less-than-significant level. However, CEQA prohibits speculation, and it is not possible at this time to identify

the specific construction or operational details of future projects, or to say with certainty that offset programs will be available in the types and amounts necessary to offset future pollutants. Therefore, even though the mitigation measures could mitigate impacts to a less-than-significant level, the City is required under CEQA to make a finding that impacts would be "significant and unavoidable."

With respect to transportation impacts, the draft EIR identified one significant and unavoidable impact related to signal warrants at the Huntington Avenue/Herman Street/Forest Avenue intersection; this impact would occur even without the Project, although the Project would contribute to the impact under full buildout conditions. As discussed on pages 4.15-45 through 4.15-46 in Section 4.15, *Transportation and Circulation*, of the draft EIR, installation of a traffic signal at the Huntington Avenue/Herman Street/Forest Avenue intersection, which is located in the City of San Bruno, would reduce the impact to a less-than-significant level. Accordingly, the project's contribution to the impact could be fully mitigated by paying a fair-share contribution toward installation of a traffic signal at this intersection. However, this traffic signal is not presently included in a capital improvement or fee program adopted by the City of San Bruno, and therefore, the City of San Bruno does not have a mechanism for funding this mitigation and cannot ensure this mitigation will be implemented. Moreover, assuming that this traffic signal were to be included in a capital improvement or fee program adopted by the City of San Bruno, because the intersection and any such fee program would be under the control and jurisdiction of San Bruno, the City of South San Francisco as lead agency would not be able to guarantee that this mitigation measure would be implemented. CEQA requires mitigation to be feasible and to be within the control of the lead agency to implement. Therefore, while mitigation exists that could reduce the impact on this intersection to a less-than-significant level, the City is required under CEQA to make a finding that impacts would be significant and unavoidable. Notwithstanding this conclusion, outside of the CEQA process, the City of San Bruno may determine that capital improvements at the Huntington Avenue/Herman Street/Forest Avenue intersection are warranted and elect to undertake those improvements or require them as conditions of approval for projects occurring within San Bruno. As of preparation of this EIR, the project applicant is engaged in discussions with San Bruno staff regarding potential completion of, or funding for, the identified improvements.

The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment PC-2

The comment reiterates statements made in Comment PC-1 and notes that the proposed project would be in proximity to public transit. See Response to Comment PC-1.

The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment PC-3

The comment reiterates statements made in Comment PC-1 and notes that the proposed project would remediate existing environmental hazards on-site, would be in proximity to public transit, and would create new jobs. See Response to Comment PC-1.

Section 4.8, *Hazards and Hazardous Materials*, of the draft EIR provides information on the existing hazards and hazardous materials that are known to occur within the project site. Identified hazards

and hazardous materials include soil contaminants, groundwater contaminants, subsurface vapors, and asbestos-containing materials and lead-based paint in existing structures. As discussed in Section 4.8, *Hazards and Hazardous Materials,* impacts associated with the identified hazards would be mitigated to a less-than-significant level with implementation of the following mitigation measures:

- Mitigation Measure HAZ-2a: Prepare a Soil Management Plan Prior to Issuance of Grading Permit (All Phases);
- Mitigation Measure HAZ-2: Engineering Controls to Address Vapor Encroachment Conditions (Future Phases that Include the Property at 325 South Maple Avenue);
- Mitigation Measure HAZ-2c: Conduct a Hazardous Building Materials Survey prior to Demolition Activities and Hazardous Building Material Handing (All Phases); and
- Mitigation Measure HWQ-1: Require Groundwater Monitoring and Sampling Prior to Dewatering Activity (All Phases).

The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment PC-4

The comment reiterates statements made in Comment PC-1. See Response to Comment PC-1.

Response to Comment PC-5

The comment reiterates statements made in Comment PC-1. See Response to Comment PC-1. The comment also requests clarification on whether the project applicant has acquired all properties within the Specific Plan area. The project applicant currently owns all properties comprising the 26.5-acre Specific Plan area.

Response to Comment PC-6

The comment notes that the proposed project is large and includes general statements regarding land and ground waste at the project site. See Response to Comment PC-1 and Response to Comment PC-3.

Response to Comment PC-7

The comment asks how the project would align with the preferred land use map for the new general plan. As detailed on p. 4.10-35 in Section 4.10, *Land Use and Planning*, of the draft EIR, the project was found to be consistent with the relevant land use and planning-related policies from the existing general plan. As explained in the analysis in the draft EIR, and in staff responses at the Planning Commission meeting, the project is generally consistent with the General Plan's goals for the Specific Plan area and includes provisions to update the General Plan and Zoning Ordinance consistent with state law to ensure internal consistency. The General Plan Update, *Shape SSF 2040 General Plan*, which is currently underway but has not yet been adopted, proposes to maintain the existing land use designation for the bulk of the Specific Plan area in the preferred land use scenario, which would ultimately serve as the basis for the updated Land Use Element, although it renames the designation

from Office to Business and Professional Office. Therefore, should the preferred land use scenario be adopted, the proposed project would also be consistent with the General Plan Update.

Response to Comment PC-8

The comment expresses concern regarding how the project would affect housing needs in the City of South San Francisco and inquires whether the Specific Plan area could be used for residential uses in the future.

A Residential Alternative was considered in the draft EIR but rejected based on its infeasibility and inability to meet the basic project objectives. Refer to pages 5-11 through 5-12 in Chapter 4, *Alternatives*, of the draft EIR. As discussed therein, residential use is not consistent with the current General Plan land use designation or zoning designation for the Specific Plan area. As discussed in Response to Comment PC-7, the pending General Plan Update would maintain the existing land use designation. Further, although residential uses in San Bruno are located to the south, the Specific Plan area generally is not well suited for residential development as it is an existing industrial site where existing hazards and hazardous materials are known to occur (see Response to Comment PC-3). Further, approximately half of the Specific Plan area is in the 2012 SFO Airport Land Use Compatibility Plan (ALUCP)'s 70 decibel (db) noise contour, which the ALUCP identifies as incompatible for residential uses. Therefore, the City determined that the Specific Plan area is not suited for residential use.

With regard to housing needs, as detailed in Section 4.12, *Population and Housing*, of the draft EIR, the proposed project would not directly generate new population or households. Population and housing growth indirectly generated by project employees was estimated in the draft EIR and was determined to be within the Association of Bay Area Government's forecasted growth for the City, the San Francisco-Oakland-Hayward core-based statistical area, and the Bay Area. In addition, the project would be required to pay the Affordable Housing Commercial Linkage Fee, which would contribute to the development of affordable housing in other locations within the City. Refer to pages 4.12-13 through 4.12-17 of the draft EIR.

Pacific Gas and Electric Company

Plan Review Team
Land Management

PGEPlanReview@pge.com

A-PG&E #1

September 30, 2021

Adena Friedman
City of South San Francisco
PO Box 711
South San Francisco, CA 94083

Ref: Gas and Electric Transmission and Distribution

Dear Adena Friedman,

Thank you for submitting the Southline NOA plans for our review. PG&E will review the submitted plans in relationship to any existing Gas and Electric facilities within the project area. If the proposed project is adjacent/or within PG&E owned property and/or easements, we will be working with you to ensure compatible uses and activities near our facilities.

1

Attached you will find information and requirements as it relates to Gas facilities (Attachment 1) and Electric facilities (Attachment 2). Please review these in detail, as it is critical to ensure your safety and to protect PG&E's facilities and its existing rights.

Below is additional information for your review:

1. This plan review process does not replace the application process for PG&E gas or electric service your project may require. For these requests, please continue to work with PG&E Service Planning: https://www.pge.com/en_US/business/services/building-and-renovation/overview/overview.page.

2. If the project being submitted is part of a larger project, please include the entire scope of your project, and not just a portion of it. PG&E's facilities are to be incorporated within any CEQA document. PG&E needs to verify that the CEQA document will identify any required future PG&E services.

2

3. An engineering deposit may be required to review plans for a project depending on the size, scope, and location of the project and as it relates to any rearrangement or new installation of PG&E facilities.

Any proposed uses within the PG&E fee strip and/or easement, may include a California Public Utility Commission (CPUC) Section 851 filing. This requires the CPUC to render approval for a conveyance of rights for specific uses on PG&E's fee strip or easement. PG&E will advise if the necessity to incorporate a CPUC Section 851filing is required.

This letter does not constitute PG&E's consent to use any portion of its easement for any purpose not previously conveyed. PG&E will provide a project specific response as required.

Sincerely,

Plan Review Team
Land Management

Attachment 1 – Gas Facilities

There could be gas transmission pipelines in this area which would be considered critical facilities for PG&E and a high priority subsurface installation under California law. Care must be taken to ensure safety and accessibility. So, please ensure that if PG&E approves work near gas transmission pipelines it is done in adherence with the below stipulations. Additionally, the following link provides additional information regarding legal requirements under California excavation laws: https://www.usanorth811.org/images/pdfs/CA-LAW-2018.pdf

1. Standby Inspection: A PG&E Gas Transmission Standby Inspector must be present during any demolition or construction activity that comes within 10 feet of the gas pipeline. This includes all grading, trenching, substructure depth verifications (potholes), asphalt or concrete demolition/removal, removal of trees, signs, light poles, etc. This inspection can be coordinated through the Underground Service Alert (USA) service at 811. A minimum notice of 48 hours is required. Ensure the USA markings and notifications are maintained throughout the duration of your work.

2. Access: At any time, PG&E may need to access, excavate, and perform work on the gas pipeline. Any construction equipment, materials, or spoils may need to be removed upon notice. Any temporary construction fencing installed within PG&E's easement would also need to be capable of being removed at any time upon notice. Any plans to cut temporary slopes exceeding a 1:4 grade within 10 feet of a gas transmission pipeline need to be approved by PG&E Pipeline Services in writing PRIOR to performing the work.

3. Wheel Loads: To prevent damage to the buried gas pipeline, there are weight limits that must be enforced whenever any equipment gets within 10 feet of traversing the pipe.

Ensure a list of the axle weights of all equipment being used is available for PG&E's Standby Inspector. To confirm the depth of cover, the pipeline may need to be potholed by hand in a few areas.

Due to the complex variability of tracked equipment, vibratory compaction equipment, and cranes, PG&E must evaluate those items on a case-by-case basis prior to use over the gas pipeline (provide a list of any proposed equipment of this type noting model numbers and specific attachments).

No equipment may be set up over the gas pipeline while operating. Ensure crane outriggers are at least 10 feet from the centerline of the gas pipeline. Transport trucks must not be parked over the gas pipeline while being loaded or unloaded.

4. Grading: PG&E requires a minimum of 36 inches of cover over gas pipelines (or existing grade if less) and a maximum of 7 feet of cover at all locations. The graded surface cannot exceed a cross slope of 1:4.

5. Excavating: Any digging within 2 feet of a gas pipeline must be dug by hand. Note that while the minimum clearance is only 12 inches, any excavation work within 24 inches of the edge of a pipeline must be done with hand tools. So to avoid having to dig a trench entirely with hand tools, the edge of the trench must be over 24 inches away. (Doing the math for a 24 inch

wide trench being dug along a 36 inch pipeline, the centerline of the trench would need to be at least 54 inches [24/2 + 24 + 36/2 = 54] away, or be entirely dug by hand.)

Water jetting to assist vacuum excavating must be limited to 1000 psig and directed at a 40° angle to the pipe. All pile driving must be kept a minimum of 3 feet away.

Any plans to expose and support a PG&E gas transmission pipeline across an open excavation need to be approved by PG&E Pipeline Services in writing PRIOR to performing the work.

6. Boring/Trenchless Installations: PG&E Pipeline Services must review and approve all plans to bore across or parallel to (within 10 feet) a gas transmission pipeline. There are stringent criteria to pothole the gas transmission facility at regular intervals for all parallel bore installations.

For bore paths that cross gas transmission pipelines perpendicularly, the pipeline must be potholed a minimum of 2 feet in the horizontal direction of the bore path and a minimum of 12 inches in the vertical direction from the bottom of the pipe with minimum clearances measured from the edge of the pipe in both directions. Standby personnel must watch the locator trace (and every ream pass) the path of the bore as it approaches the pipeline and visually monitor the pothole (with the exposed transmission pipe) as the bore traverses the pipeline to ensure adequate clearance with the pipeline. The pothole width must account for the inaccuracy of the locating equipment.

7. Substructures: All utility crossings of a gas pipeline should be made as close to perpendicular as feasible (90° +/- 15°). All utility lines crossing the gas pipeline must have a minimum of 12 inches of separation from the gas pipeline. Parallel utilities, pole bases, water line ‘kicker blocks’, storm drain inlets, water meters, valves, back pressure devices or other utility substructures are not allowed in the PG&E gas pipeline easement.

If previously retired PG&E facilities are in conflict with proposed substructures, PG&E must verify they are safe prior to removal. This includes verification testing of the contents of the facilities, as well as environmental testing of the coating and internal surfaces. Timelines for PG&E completion of this verification will vary depending on the type and location of facilities in conflict.

8. Structures: No structures are to be built within the PG&E gas pipeline easement. This includes buildings, retaining walls, fences, decks, patios, carports, septic tanks, storage sheds, tanks, loading ramps, or any structure that could limit PG&E’s ability to access its facilities.

9. Fencing: Permanent fencing is not allowed within PG&E easements except for perpendicular crossings which must include a 16 foot wide gate for vehicular access. Gates will be secured with PG&E corporation locks.

10. Landscaping: Landscaping must be designed to allow PG&E to access the pipeline for maintenance and not interfere with pipeline coatings or other cathodic protection systems. No trees, shrubs, brush, vines, and other vegetation may be planted within the easement area. Only those plants, ground covers, grasses, flowers, and low-growing plants that grow unsupported to a maximum of four feet (4’) in height at maturity may be planted within the easement area.

11. Cathodic Protection: PG&E pipelines are protected from corrosion with an “Impressed Current” cathodic protection system. Any proposed facilities, such as metal conduit, pipes, service lines, ground rods, anodes, wires, etc. that might affect the pipeline cathodic protection system must be reviewed and approved by PG&E Corrosion Engineering.

12. Pipeline Marker Signs: PG&E needs to maintain pipeline marker signs for gas transmission pipelines in order to ensure public awareness of the presence of the pipelines. With prior written approval from PG&E Pipeline Services, an existing PG&E pipeline marker sign that is in direct conflict with proposed developments may be temporarily relocated to accommodate construction work. The pipeline marker must be moved back once construction is complete.

13. PG&E is also the provider of distribution facilities throughout many of the areas within the state of California. Therefore, any plans that impact PG&E’s facilities must be reviewed and approved by PG&E to ensure that no impact occurs which may endanger the safe operation of its facilities.

Attachment 2 – Electric Facilities

It is PG&E's policy to permit certain uses on a case by case basis within its electric transmission fee strip(s) and/or easement(s) provided such uses and manner in which they are exercised, will not interfere with PG&E's rights or endanger its facilities. Some examples/restrictions are as follows:

1. Buildings and Other Structures: No buildings or other structures including the foot print and eave of any buildings, swimming pools, wells or similar structures will be permitted within fee strip(s) and/or easement(s) areas. PG&E's transmission easement shall be designated on subdivision/parcel maps as "**RESTRICTED USE AREA – NO BUILDING."**

2. Grading: Cuts, trenches or excavations may not be made within 25 feet of our towers. Developers must submit grading plans and site development plans (including geotechnical reports if applicable), signed and dated, for PG&E's review. PG&E engineers must review grade changes in the vicinity of our towers. No fills will be allowed which would impair ground-to-conductor clearances. Towers shall not be left on mounds without adequate road access to base of tower or structure.

3. Fences: Walls, fences, and other structures must be installed at locations that do not affect the safe operation of PG&'s facilities. Heavy equipment access to our facilities must be maintained at all times. Metal fences are to be grounded to PG&E specifications. No wall, fence or other like structure is to be installed within 10 feet of tower footings and unrestricted access must be maintained from a tower structure to the nearest street. Walls, fences and other structures proposed along or within the fee strip(s) and/or easement(s) will require PG&E review; submit plans to PG&E Centralized Review Team for review and comment.

4. Landscaping: Vegetation may be allowed; subject to review of plans. On overhead electric transmission fee strip(s) and/or easement(s), trees and shrubs are limited to those varieties that do not exceed 15 feet in height at maturity. PG&E must have access to its facilities at all times, including access by heavy equipment. No planting is to occur within the footprint of the tower legs. Greenbelts are encouraged.

5. Reservoirs, Sumps, Drainage Basins, and Ponds: Prohibited within PG&E's fee strip(s) and/or easement(s) for electric transmission lines.

6. Automobile Parking: Short term parking of movable passenger vehicles and light trucks (pickups, vans, etc.) is allowed. The lighting within these parking areas will need to be reviewed by PG&E; approval will be on a case by case basis. Heavy equipment access to PG&E facilities is to be maintained at all times. Parking is to clear PG&E structures by at least 10 feet. Protection of PG&E facilities from vehicular traffic is to be provided at developer's expense AND to PG&E specifications. Blocked-up vehicles are not allowed. Carports, canopies, or awnings are not allowed.

7. Storage of Flammable, Explosive or Corrosive Materials: There shall be no storage of fuel or combustibles and no fueling of vehicles within PG&E's easement. No trash bins or incinerators are allowed.

8. Streets and Roads: Access to facilities must be maintained at all times. Street lights may be allowed in the fee strip(s) and/or easement(s) but in all cases must be reviewed by PG&E for proper clearance. Roads and utilities should cross the transmission easement as nearly at right angles as possible. Road intersections will not be allowed within the transmission easement.

9. Pipelines: Pipelines may be allowed provided crossings are held to a minimum and to be as nearly perpendicular as possible. Pipelines within 25 feet of PG&E structures require review by PG&E. Sprinklers systems may be allowed; subject to review. Leach fields and septic tanks are not allowed. Construction plans must be submitted to PG&E for review and approval prior to the commencement of any construction.

10. Signs: Signs are not allowed except in rare cases subject to individual review by PG&E.

11. Recreation Areas: Playgrounds, parks, tennis courts, basketball courts, barbecue and light trucks (pickups, vans, etc.) may be allowed; subject to review of plans. Heavy equipment access to PG&E facilities is to be maintained at all times. Parking is to clear PG&E structures by at least 10 feet. Protection of PG&E facilities from vehicular traffic is to be provided at developer's expense AND to PG&E specifications.

12. Construction Activity: Since construction activity will take place near PG&E's overhead electric lines, please be advised it is the contractor's responsibility to be aware of, and observe the minimum clearances for both workers and equipment operating near high voltage electric lines set out in the High-Voltage Electrical Safety Orders of the California Division of Industrial Safety (https://www.dir.ca.gov/Title8/sb5g2.html), as well as any other safety regulations. Contractors shall comply with California Public Utilities Commission General Order 95 (http://www.cpuc.ca.gov/gos/GO95/go_95_startup_page.html) and all other safety rules. No construction may occur within 25 feet of PG&E's towers. All excavation activities may only commence after 811 protocols has been followed.

Contractor shall ensure the protection of PG&E's towers and poles from vehicular damage by (installing protective barriers) Plans for protection barriers must be approved by PG&E prior to construction.

13. PG&E is also the owner of distribution facilities throughout many of the areas within the state of California. Therefore, any plans that impact PG&E's facilities must be reviewed and approved by PG&E to ensure that no impact occurs that may endanger the safe and reliable operation of its facilities.

Letter A-PG&E#1: Plan Review Team, PG&E (September 30, 2021)

Response to Comment A-PG&E#1-1

The comment states that PG&E will review the project and site plans in relation to any existing PG&E facilities in the project area. Comment noted. The comment does not raise any questions or concerns about the adequacy of the draft EIR. The Phase 1 applicant and applicants of future projects affecting PG&E properties and easements will be required to consult with PG&E and obtain all necessary approvals from PG&E prior to construction and operation of the subject projects.

Response to Comment A-PG&E#1-2

The comment summarizes the role of PG&E in relation to the proposed project, and the PG&E-related approvals and applications required for the project. The comment also states that the CEQA document should identify any required future PG&E services. Comment noted. See Response to Comment PG&E#1-1. The draft EIR notes that the project would be served by existing PG&E gas and electric infrastructure. Project impacts on PG&E gas and electric infrastructure are evaluated in Section 4.17, *Utilities and Service Systems*, pages 4.17-38 through 4.17-39. As discussed, impacts would be less than significant and no mitigation is required. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Pacific Gas and Electric Company

Plan Review Team
Land Management

PGEPlanReview@pge.com

A-PG&E #2

November 17, 2021

Adena Friedman
City of South San Francisco
PO Box 711
South San Francisco, CA 94083

Re: Southline DEIR Notice of Availability
30 Tanforan Avenue, South San Francisco, CA 94080

Dear Adena:

Thank you for giving us the opportunity to review the subject plans. The proposed Southline DEIR is within the same vicinity of PG&E's existing facilities that impact this property.

The proposed will require the relocation of multiple PG&E facilities and assets. I can confirm that the applicant has submitted applications for these relocations with PG&E and initiated to relocation process. The applicant will need to continue to work with our teams to continue their development.

1

Please contact the Building and Renovation Center (BRSC) for facility map requests by calling 1-877-743-7782 and PG&E's Service Planning department at www.pge.com/cco for any modification or relocation requests, or for any additional services you may require.

As a reminder, before any digging or excavation occurs, please contact Underground Service Alert (USA) by dialing 811 a minimum of 2 working days prior to commencing any work. This free and independent service will ensure that all existing underground utilities are identified and marked on-site.

If you have any questions regarding our response, please contact me at Justin.Newell@pge.com.

Sincerely,

J Newell

Justin Newell
Land Management
916-594-4068

Letter A-PG&E#2: Justin Newell, PG&E (November 17, 2021)

Response to Comment PG&E#1-1

The comment states that there are existing PG&E facilities in the project area, and that the project applicant has initiated coordination with PG&E for the proposed relocations of these facilities. Comment noted. See Response to Comment PG&E#1-1 and Response to Comment PG&E#1-2. The comment does not raise any questions or concerns about the adequacy of the draft EIR. No revisions to the draft EIR are required.

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November 12, 2021

City of South San Francisco
Department of Economic and Community Development
Attn: Adena Friedman, Senior Planner
315 Maple Street
South San Francisco, CA 94080
Adena.Friedman@ssf.net

RE: Comment Letter on the Draft EIR for the Proposed Southline Specific Plan and Related Offsite Improvements

Dear Ms. Friedman,

Please accept this letter as the City of San Bruno's ("City") official response to the Southline Specific Plan Draft Environmental Impact Report (DEIR), State Clearinghouse #2020050452 prepared by the City of South San Francisco. As noted in our response to the Notice of Preparation (NOP) issued in connection with the DEIR (dated July 6, 2020), the City is a Responsible Agency as defined in California Public Resources Code Section 21069.[1] As a Responsible Agency for the Southline Specific Plan project, the City has the authority to:

- Comment on project activities within its areas of expertise or regulatory authority (CEQA Guidelines Section 15096(d);
- Require feasible changes to project activities within its regulatory authority in order to substantially lessen or avoid significant effects, or to disapprove a project to avoid significant effects (Public Resources Code Section 21002.1, CEQA Guidelines Section 15041, 15042).

1

Accordingly, the City's review of the DEIR was focused on the environmental effects of project activities that the City would be called on to implement, finance, approve, or would otherwise affect residents, businesses, or infrastructure located in San Bruno's jurisdiction. In particular, the project proposes to complete several transportation and circulation improvements within San Bruno that would require the Applicant to submit separate applications to the City of San Bruno subject to review and approval. These improvements include:

- A reconfiguration of Huntington Avenue that would incorporate it into a signalized intersection connected with South Maple Avenue and the proposed Southline Avenue east-west connection road;

[1] A responsible agency is defined as a public agency, other than the lead agency, which has responsibility for carrying out or approving a project.

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- The construction of a new dedicated, signalized northbound left turn lane on Huntington Avenue providing a new entrance into the transit center for SamTrans buses;
- A reconfiguration of Tanforan Avenue to create a cul-de-sac limiting through traffic;
- Utility, stormwater treatment, landscaping, lighting, and pedestrian circulation modifications to portions of Huntington Avenue extending west and south of the proposed intersection.

Prior to construction of the proposed transportation and circulation improvements within the City's jurisdiction, the Applicant would be required to obtain the following discretionary and ministerial approvals:

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- General Plan Amendment to amend Figures 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, and 4-7 of the Transportation Element to reflect the construction of the proposed Huntington Avenue/Southline Avenue intersection;
- Improvement and Maintenance Agreement;
- Encroachment Permit for work performed within the right-of-way;
- Construction Traffic Control Plans, including Truck Routes
- Street tree removal permit(s); and
- Any additional actions or permits deemed necessary to implement the off-site improvements within the City of San Bruno's jurisdiction.

Our comments on the Southline Specific Plan DEIR are summarized below.

I. REVIEW OF DRAFT ENVIRONMENTAL IMPACT REPORT

a) Air Quality

2 Our response to the NOP identified several air quality-related concerns, including the potential for construction and operation of Phase I of the Southline Specific Plan and future phases to result in the exposure of nearby sensitive receptors to toxic air contaminants (TACs) and $PM_{2.5}$ in excess of Bay Air Quality Management District (BAAQMD) significance thresholds. Page 4.2-1 incorrectly states that "no questions or concerns related to air quality were raised in the responses to the NOP". Please revise this sentence to reflect the concerns raised in San Bruno's response to the NOP.

Fugitive Dust

3 To address fugitive dust generated by project construction during Phase I, the DEIR requires the project to implement Mitigation Measure AQ-1, which requires the applicant to follow BAAQMD's "Basic Construction Mitigation Measures" identified in Table 8-2 of the BAAQMD 2017 CEQA Guidelines. However, as shown in Table 4.2-6 of the DEIR, construction of Phase I would result in NO_x emissions above the corresponding BAAQMD threshold. When construction-generated criteria air pollutants would exceed BAAQMD thresholds, BAAQMD recommends that projects incorporate "Additional Construction Mitigation Measures" (identified in Table 8-3 of the BAAQMD 2017 CEQA Guideline). Accordingly, in order to properly mitigate the impact of criteria air pollutants and fugitive dust generated during construction, AQ-

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1 should be revised in the Final EIR (FEIR) to include BAAQMD Additional Construction Mitigation Measures. Additionally, the discussion of construction-related fugitive dust impacts on page 4.2-53 should be updated to include the Additional Construction Mitigation Measures.

Criteria Air Pollutants

4

The City concurs that Mitigation Measure AQ-2 would reduce construction-related Phase I criteria air pollutant emissions below BAAQMD thresholds. However, AQ-2 as written does not adequately describe how this measure would be enforced. The Mitigation Monitoring and Reporting Program (MMRP), which we understand will be prepared during completion of the FEIR, should describe the enforcement mechanism used to ensure contractor compliance. For example, the measure could be revised to include "All contractors would be required to submit a list of equipment and associated Engine Identification Numbers (EINs) to the California Air Resources Board for Tier 4 verification".

5

To address criteria air pollutant emissions generated by testing of emergency generators during operation of Phase I, the DEIR prescribes Mitigation Measure AQ-8, which would limit testing to one generator per day. Implementation of this measure would not reduce NO_x emissions below BAAQMD thresholds, and would expose sensitive receptors located south of Tanforan Avenue to elevated noise levels five days per month as opposed to one day per month. Furthermore, as discussed below under c) Noise and Vibration, the analysis of noise levels generated by testing of the emergency generators does not appear to have taken Measure AQ-8 into consideration. Therefore, Measure AQ-8 does not mitigate the project's operational NO_x emissions while potentially worsening the impact associated with noise generated by emergency generator testing. The FEIR should estimate ambient noise levels at nearby sensitive receptors during emergency generator testing with and without Measures AQ-8 and NOI-1d, and remove Measure AQ-8 should ambient noise levels increase by 10 dBA or more on a greater number of days with implementation of this measure.

Toxic Air Contaminants and $PM_{2.5}$

6

The DEIR determined that without mitigation, the nearest sensitive receptor (residences located on Tanforan Avenue within the City of San Bruno) would be exposed to cancer risks and annual $PM_{2.5}$ concentrations in excess of BAAQMD significance thresholds. With implementation of Measures AQ-1 and AQ-2, the cancer risks and annual $PM_{2.5}$ concentrations associated with Phase I construction appear to be reduced (according to Table 4.2-14) by approximately 95 percent. This does not appear to be mathematically possible, since Measure AQ-2 only requires 95 percent of construction equipment to be Tier 4, and Tier 4 equipment has emissions that are between 90 and 93 percent lower than the default emissions used in the California Emissions Estimator Model. Accordingly, cancer risks and annual $PM_{2.5}$ concentrations could be reduced by as little as 85.5 percent.[2] Please clarify how the difference between the unmitigated and mitigated cancer risks and annual $PM_{2.5}$ concentrations (approximately 9.5 percent) was

[2] Multiplying 95 percent (percentage of Tier 4 equipment) by 90 percent (minimum emissions reduction provided by Tier 4 engines) equals .855 or 85.5 percent.

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6 Con't

calculated and achieved.[3] Assuming 85.5 percent is the correct reduction provided by Measure AQ-2, the cancer risk would be approximately 13 cases per million, which would exceed the BAAQMD significance threshold of 10 cases per million, and the project would have a significant impact on sensitive receptors located within San Bruno on Tanforan Avenue.[4] The FEIR must either confirm and explain how the 95 percent reduction is achieved, or re-evaluate the cancer risks for these sensitive receptors and, if necessary, include additional mitigation that reduces these risks to a less than significant level. As noted above, the City has the authority to require feasible changes to a project in order to lessen or avoid significant effects, or to disapprove a project to avoid significant effects (Public Resources Code Section 21002.1; CEQA Guidelines Sections 15041, 15042).

b) <u>Archaeological Resources</u>

7

The DEIR evaluates the project's potential to affect archaeological resources located within the City's jurisdiction and its consistency with relevant San Bruno General Plan policies, specifically Implementing Policy ERC-39. The DEIR appropriately documents that no known archaeological resource recovery sites are located within or adjacent to the project site, and correctly identifies that excavation and grading activities associated with construction of the proposed off-site transportation and circulation improvements (described above) would have the potential to encounter undiscovered subsurface archaeological resources within San Bruno city limits. With incorporation of mitigation measures CR-2a and -2b, the DEIR concluded that the project's impacts to archaeological resources would be less than significant. Since these measures are comparable to what the City prescribes under similar circumstances, we concur that the project's impact to archaeological resources would be less than significant with mitigation incorporated. However, CR-2b as written is inadequate from a process perspective, as it needs to specify the City and associated contact person that would be notified and consulted with in the event that a potential archaeological resource is discovered. The measure should be revised to specify that the San Bruno City Planning Manager and Public Works Director should be notified and consulted in the event a potential archaeological resource is encountered during construction within San Bruno city limits.

c) <u>Noise & Vibration</u>

8

Our response to the NOP noted that temporary and permanent increases in noise levels as a result of construction and operation of the proposed project could have a significant impact on nearby sensitive receptors located at the single-family residences along Tanforan Avenue and Huntington Avenue. Additionally, we noted that groundborne vibration generated by construction could have a significant impact on buildings adjacent to the project site.

9

Table 4.11-16, which shows the predicted noise levels at nearby sensitive receptors due to project-generated traffic noise, incorrectly calculates the "Project-Related Increase (dB)" for several roadway segments which need to be corrected in the FEIR, including:

[3] 95 percent (the reduction provided by Measures AQ-1 and AQ-2 according to the DEIR) minus 85.5 percent (the maximum reduction that appears to be mathematically feasible) equals 9.5 percent.
[4] The unmitigated cancer risk is 89.6 cases per million; reducing this number by 85.5 percent equals 12.992 cases per million.

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- Huntington Avenue between San Bruno Ave and Forest Lane (correct change: increase of 0.4 dB)
- Tanforan Avenue between Huntington Avenue and Dollar Avenue (correct change: decrease of 4.4 dB)
- South Maple Avenue between Tanforan Avenue and Victory Avenue (correct change: increase of 2.9 dB)

9 Con't Similarly, Table 4.11-18, which shows the predicted noise levels at nearby sensitive receptors due to cumulative traffic noise levels, incorrectly calculates the "Cumulative Plus Project Minus Existing (dB)" for several roadway segments which need to be corrected in the FEIR, including:

- Sneath Lane between Cherry Avenue and El Camino Real (correct change: increase of one dB)
- South Linden Avenue between Grand Avenue and San Mateo Avenue (correct change: increase of two dB)

Please confirm the predicted noise levels and correct any errors or typos.

Heating, Cooling, and Ventilation Equipment

10 Regarding the Heating, Cooling, and Ventilation (HVAC) Equipment discussion beginning on page 4.11-39: The ambient noise level threshold for sensitive receptors located along Tanforan Avenue is based on a one hour average peak hour L_{eq} value of 58.2 dBA L_{eq} derived from modeled traffic volumes. Based on short- and long-term measurements taken at 410 Noor Avenue (a cumulative project located 1,650 feet northwest in South San Francisco) in December 2020, it is possible that the nighttime ambient noise level is five to 10 dBA below the daytime peak hour noise level. Therefore, the baseline ambient noise level used in the HVAC Equipment analysis is excessively high (since it is based on one of the noisiest period of the day) and does not accurately reflect nighttime conditions, when residents are most sensitive to noise, and therefore the corresponding ambient noise level threshold of 68.2 dBA is an inappropriate threshold to use. The HVAC equipment would operate at night and would generate noise levels of approximately 77.5 dBA at the sensitive receptors located along Tanforan Avenue, which would significantly exceed the ambient noise level threshold. Therefore, noise generated by this equipment should be evaluated against a nighttime ambient noise level based on either noise measurements, or conservatively estimated at 45 dBA for consistency with San Bruno Municipal Code Section 6.16.030. Finally, the conclusion to the HVAC Equipment analysis is inadequate since the DEIR fails to estimate and compare nighttime ambient noise levels with implementation of Mitigation Measure NOI-1c to an appropriate threshold. The DEIR should establish a nighttime ambient noise level based on noise measurements or use a 45 dBA threshold, and evaluate the nighttime ambient noise level during project operation with Measure NOI-1c incorporated against said threshold, and provide additional mitigation to reduce noise generated by the HVAC equipment to a less than significant level if warranted.

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Emergency Generator Testing

Regarding the Emergency Generator Testing discussion beginning on page 4.11-42: Noise generated by testing of the emergency generators appears to be estimated based on the assumption that generators would be tested simultaneously. Without mitigation, testing of these emergency generators would result in ambient noise levels between 76 and 87 dBA, which would exceed the ambient noise level threshold of 68.2 used in the DEIR. As noted above under Heating, Cooling, and Ventilation Equipment, we do not agree that 68.2 dBA is an appropriate ambient noise level threshold. The DEIR concludes that implementation of NOI-1d, noise generated by emergency generator testing would be reduced to less than significant levels. 11 However, the DEIR must identify the noise reduction provided by Measure NOI-1d and the ambient noise level post-mitigation. Additionally, with implementation of Mitigation Measure AQ-8 (refer to the Air Quality discussion above), each of the five proposed generators would be tested once per month, potentially resulting in noise levels in excess of San Bruno noise thresholds five days per month. The DEIR's analysis of noise generated by emergency generator testing does not appear to have taken into account Measure AQ-8. The Emergency Generator Testing discussion should be revised to reflect Measure AQ-8, and should demonstrate the resulting noise levels with implementation of Mitigation Measure NOI-1d to ensure noise levels do not result in noise levels that are 10 dB or greater than ambient noise levels.

d) <u>Transportation</u>

Our response to the NOP identified several concerns related to transportation and circulation, especially as regards to the proposed intersection that would connect South Maple Avenue, 12 Huntington Avenue/Sneath Lane, and the proposed Southline Avenue. Specifically, we identified increases in traffic volumes on Huntington Avenue, potential effects on level of service (LOS), additional VMT generated by the proposed development, and potential issues with site geometry.

In response to the conceptual design (Figure 3-21b) of the new South Maple Avenue/Huntington Avenue/Sneath Lane/Southline Avenue intersection, the City recommends adding a bulbout to 13 the southwest corner of the intersection to discourage cars in the southbound right turn pocket on the Maple Avenue approach from accidently or intentionally going through the intersection from the right turn lane. Additionally, the City would like to reiterate that no driveways should be 14 present within 150 feet of the proposed intersection. The intersection must be connected to the existing signalized intersections to the west and to the south of the new intersection via 15 communication cable (preferably fiber optic) so that these three signals can communicate and have coordinated signal timing for safe and efficient flow of traffic.

Regarding the Regulatory Framework discussion: In Section 4.15.3.2, "California Department of Transportation", the discussion references Caltrans' *Local Development – Intergovernmental Review Program Interim Guidance* published in November 2016. However this guidance is now 16 obsolete with the publication of Caltrans' *Vehicle Miles Traveled-Focused Transportation Impact Study Guide* (TISG) which provides the most recent guidance regarding Caltrans' review of VMT impact analysis for land use projects and land use plans. In addition, Caltrans issued Traffic Safety Bulletin 20-02-R1, announcing the release of the Interim Local Development Intergovernmental Review Safety Review Practitioners Guidance. This new guidance material

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16 Con't provides instructions for conducting safety impact analysis for proposed land use projects and plans in compliance with CEQA. The transportation analysis should be updated to conform with the guidance provided in these documents in order to comply with Caltrans' safety impact review expectations as it relates to CEQA.

Trip Generation Estimates

17 Regarding the person-trip generation estimates for Phase I and the entire project (Tables 4.15-2 and 4.15-4, respectively): Please clarify why the person trips for public amenity visitors during peak hours are different under Phase I versus the entire project, but daily persons trips are equivalent. Additionally, please clarify why the AM, PM, and Daily rates for Phase I and the entire project are different.

18 Regarding the vehicle trip generation estimates for Phase I and the entire project (Tables 4.15-3 and 4.15-5, respectively): The table notes indicate that the trip generation estimates were calculated using the fitted curve equation, however based on the calculations it appears that estimates were derived from average trip rates. The City supports the use of average trip rates versus the fitted curve equation.

Freeway Ramp Analysis

19 Regarding the Freeway Ramp discussion beginning on page 4.15-40: The analysis of potential safety hazards associated with freeway ramp queueing focuses solely on freeway off-ramps. There are several metered freeway on-ramps located in the surrounding area, including the northbound and southbound San Bruno Avenue on-ramps to US 101, and the San Bruno Avenue to I-280 northbound on-ramp. The discussion should be updated to include an analysis of these and other on-ramps in the surrounding area that are metered or may become metered during buildout of the Specific Plan to determine if vehicle queues would extend beyond the storage area and spill back onto the local road. In addition, a ramp capacity analysis should be performed to determine if the ramps have adequate capacity to accommodate the increase in future traffic.

20 The analysis of the San Bruno Avenue/Northbound 101 off-ramp shows a 95th percentile queue of 2,299 feet; assuming 25 feet per vehicle, a queue of 2,299 feet translates in approximately 92 vehicles. The reported LOS at the San Bruno Avenue/Northbound 101 intersection presented in Table 7 in Appendix 4.15-1 Traffic Impact Analysis Part B, shows that this intersection would operate at LOS C under Project Conditions. It is counter intuitive that the intersection would operate at LOS C if one approach leg would experience a queue of 92 vehicles. Please check the calculations or provide an explanation why the intersection would operate at LOS C while experiencing long queues at the off-ramp.

21 The analysis of the San Bruno Avenue/I-280 northbound off-ramp shows a 95th percentile queue of 419 feet, which would exceed the off-ramp's storage capacity of 230 feet. Please explain why the project would cause a large increase in queue length at the northbound left turn lane in comparison with existing conditions where the queue is only 93 feet, when traffic on the northbound left turn lane would travel away from the project.

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City/County Association of Governments of San Mateo County

22 Pursuant to the Congestion Management Program (CMP) Technical Guidelines issued by the City/County Association of Governments of San Mateo County (C/CAG), a freeway segment LOS analysis is required when a project is expected to add trips greater than one percent of a segment's capacity. Review of the changes in AM and PM peak hour traffic volumes (Figures 7 and 8 of Appendix 4.15-1 Part B) show that several freeway segments would experience an increase in traffic of more than one percent of their capacity. Accordingly, a freeway segment analysis should be completed and the transportation analysis revised accordingly.

Level of Service Analysis

Our review of the changes in AM and PM peak hour traffic volumes also identified several roadway segments where the increase in peak hour traffic amounted to 100 vehicle trips or more, including:

- South Maple Avenue, between South Canal Street and the Project
- El Camino Real, north of South Spruce Avenue
- Huntington Avenue and I-380
- El Camino Real, south of San Bruno Avenue
- South Linden Avenue, north of the project site

These roadway segments should be investigated to determine if the LOS at additional intersections needs to be evaluated.

Additionally, our review of the LOS Analysis identified some errors and omissions, including:

23
- The LOS results presented in Table 7 of Appendix 4.15-1 Part B do not match the level of service calculation output sheets. Please check the analysis and confirm the correct delay and level of service. Synchro output sheets show that traffic volumes may be missing from select movements.
- Table 7 of Appendix 4.15-2 Part B contains turning movements with shared and exclusive lanes for the San Bruno Avenue/Northbound I-280 intersection; however, the 6th Edition of the Highway Capacity Manual does not support this. Please check the lane geometry for this intersection.
- The LOS calculation sheets for the 2040 plus Full Buildout Partial Circulation scenario are missing; please provide.
- The existing AM peak hour lane configuration for the Airport Boulevard/San Mateo Avenue/Produce Avenue is coded incorrectly in VISSIM; other scenarios show correct approach lines.
- The northbound throughlane at the San Bruno Avenue/Northbound 101 intersection should be coded as a shared through and left-turn lane.
- The southbound leg of the San Bruno Avenue/Cherry Avenue intersection should be coded as two lanes (one shared through/left and one right)

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- Please correct the coding of the El Camino Real/Eastbound I-380 intersection to reflect that the north and southbound right turns are uncontrolled freeway on-ramps, i.e. not controlled by the traffic signal. Similarly, the southbound right at the El Camino Real/Westbound I-380 intersection should be coded as a free-turning uncontrolled freeway on-ramp.

Although LOS is no longer the standard for determining transportation-related CEQA impacts, as noted in the City's response to the NOP, San Bruno's General Plan requires projects that would result in intersections operating at an unacceptable LOS (i.e. LOS E or F) to complete physical roadway modifications to maintain or restore acceptable LOS conditions (LOS D or better). According to the *Southline Traffic Operations Analysis Memorandum* prepared by Fehr & Peers (dated December 15, 2020), six intersections located in San Bruno would operate at an unacceptable LOS under 2040 Project Buildout conditions. In order to restore and/or maintain acceptable LOS at these intersections, the *Recommended San Bruno Intersection Improvements Memorandum* prepared by Kimley Horn (dated August 16, 2021) recommended the following improvements:

- El Camino Real/Sneath Lane Intersection: Signal timing and equipment modification
- Sneath Lane/Southbound 280 Intersection: Intersection geometry improvements
- Huntington Avenue/Herman Street/Forest Lane Intersection: Signalization
- San Bruno Avenue/Cherry Avenue Intersection: Intersection geometry improvements; signal timing and equipment modification
- El Camino Real/San Bruno Avenue Intersection: Signal timing adjustments

24

- Sneath Lane/Huntington Avenue Intersection: Retain existing lane geometry

While the DEIR acknowledges that six intersections located in San Bruno would operate at LOS E or F under project buildout, it does not identify the intersection improvements necessary to restore or maintain acceptable LOS conditions and evaluate the environmental impact of the necessary improvements, should the City of San Bruno decide to pursue their implementation in response to the proposed project traffic. CEQA requires projects to evaluate all activities which may cause a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment. Accordingly, both Table 3-5 "Summary of Off-Site Infrastructure Improvements" and the FEIR at large should be updated to include and evaluate the potential environmental impacts of these proposed improvements, so that the City of San Bruno may rely on the EIR for implementation of any of the recommended roadway improvements. It is expected that these improvements can be accomplished within existing right-of-way and would involve minimal impacts and their inclusion in the EIR would not warrant recirculation. Additionally, the City has the following comments on the proposed intersection improvements:

- El Camino Real/Sneath Lane Intersection Improvement: The separation between vehicle paths for vehicles completing east- and west-bound left turn movements is very tight, such that vehicles in the outside opposing left-turn lanes would barely clear each other. Caltrans will need to confirm if the proposed lane geometry is acceptable.

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- Sneath Lane/Southbound 280 Intersection Improvement: As designed, the proposed intersection geometry poorly aligns the westbound throughlane with its receiving lane. Additionally, we are concerned that it may not be possible for the eastbound bicycle lane to be carried through this intersection.
- San Bruno Avenue/Cherry Avenue Intersection Improvement: As designed, the plans show that the proposed southbound left-turn lane would move the southbound throughlane approximately 12 feet out of alignment with its receiving lane, which is a significant offset and not recommended. Additionally, it appears the northbound and southbound left-turn vehicle paths would not clear each other, making eight-phase operation difficult to achieve. The proposed southbound left-turn pocket should be placed in the existing median on the north leg, and the existing shared through/left-turn lane should be converted to a throughlane only.

24 Con't

Please address the issues, errors, and omissions identified above and update the Transportation Analysis and FEIR to reflect our guidance regarding LOS-related physical improvements.

Rail Service Analysis

25 The analysis of the project's effect on BART and Caltrain capacity is based on 2019 passenger counts; since the project would not be fully built out until well after 2019 (projected build out date of 2030), the DEIR should analyze the project's effect under 2040 cumulative conditions.

Emergency Access Analysis

26 The Emergency Access Analysis on page 4.15-46 of the DEIR states that the project would provide an additional route for emergency vehicles to access the project vicinity through construction of the new east-west Southline Avenue and the new intersection at Sneath Lane, Huntington Avenue, and Southline Avenue. The FEIR should include a figure with a diagram showing the proposed location of this emergency vehicle access route so that the San Bruno Police and Fire Departments can review and ensure that Phase I of the project would not affect emergency vehicle ingress, egress, or response times.

Cumulative Impacts

27 As noted in our response to the NOP, the analysis of cumulative transportation impacts should have taken into account the Decima Allen Elementary School project. However, based on the cumulative projects identified in Section 4.1.5 of the DEIR, the Decima Allen Elementary School project was not accounted for in the cumulative analysis. Please clarify why this project was not included in the DEIR's cumulative analysis, or revise the DEIR accordingly.

28 Additionally, it is unclear if Transportation Analysis Scenarios 4 and 5 assumed that the hybrid approach to the South Linden Avenue grade crossing and associated closure of Scott Street to vehicles would be completed. If this is not the case, please assume these improvements would be completed in the analysis of Scenarios 4 and 5, or assess a sixth scenario that assumes these conditions.

e) <u>Utilities and Service Systems</u>

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29 Our response to the Notice of Preparation identified project- and cumulative-level concerns with new stormwater and wastewater flows generated by project buildout and their effect on existing infrastructure capacity and future development within San Bruno. Additionally, we requested that visual inspections of existing utilities within our jurisdiction be completed prior to and after construction. As noted in our response to the NOP, South San Francisco will need to confirm ownership of the utility mains that the new utilities will tie into, and conduct relevant studies if warranted. Regardless of ownership, all costs associated with replacing or upsizing of the sewer utilities located in Tanforan Avenue will be assumed by the Applicant. New utilities or any utility relocations owned by the City of San Bruno will need to meet City of San Bruno standards and receive prior approval of the pipe sizes, alignment, material, and design proposed. Relocation of fire hydrants will require concurrence with the City's Operations Division and Fire Marshal. The City of San Bruno may also require trash capture devices for new storm drain inlets and green infrastructure be installed by the applicant.

30 Based on our review of Figures 4.17-2 and 4.17-3, it is our understanding that all wastewater and stormwater flows would travel away from San Bruno, and no improvements to wastewater and stormwater infrastructure beyond what is identified in Table 4.17-5 and evaluated throughout the DEIR would be required. We also concur that the South San Francisco Water Quality Control Plant (WQCP) has adequate capacity to serve existing and project-generated wastewater flows. As such, we have no comments on the project-level analysis of the project's utility and service system impacts.

CityNet Services

31 CityNet fiber optic cables are present underground at the intersection of Sneath Lane and Huntington Avenue that provide internet services to the San Bruno Police and Fire Departments, City Hall, and other customers. Prior to any below-ground construction work within this area, the Applicant will need to pothole and accurately locate and identify all fiber optic cables to ensure that construction does not damage these cables or interrupt service.

Cumulative Impacts

32 As noted in our response to the NOP, the analysis of cumulative utilities and service systems impacts should have taken into account both the Bayhill Specific Plan and the Mills Park Center projects. However, based on the cumulative projects identified in Section 4.1.5 of the DEIR, the Mills Park Center project was not accounted for in the cumulative analysis. The DEIR will need to be revised accordingly.

f) <u>Alternatives</u>

33 As requested in our response to the NOP, the DEIR analyzed both a "No Project" alternative and a project alternative that did not include the proposed South Maple Avenue/Huntington Avenue/Sneath Lane/Southline Avenue intersection. We have reviewed the discussion of both alternatives and have no further comment on the DEIR's presentation of the alternatives and the tradeoffs presented relative to the proposed project. The City reserves the right to communicate at a later date regarding its potential preference for an alternative prior to South San Francisco's action on the Specific Plan.

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34 Thank you for providing the City of San Bruno the opportunity to review and comment on the Southline Specific Plan DEIR. As required by CEQA Guidelines Sections 15088 and 15132, the FEIR must respond to the comments raised herein through revisions to the DEIR or directly through a separate action, and provide said responses to the City of San Bruno at least 10 days prior to certification of the FEIR. If there are any questions regarding the comments provided herein, please contact Hae Won Ritchie, City Engineer/Interim Director of Public Works at (650) 616-7065 or hritchie@sanbruno.ca.gov.

Sincerely,

DocuSigned by:
Hae Won Ritchie
D109F278D35D40A...

Hae Won Ritchie
Interim Public Works Director

cc:
Pamela Wu, Community and Economic Development Director

Letter A-San Bruno: Hae Won Ritchie, City of San Bruno (November 12, 2021)

Response to Comment A-San Bruno-1

The comment summarizes the role of the City of San Bruno in relation to the proposed project (i.e., as a responsible agency under CEQA), the off-site improvements located in San Bruno's jurisdiction, and the approvals required from the City of San Bruno for the project. The comment states that the City of San Bruno's comments are focused on the environmental effects of the proposed off-site improvements located in San Bruno's jurisdiction, as well as other effects on San Bruno residences, businesses, or infrastructure.

Comment noted. The list of off-site improvements located in San Bruno's jurisdiction and the list of San Bruno approvals required for the project are consistent with information presented in Chapter 3, *Project Description*, of the draft EIR (e.g., see Table 3-5 on pages 3-21 through 3-23 and section 3.7 on pages 3-44 through 3-46). The comment does not raise any issues about the adequacy of the draft EIR. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-2

The comment correctly notes that the air quality-related comments in the City of San Bruno's response to the NOP were not described in the draft EIR. This editorial error has been corrected in Chapter 3, *Revisions to the Draft EIR*. However, all of the air-quality related comments raised in San Bruno's response to the NOP were substantively addressed in the draft EIR analysis; therefore, no further revisions to the draft EIR are required.

Response to Comment A-San Bruno-3

The comment states that BAAQMD provides in its *CEQA Air Quality Guidelines* (CEQA Guidelines) Table 8-3, *Additional Construction Mitigation Measures Recommended for Projects with Construction Emissions Above the Threshold*. BAAQMD recommends incorporating the measures in Table 8-3 for projects when construction-generated air pollutants would exceed BAAQMD thresholds.[1] Because construction emissions from Phase 1 and the proposed project would exceed BAAQMD daily emissions thresholds, the comment recommends that the draft EIR be revised to incorporate BAAQMD's additional construction mitigation measures.

The comment inaccurately states that "construction of Phase I would result in NOx emissions above the corresponding BAAQMD threshold." In fact, as disclosed in Table 4.2-7 of the draft EIR, Phase 1 construction emissions will have a less-than-significant impact with implementation of Mitigation Measure AQ-1. Moreover, to the extent that the comment indicates that project or Phase 1 impacts from fugitive dust will be significant, this is inaccurate, as fugitive dust impacts are mitigated to less-than-significant through Mitigation Measure AQ-1. However, the comment correctly notes that overall construction emissions associated with project buildout, not including Phase 1, would be significant and unavoidable.

[1] Bay Area Air Quality Management District. 2017. *California Environmental Quality Act Air Quality Guidelines*. May. Available: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en. Accessed: December 1, 2021.

BAAQMD's CEQA Guidelines is a guidance document, and its recommended mitigation measures are recommendations, not requirements. In its discretion as lead agency, the City of South San Francisco has determined that the mitigation measures included in the draft EIR are equivalent to, and in most cases more stringent than, the additional construction mitigation measures provided in Table 8-3 of BAAQMD's CEQA Guidelines. Additional discussion is provided in Table 2-1 below, which compares each of BAAQMD's additional construction mitigation measures to the corresponding mitigation measure from the draft EIR. The City also notes that BAAQMD was provided the opportunity to review the draft EIR and did not submit comments on the draft EIR. Therefore, no revisions to the draft EIR are required.

Response to Comment A-San Bruno-4

The comment requests that Mitigation Measure AQ-2, which is on page 4.2-42 of the draft EIR, be revised to clarify the enforcement process by stating that "All contractors would be required to submit a list of equipment and associated Engine Identification Numbers (EINs) to the California Air Resources Board for Tier 4 verification." This mitigation measure has been revised to include the requested text, as shown in Chapter 3, *Revisions to the Draft EIR*.

Response to Comment A-San Bruno-5

The comment describes Mitigation Measure AQ-8 on page 4.2-52 in Section 4.2, *Air Quality*, of the draft EIR, and notes that the mitigation would not fully mitigate significant impacts related to Phase 1 generator operations. This is consistent with the analysis on page 4.2-50 of the draft EIR. The draft EIR identifies additional mitigation, Mitigation Measure AQ-7, which requires the payment of mitigation fees to fund offsets for operational emissions exceeding BAAQMD's daily pollutant thresholds, to mitigate this impact to the extent feasible. As described on page 4.2-50, it is reasonable to assume that such offset programs will be available to mitigate these impacts, but operational impacts for Phase 1 are conservatively assumed to be significant and unavoidable because it cannot be concluded that offset programs will always be available at the time and in the amounts needed to mitigate annual emissions. No revisions to the draft EIR are required.

The comment expresses concerns regarding the noise impacts that could result from implementation of Mitigation Measure AQ-8. See Response to Comment A-San Bruno-11 for a response to this portion of the comment.

Response to Comment A-San Bruno-6

The comment notes that prior to mitigation, construction of Phase 1 would result in a significant impact related to cancer risk and annual PM2.5 concentrations for the maximally exposed individual receptor, per Table 4.2-14 on page 4.2-59 of the draft EIR. The comment further notes that implementation of Mitigation Measures AQ-1 and AQ-2 would mitigate these impacts to a less-than-significant level, also per Table 4.2-14, which shows a reduction of approximately 95 percent. The comment questions the accuracy of this reduction, referencing that (1) Mitigation Measure AQ-1 only requires 95 percent of construction equipment to be Tier 4, and (2) Tier 4 equipment has emissions that are between 90 and 93 percent lower than the default emissions used in CalEEMod. Accordingly, the comment notes that cancer risks and annual PM2.5 concentrations could be reduced by as little as 85.5 percent (i.e., 95 multiplied by 90). The comment requests clarification on how the difference between unmitigated and mitigated results was calculated.

Table 2-1. Comparison of BAAQMD's Additional Recommended Construction Mitigation Measures and the Draft EIR's Construction Mitigation Measures for Air Quality

#	BAAQMD Additional Recommended Measure (CEQA Guidelines Table 8-3)	Draft EIR Equivalent Measure – Phase 1	Draft EIR Equivalent Measure – Project
1	All exposed surfaces shall be watered at a frequency adequate to maintain minimum soil moisture of 12 percent. Moisture content can be verified by lab samples or moisture probe.	This measure would reduce fugitive dust emissions. Phase 1's significant fugitive dust impacts would be mitigated to a less-than-significant level with implementation of Mitigation Measure AQ-1, which requires implementation of fugitive dust BMPs in BAAQMD's basic construction mitigation measures. Therefore, additional fugitive dust mitigation is not required.	This measure would reduce fugitive dust emissions. The project's significant fugitive dust impacts would be mitigated to a less-than-significant level with implementation of Mitigation Measure AQ-1, which requires implementation of fugitive dust BMPs in BAAQMD's basic construction mitigation measures. Therefore, additional fugitive dust mitigation is not required.
2	All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.	Same response as #1.	Same response as #1.
3	Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.	Same response as #1.	Same response as #1.
4	Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.	Same response as #1.	Same response as #1.
5	The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.	Same response as #1.	Same response as #1.
6	All trucks and equipment, including their tires, shall be washed off prior to leaving the site.	Same response as #1.	Same response as #1.

#	BAAQMD Additional Recommended Measure (CEQA Guidelines Table 8-3)	Draft EIR Equivalent Measure – Phase 1	Draft EIR Equivalent Measure – Project
7	Site accesses to a distance of 100 feet from the paved road shall be treated with a 6 to 12 inch compacted layer of wood chips, mulch, or gravel.	Same response as #1.	Same response as #1.
8	Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent.	Same response as #1.	Same response as #1.
9	Minimizing the idling time of diesel powered construction equipment to two minutes.	This measure would reduce criteria pollutant emissions from construction equipment. Phase 1 would result in a significant impact related to NO_X emissions during construction (see Table 4.2-6 on page 4.2-40 of the draft EIR). Other criteria pollutant emissions would not exceed BAAQMD daily emissions thresholds. Phase 1's significant NO_X impact would be mitigated to a less-than-significant level with implementation of Mitigation Measure AQ-2, which requires Tier 4 Final engines in construction equipment (see Table 4.2-7 on page 4.2-41 of the draft EIR). Therefore, additional mitigation for criteria pollutants during Phase 1 construction is not required. Furthermore, Mitigation Measure AQ-2 would result in much greater emissions reductions (e.g., Tier 4 Final engines decrease NO_x emissions by more than 90 percent) than the BAAQMD measure, which would eliminate emissions from only a small duration of total equipment activity. Therefore, the draft EIR measure is more stringent than the BAAQMD measure.	This measure would reduce criteria pollutant emissions from construction equipment. Construction of future development projects under the Specific Plan could generate criteria pollutant emissions that exceed BAAQMD's daily emissions thresholds for ROG, NO_X, and PM. Implementation of Mitigation Measure AQ-2, which requires the uses of Tier 4 Final engines in construction equipment, and Mitigation Measure AQ-4, which requires the use of renewable diesel in construction equipment, would result in much greater emissions reductions (e.g., Tier 4 Final engines decrease NO_x emissions by more than 90 percent) than the BAAQMD measure, which would eliminate emissions from only a small duration of total equipment activity. Therefore, the draft EIR measures are more stringent than the BAAQMD measure.
10	The project shall develop a plan demonstrating that the off-road equipment (more than 50 horsepower) to be used in the construction project (i.e., owned, leased, and subcontractor vehicles) would achieve a project wide fleet-	Same response as #9.	Same response as #9.

#	BAAQMD Additional Recommended Measure (CEQA Guidelines Table 8-3)	Draft EIR Equivalent Measure – Phase 1	Draft EIR Equivalent Measure – Project
	average 20 percent NO_X reduction and 45 percent PM reduction compared to the most recent CARB fleet average. Acceptable options for reducing emissions include the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available.		
11	Use low VOC (i.e., ROG) coatings beyond the local requirements (i.e., Regulation 8, Rule 3: Architectural Coatings).	This measure would reduce VOC emissions during construction. Phase 1 would result in a less-than-significant impact related to VOC emissions during construction (see Table 4.2-6 on page 4.2-40 of the draft EIR). Therefore, additional VOC mitigation is not required.	This measure would reduce VOC emissions during construction. This measure is incorporated in the draft EIR as Mitigation Measure AQ-5, which would be required for future phases under the Specific Plan (not including Phase 1).
12	Requiring that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NO_X and PM.	Same response as #9.	Same response as #9. In addition to the measures noted in #9, implementation of Mitigation Measure AQ-3, which requires the use of diesel trucks with 2010-compliant model year engines, would further reduce exhaust emissions from diesel trucks. Therefore, the draft EIR measures are more stringent than the BAAQMD measure.
13	Requiring all contractors use equipment that meets CARB's most recent certification standard for off-road heavy duty diesel engines.	Same response as #9.	Same response as #9.

Source: Bay Area Air Quality Management District. 2017. California Environmental Quality Act Air Quality Guidelines. May. Available: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en. Accessed: December 1, 2021.

The comment correctly identifies an editorial error in Table 4.2-14 of the draft EIR. While the modeling outputs in Appendix 4.2-1, *Air Quality, Greenhouse Gas, and Energy Modeling Results*, of the draft EIR are correct (see pages 398-399), the values were incorrectly transcribed to the corresponding draft EIR table. The text of Table 4.2-14 of the draft EIR has been corrected in Chapter 3, *Revisions to the Draft EIR*. As shown, the unmitigated cancer risk at the maximally exposed individual receptor has been revised from 89.6 to 139.1. The mitigated cancer risk has been revised from 4.5 to 9.7 and remains below the threshold of 10.0. Therefore, no new significant impact would occur, and recirculation of the draft EIR pursuant to CEQA Guidelines Section 15088.5 is not required.

The corrected mitigated cancer risk is a 93 percent reduction from the unmitigated cancer risk, rather than a 95 percent reduction. Two example calculations and provided below that demonstrate how Mitigation Measure AQ-2, which requires at least 95 percent of off-road equipment to operate with Tier 4 engines, can result in a 93 percent reduction in the unmitigated and mitigated construction equipment PM2.5 emissions.

Example 1: a 120-horsepower crawler tractor in construction year 2022 with a 93 percent reduction in the PM2.5 mitigated emission factor compared to the default CalEEMod unmitigated emission factor.

- PM2.5 emission factor without mitigation = 0.375 (g/bhp-hr)[2]
- Mitigated PM2.5 emission factor with Tier 4 Final engine = 0.008 (g/bhp-hr)[3]
- Mitigated PM2.5 emission factor with 95 percent penetration of Tier 4 Final engines = 0.375 * 5% + 0.008 * 95% = 0.02635 (g/bhp-hr)
- Percent reduction in PM2.5 emission factor between mitigated and unmitigated = (0.02635-0.375)/0.375 = -93%

Example 2: a 50-horsepower crane in construction year 2021 with a 94 percent reduction in the PM2.5 mitigated emission factor compared to the default CalEEMod unmitigated emission factor.

- PM2.5 emission factor without mitigation = 0.581 (g/bhp-hr)[4]
- Mitigated PM2.5 emission factor with Tier 4 Final engine = 0.008 (g/bhp-hr)[5]
- Mitigated PM2.5 emission factor with 95 percent penetration of Tier 4 Final engines = 0.581 * 5% + 0.008 * 95% = 0.03666 (g/bhp-hr)
- Percent reduction in PM2.5 emission factor between mitigated and unmitigated = (0.03666-0.581)/0.581 = -94%

[2] South Coast Air Quality Management District. 2021. *CalEEMod Appendix D – Default Data Tables*. Available: http://www.aqmd.gov/docs/default-source/caleemod/user-guide-2021/appendix-d2020-4-0-full-merge.pdf?sfvrsn=12. Accessed: December 1, 2021.

[3] Ibid.

[4] Ibid.

[5] Ibid.

Response to Comment A-San Bruno-7

The comment requests that the text in Mitigation Measure CR-2b in Section 4.4, *Cultural Resources*, of the draft EIR be revised to clarify that the City of San Bruno must be notified and consulted in the event that potential archaeological resources are discovered during construction within San Bruno's jurisdiction. This mitigation measure has been revised to include the requested text, as shown in Chapter 3, *Revisions to the Draft EIR*.

Response to Comment A-San Bruno-8

The comment reiterates statements made in the City of San Bruno's response to the NOP, specifically that temporary and permanent increases in noise during construction and operation could affect the nearby sensitive receptors, and that construction-related vibration could have an impact of adjacent buildings.

Page 4.11-1 in Section 4.11, *Noise and Vibration*, of the draft EIR states that NOP comments pertaining to noise included concerns related to construction and operational noise. A reference to the vibration-related NOP comment has been added to the EIR, as shown in Chapter 3, *Revisions to the Draft EIR*. The topics identified in the comment (i.e., construction and operational noise, construction vibration) were evaluated in Section 4.11, *Noise and Vibration*, of the draft EIR.

Response to Comment A-San Bruno-9

The comment states that the predicted noise levels shown in Table 4.11-16 on page 4.11-38 and Table 4.11-18 on page 4.11-57 in Section 4.11, *Noise and Vibration*, of the draft EIR are incorrectly calculated. The comment is accurate, in that some calculated changes in noise levels are misstated by 0.1 dB as a result of rounding errors. These numbers have been corrected in Chapter 3, *Revisions to the Draft EIR*, and footnotes noting that values have been rounded have been added to the tables. These revisions do not affect any of the significance conclusions in the draft EIR.

Response to Comment A-San Bruno-10

The comment states that the one-hour average peak-hour noise level of 58.2 dBA L_{eq} derived from modeled traffic noise levels should not be used to determine a nighttime noise threshold for heating, ventilation, and air conditioning (HVAC) equipment because it may be too high. As stated on page 4.11-9 in Section 4.11, *Noise and Vibration*, of the draft EIR, because of state and local COVID-19 shelter-in-place orders that were in effect when the draft EIR was prepared, modeling of existing noise levels was based on traffic data from 2019 rather than noise measurements taken in the field. Traffic noise is usually the dominant source of overall ambient noise in urban areas. Fieldwork conducted during the shelter-in-place orders would not accurately capture typical traffic noise levels given that many schools and businesses were closed and many people were working remotely, thereby decreasing traffic volumes. The analysis of HVAC noise impacts on pages 4.11-39 through 4.11-42 of the draft EIR finds that HVAC noise impacts would be significant based on the potential for project HVAC equipment to increase nearby ambient noise levels by 10 dB or more. This conclusion would not change if lower ambient noise levels are used. Further, Mitigation Measure NOI-1c is a performance-based mitigation measure that requires noise measurements to be taken once equipment models, design features, and specific locations are identified to demonstrate that HVAC equipment would not result in a 10 dB increase over actual ambient levels at nearby

sensitive uses (in addition to ensuring other applicable thresholds are met). Thus, using a lower ambient noise measurements for purposes of the EIR analysis would not affect the impact conclusion or required mitigation. As shown in Chapter 3, *Revisions to the Draft EIR*, a sentence has been added to Mitigation Measure NOI-1c to clarify that ambient noise levels must be identified by conducting field noise measurements.

The comment also states that the draft EIR's analysis of HVAC noise is inadequate because it fails to estimate and compare nighttime noise levels with implementation of Mitigation Measure NOI-1c to an appropriate threshold. As stated above, Mitigation Measure NOI-1c is a performance-based mitigation measure that provides a menu of options to reduce noise, with the requirement that compliance with applicable thresholds be demonstrated prior to the issuance of building permits. Because it is not possible to know which methods of noise reduction would be implemented at this time, it is not possible to quantify post-mitigation noise levels. However, building permits would not be issued until compliance with applicable thresholds is demonstrated in a Noise Reduction Plan pursuant to Mitigation Measure NOI-1c. No further revisions to the draft EIR are required.

Response to Comment A-San Bruno-11

The comment states that the analysis of generator noise on pages 4.11-42 through 4.11-45 in Section 4.11, *Noise and Vibration*, of the draft EIR implies that generators would be tested simultaneously. Although the noise analysis does not rule out this possibility, the modeling results demonstrate that the testing of a single generator would result in noise levels in excess of applicable thresholds, as stated on page 4.11-44. This is the basis of the draft EIR's determination that noise impacts related to generator testing would be significant, requiring implementation of Mitigation Measure NOI-1d.

Similar to Comment A-San Bruno-10, the comment states that the draft EIR's analysis of generator noise is inadequate because it fails to estimate and compare noise levels with implementation of Mitigation Measure NOI-1d to an appropriate threshold. In addition, the comment states that ambient noise level cited in the analysis is not appropriate for the approximation of daytime ambient noise levels in the project area. See Response to Comment A-San Bruno-10. Similar to Mitigation Measure NOI-1c, Mitigation Measure NOI-1d is a performance-based mitigation measure that requires noise measurements to be taken once equipment models, design features, and specific locations are identified to demonstrate that generators would not result in a 10 dB increase over actual ambient levels at nearby sensitive uses (in addition to ensuring other applicable thresholds are met). Thus, using a lower ambient noise measurement for purposes of the EIR analysis would not affect the impact conclusion or required mitigation. As shown in Chapter 3, *Revisions to the Draft EIR*, a sentence has been added to Mitigation Measure NOI-1d to clarify that ambient noise levels must be identified by conducting field noise measurements.

In addition, the comment refers to Mitigation Measure AQ-8, which requires that no more than one Phase 1 emergency generator be tested in any 24-hour period. The comment expresses concern that implementation of Mitigation Measure AQ-8 would result in elevated noise levels for more days than would occur if the generators were all tested on the same day. As stated in the EIR, the threshold of significance for the analysis of generator noise impacts is whether noise from generator testing would exceed applicable thresholds at any given time. If an exceedance would occur, a significant impact is identified and mitigation is prescribed (as is the case in the draft EIR). The threshold does not account for the cumulative duration of the exceedance or the number of times the exceedance would occur. While some receptors could experience increased disturbance if generator testing

occurs on multiple days, this would not affect the impact determination under CEQA. Mitigation Measure NOI-1d would reduce the impact from emergency generators to a less-than-significant level, regardless of the number of days per month on which testing may occur.

Response to Comment A-San Bruno-12

The comment summarizes the transportation-related comments that the City of San Bruno provided in response to the project's NOP. Impacts related to intersections, traffic volumes, VMT, and site geometry are addressed in Section 4.15, *Transportation and Circulation*, of the draft EIR. In addition, although not required for CEQA analysis, a level of service (LOS) analysis was included for informational purposes in Appendix 4.15-1 of the draft EIR.

Response to Comment A-San Bruno-13

The comment suggests that a bulbout be incorporated into the southwest corner of the South Maple Avenue/Huntington Avenue/Sneath Lane/Southline Avenue intersection to discourage cars in the southbound right turn pocket on the Maple Avenue approach from accidentally or intentionally going through the intersection from the right turn lane. The proposed right turn only lane allows for only right turn movements and is not aligned with the through movement; moreover, the right turn only lane would be appropriately signed and striped consistent with the City's applicable design standards for roadway configuration. Consequently, this proposed lane configuration is not expected to pose any conflicts at the intersection. The comment does not raise any issues about the adequacy of the draft EIR. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-14

The comment states that no driveways should be located within 150 feet of a proposed intersection. As described in Impact TR-3A beginning on page 4.15-37 in Section 4.15, *Transportation and Circulation*, of the draft EIR, there are two existing driveways and one proposed driveway within 150 feet of the new intersection that are necessary to maintain access to the SamTrans Transit Center and San Bruno BART station. The project's proposed new intersection at Huntington Avenue/Sneath Lane/Southline Avenue/Maple Avenue would change access to several adjacent driveways associated with the SamTrans Transit Center and BART operations and maintenance facility:

- Access to the BART maintenance facility driveway on the north side of Huntington Avenue would remain in the westbound direction but would be restricted in the eastbound direction. BART vehicles would retain a right-in, right-out access.
- Eastbound access to the SamTrans Transit Center for buses would not change; buses would continue to use the driveway for ingress only. A majority of buses accessing the transit center are expected to continue using this driveway.
- Northbound bus ingress from Huntington Avenue to the SamTrans Transit Center would be relocated to a signalized bus-only left turn to the south of the proposed intersection from the existing unsignalized left turn. About five buses per hour are expected to use this signalized driveway.

The project would not otherwise close or limit access to the SamTrans Transit Center or BART operations and maintenance facility; doing so would adversely impact existing transit operations. As

each driveway would be used by professional drivers only from these transit agencies with relatively low volumes, use of these driveways would not pose a design hazard and would be consistent with applicable design standards. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-15

The comment states that the new proposed intersection must connect to existing signalized intersections to the west and south of the new intersection so that these three signals can communicate and have coordinated signal timing for safety and efficiency reasons. As documented in Specific Plan Chapter 3 *Circulation and Mobility,* the new traffic signals along Southline Avenue (Huntington Avenue, project entrance, South Linden Avenue) and the rail crossing would be connected to existing nearby signals; signalization of the intersections described in the comment are included in the project.

Response to Comment A-San Bruno-16

The comment suggests updates to the regulatory framework discussion in Section 4.15, *Transportation and Circulation*, of the draft EIR to include additional Caltrans policy and guidance documents including the Caltrans Vehicle Miles Traveled-Focused Transportation Impact Study Guide and Traffic Safety Bulletin 20-02-R1. The draft EIR includes an assessment of VMT impacts consistent with the *Technical Advisory on Evaluating Transportation Impacts in CEQA* that provides guidance on evaluating VMT impacts, as developed by the Governor's Office of Planning and Research (OPR). The draft EIR also includes assessment of safety impacts. The approach to VMT and safety impact assessment is summarized below.

As the lead agency, the City of South San Francisco has authority to determine its thresholds of significance and analysis methodology under CEQA and neither of the Caltrans documents are binding on the City. As noted on page 3 of the Caltrans Vehicle Miles Traveled-Focused Transportation Impact Study Guide referenced in the comment, the document is "not binding on public agencies and is intended to be a reference and informational document"; regarding the Caltrans Traffic Safety Bulletin 20-02-R1: Interim Local Development Intergovernmental Review Safety Review Practitioners Guidance document referenced in the comment, that document states on page 2 that "local agencies may use this guidance at their own discretion." With regard to Caltrans facilities, the draft EIR addresses topics raised in Caltrans' response to the project's NOP. Caltrans did not provide comments on the draft EIR.

An analysis of the project's effects on VMT consistent with Public Resources Code Section 21099, City of South San Francisco Resolution 77-2020 and CEQA Guidelines Section 15064.3, and the Caltrans Vehicle Miles Traveled-Focused Transportation Impact Study Guide is provided in Impact TR-2 beginning on page 4.15-35 of the draft EIR. These documents establish a presumption of less than significant for VMT impacts related to qualifying land use projects within a transit priority area (TPA), defined as an area within 0.5 mile of an existing or planned major transit stop, such as a rail transit station, a ferry terminal served by transit, or the intersection of two or more major bus routes. The Specific Plan area is within 0.5 mile of two major transit stops, including the San Bruno BART station and a frequent bus route (i.e., the SamTrans ECR route, which operates every 15 minutes), as stated in the draft EIR.

An analysis of the project's effects on safety is included in Impacts TR-3A (site design hazards), TR-3B (freeway off-ramp hazards), TR-3C (rail crossing hazards), TR-3D (traffic signal warrants), and TR-5B (bicycle and pedestrian facilities) beginning on page 4.15-37 of the draft EIR. Topics identified on pages 6 and 7 of the Caltrans Traffic Safety Bulletin 20-02-R1 are covered in these impact analyses, including the project's effects on degrading the walking and bicycling environment and experience, new pedestrian and bicyclist desire lines, multimodal conflict points, change in traffic composition, driveway or intersection spacing, and queueing on roadways and freeway ramps.

No revisions to the draft EIR are required.

Response to Comment A-San Bruno-17

The comment asks for clarification regarding why the person trips for public amenity visitors during peak hours are different under Phase 1 and the project, while daily persons trips are the same, as described in Tables 4.15-2 and 4.15-4 in Section 4.15, *Transportation and Circulation*, of the draft EIR. Tables 4.15-2 and 4.15-4 present trip generation data for external project trips. These differences were presented due to a rounding error in Table 4.15-4 and have been revised in Chapter 3, *Revisions to the Draft EIR*.

Response to Comment A-San Bruno-18

The comment states that, regarding vehicle trip generation rates for Phase 1 and project buildout as stated in draft EIR Tables 4.15-3 and 4.15-5, it appears that vehicle trip generation estimates were calculated using average trip rates rather than the fitted curve equation, and states a preference for average trip rates. Tables 4.15-3 and 4.15-5 in Section 4.15, *Transportation and Circulation*, of the draft EIR note that the fitted curve equation was used for the calculation of existing trip generation only, while average rates were used for proposed project land uses. Use of the fitted curve for existing land uses is consistent with ITE 10th Edition guidance. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-19

The comment states that the freeway ramp discussion included in the draft EIR under Impact TR-3a analyzes off-ramp queuing analysis but should be updated to include other on-ramps in the surrounding area that are metered or may become metered during buildout of the project, as well as that a ramp capacity analysis should be performed. Impact TR-3B beginning on page 4.15-40 in Section 4.15, *Transportation and Circulation*, of the draft EIR analyzes whether the project would increase hazards due to freeway ramp queuing, and addresses freeway off-ramps where project-generated traffic volumes may cause a queue to spill back onto the mainline per Caltrans guidance and comments raised by Caltrans in response to the project's NOP. Queueing on freeway on-ramps does not typically cause a safety hazard and is not documented in Caltrans Traffic Safety Bulletin 20-02-R1. Analysis of on-ramp capacity and queues are primarily a measure of automobile delay; per CEQA Guidelines Section 15064.3, a project's effect on automobile delay shall not constitute a significant environmental impact as described in Response to Comment A-San Bruno-16. For these reasons, the City has not adopted thresholds of significance for onramp queues. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-20

The comment states that analysis conducted for the San Bruno Avenue/Northbound 101 off-ramp intersection needs to provide an explanation as to why the intersection would operate at LOS C while experiencing long queues at the off-ramp. As shown in Chapter 3, *Revisions to the Draft EIR*, the analysis of 95th percentile queues has been updated in Table 4.15-7 of the draft EIR to reflect fully optimized signal timing for the 2040 Future Baseline and 2040 Project Buildout Scenarios. By optimizing signal timing, the 95th percentile queue for the northbound left turn lane would be approximately 201 feet during the AM peak hour under 2040 Future Baseline conditions and 305 feet under 2040 Project Buildout conditions, which is consistent with an off-ramp that experiences low to moderate delay (LOS C).

Response to Comment A-San Bruno-21

The comment asks for clarification as to why the project would cause a large increase in queue length at the northbound left turn lane of the San Bruno Avenue/I-280 northbound off-ramp intersection in comparison with existing conditions where the queue is only 93 feet, when traffic on the northbound left turn lane would travel away from the project. As discussed in Response to Comment A-San Bruno-20 and shown in Chapter 3, *Revisions to the Draft EIR*, the analysis of 95th percentile queues has been updated in Table 4.15-7 of the draft EIR to reflect fully optimized signal timing for the 2040 Future Baseline and 2040 Project Buildout Scenarios. By optimizing signal timing, the 95th percentile queue for the northbound left turn lane would be approximately 225 feet during the PM peak hour under 2040 Future Baseline conditions and 426 feet under 2040 Project Buildout conditions. The 95th percentile queue for the northbound through/left/right turn would be approximately 1,372 under 2040 Future Baseline conditions and 1,391 under 2040 Project Buildout conditions.

As discussed in Response to Comment A-San Bruno-19, Impact TR-3B in Section 4.15, *Transportation and Circulation*, of the draft EIR analyzes whether the project would increase hazards due to freeway ramp queuing. The analysis shows vehicle queues increasing at this northbound off-ramp during the PM peak hour under Phase 1 and Project Buildout conditions due to the optimization of signal timing associated with a net increase in eastbound and westbound volumes serving project-generated trips and diverted trips. However, the project is not anticipated to increase traffic volumes at the off-ramp itself, as it represents the reverse-peak direction of travel at an off-ramp location that is less convenient to the project compared to the other freeway ramps for U.S. 101, I-280 and I-380 that serve the project. Since project-related traffic volumes would not add to vehicle queues for the northbound off-ramp, the impact would be less than significant and no mitigation is required.

Response to Comment A-San Bruno-22

The comment requests that a freeway segment LOS analysis be conducted pursuant to the C/CAG CMP Technical Guidelines. Per CEQA Guidelines Section 15064.3, a project's effect on automobile delay shall not constitute a significant environmental impact as described in Response to Comment A-San Bruno-16. The C/CAG CMP Technical Guidelines have not been updated since adoption of SB 743 which amended CEQA Guidelines Section 15064.3 to establish an alternative to automobile delay. Therefore, notwithstanding prior guidance provided in the C/CAG CMP Technical Guidelines,

a freeway segment LOS analysis is not required. For these reasons, the City has not adopted thresholds of significance for onramp queues. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-23

The comment pertains to the LOS analysis conducted for the project, which was included for informational purposes in Appendix 4.15-1 of the draft EIR. Per CEQA Guidelines Section 15064.3, a project's effect on automobile delay shall not constitute a significant environmental impact. The City no longer utilizes LOS significance thresholds in connection with CEQA analysis; on June 10, 2020, the City of South San Francisco adopted Resolution 77-2020 establishing VMT thresholds and methodology effective July 1, 2020 consistent with CEQA Guidelines Section 15064.3, as discussed further in Section 4.15, *Transportation and Circulation*, of the draft EIR. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-24

See Response to Comment A-San Bruno-23.

Response to Comment A-San Bruno-25

The comment states that the project's effects on BART and Caltrain capacity should be analyzed under 2040 cumulative conditions, and not based on 2019 passenger counts. Impact TR-5A beginning on page 4.15-47 in Section 4.15, *Transportation and Circulation*, of the draft EIR analyzes the project's effects on the performance of transit services including potential delay and overcrowding. The analysis of overcrowding focuses on 2019 conditions as it represents an observed and quantifiable baseline condition, and illustrates the project's potential contribution to this baseline. The analysis shows that although the project would result in a large increase in BART ridership at San Bruno Station, the increase in ridership would generally occur in the reverse-peak direction in which BART has ample capacity. Some increase in Caltrain ridership would also occur, but would be distributed across two stations served by trains traveling in both directions.

The project's contribution to transit ridership would be similar under 2040 cumulative conditions compared to 2019 conditions, while the percent contribution relative to overall transit ridership and capacity would be lower. Plan Bay Area includes projects to expand the frequency of BART and Caltrain service in the coming decades. BART service would expand to every 12 minutes on each line, increasing service levels at San Bruno Station from eight to ten trains per hour, per direction during peak periods, representing a 25 percent increase in capacity. Caltrain service would expand from six trains per hour per direction after the Peninsula Corridor Electrification Project to eight trains per hour, per direction, representing a 33 percent increase in capacity. As transit ridership and service levels increase over time, the project's percent contribution to potential overcrowding would decrease. Therefore, the analysis of 2019 conditions provides a reasonable estimation of the project's potential effects, and the lack of project contribution to overcrowding under 2019 conditions is also indicative of potential 2040 conditions. BART did not request an analysis of transit capacity under 2040 cumulative conditions in their comments on the NOP or draft EIR. Caltrain did not comment on the NOP or draft EIR. No revisions to the draft EIR are required.

See also Response to Comment A-BART-2.

Response to Comment A-San Bruno-26

The comment requests a figure showing the proposed location of the emergency vehicle access route during construction of the new Southline Avenue and intersection for review by the San Bruno Police Department and Fire Department. Figures 4.15-1 and 4.15-6 in Section 4.15, *Transportation and Circulation*, of the draft EIR depict the proposed site plan in relation to surrounding areas, illustrating the circulation network that will serve the project, including the new Southline Avenue street connection between Sneath Lane and South Linden Avenue and street changes near the San Bruno police station at 1177 Huntington Avenue. The proposed site plan would not decrease existing emergency vehicle routes: emergency vehicles would retain the ability to travel both with and against the flow of traffic on Sneath Lane and Huntington Avenue. The addition of Southline Avenue and implementation of the new Huntington Avenue/Sneath Lane/Southline Avenue intersection will enable emergency vehicle travel directly between Sneath Lane/Huntington Avenue and areas to the east of Huntington Avenue, including residential and employment areas in the City of San Bruno and City of South San Francisco. Emergency vehicles would retain the ability to access Tanforan Avenue and would have a shorter path of travel from the west via Southline Avenue. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-27

The comment states that the Decima Allen Elementary School project should be included in the cumulative transportation analysis. As stated on page 4.1-9 in Section 4.1, *Approach to Environmental Analysis*, of the draft EIR, the projects utilized for the draft EIR's list-based cumulative analyses are projects for which applications had been filed with the City as of publication of the project's NOP (May 22, 2020) but construction had not begun by that date, and/or projects that the City has otherwise determined are reasonably foreseeable. The Decima Allen Elementary School was proposed after issuance of the project's NOP and was not reasonably foreseeable at the time the cumulative project list was developed. As the lead agency the City retains the discretion to determine a reasonable cutoff date for identifying which projects to include in an EIR's cumulative analysis.

As discussed in Section 4.15.4.2 beginning on page 4.15-24 of the draft EIR, cumulative analysis included land use growth covered in Plan Bay Area 2040 plus any growth beyond Plan Bay Area 2040, including the Bayhill Specific Plan and additional employment growth in the East of 101 Area in South San Francisco. Given the Decima Allen Elementary School project would result in relatively minor land use changes that are consistent with Plan Bay Area 2040, it is reasonably captured within the Plan Bay Area 2040 land use forecasts. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-28

The comment questions of the South Linden Avenue grade crossing and associated closure of Scott Street is included in the cumulative transportation analysis. As described in Section 4.15.4.2 beginning on page 4.15-24 of the draft EIR, the grade separation of South Linden Avenue and associated closure of Scott Street was not included in the cumulative analysis as construction of this project is not yet fully funded or included in the Regional Transportation Plan. The proposed grade separation project would be subject to a separate CEQA review and approval process. As discussed in Impact TR-3A and Impact TR-3C in the draft EIR, the project's design is compatible with the

preferred hybrid grade separation design at South Linden Avenue and street closure at Scott Street. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-29

The comment states that regardless of the jurisdiction (i.e., the City of San Bruno or the City of South San Francisco) all costs associated with replacing or upsizing utilities will be assumed by the project applicant. The applicant will be responsible for paying all required utility construction costs. Section 4.17, *Utilities and Service Systems*, of the draft EIR provides information on the existing utilities found at the project site. In addition, the section details which utilities the project would be required to be upsized, replaced, or relocated. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-30

The comment states that City of San Bruno has no comments on the project-level analysis of utilities and service systems impacts provided in the draft EIR. Comment noted. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-31

The comment requests that any below-ground construction work in the vicinity of utilities that service the City of San Bruno, including fiber optic cables, will require the project applicant to pothole and accurately locate and identify all fiber optic cables to ensure that construction does not damage these cables or interrupt service. The project applicant and the City will work with the City of San Bruno to ensure that no utilities are damaged or interrupted. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-32

The comment states that the draft EIR's cumulative impact analysis appropriately includes the Bayhill Specific Plan but should also account for the Mills Park Center project. The Mills Park Center project, as of summer 2020 (i.e., when the NOP was released), is a proposed mixed-use residential and commercial project located approximately 0.75 mile south of the Specific Plan area in the City of San Bruno; no more recent publicly available information is available regarding this project. As described in Section 4.1.6, *Approach to Cumulative Impact Analysis*, the cumulative impact analysis for the EIR generally employs either a list-based approach or a projections approach, depending on which approach appropriately captures the cumulative context for the individual resource topic being analyzed. Cumulative analyses for topics that tend to be highly localized (e.g., biological resources, cultural resources, geology and soils, and construction impacts) use a list-based approach that includes nearby future projects anticipated in the project vicinity (i.e., within approximately 0.5 mile of the project site). Other impacts can affect existing conditions on a citywide or regional scale (e.g., air quality, GHG emissions, public services, population growth). These topics employ a projections approach towards evaluating cumulative impacts.

Table 2-2 provided below for informational purposes summarizes the relevancy of the Mills Park Center project to the cumulative impact analysis for each environmental topic evaluated in detail in the draft EIR. With respect to projections-based impact analyses (i.e., the air quality, greenhouse gas emissions, population and housing, and transportation and circulation sections), the Mills Park Center project is already included within such analysis. Specifically, as discussed on page 4.2-61 in Section 4.2, *Air Quality*, of the draft EIR, the cumulative geographic context for air quality impacts in the San Francisco Bay Area Air Basin (SFBAAB); the Mills Park Center project is located in the SFBAAB and is therefore included in the draft EIR analysis of cumulative air quality impacts. In addition, as discussed on page 4.7-44 in Section 4.7, *Greenhouse Gas Emissions*, of the draft EIR, climate change is a global problem, and the GHG analysis is inherently cumulative, and therefore, the draft EIR's cumulative GHG analysis accounts for the Mills Park Center project. In Section 4.12, *Population and Housing,* as discussed on page 4.12-20, of the draft EIR, the cumulative geographic context for impacts related to population and housing is the San Francisco-Oakland-Hayward core-based statistical area, which comprises Alameda, Contra Costa, Marin, San Francisco, and San Mateo counties, including the Mills Park Center project. Further, in Section 4.15.4.2 beginning on page 4.15-24 in Section 4.15, *Transportation and Circulation*, of the draft EIR, the cumulative transportation analysis includes land use growth covered in Plan Bay Area 2040, which includes the Mills Park Center project.

With respect to the environmental topics provided in Table 2-2 below that utilized the list-based impact analyses, the Mills Park Center project is not sufficiently close to the project site to warrant inclusion in the cumulative impacts analysis for this project. As detailed in Table 2-2, no revisions to the draft EIR are required.

Table 2-2. Relevancy of Mills Park Center Project to Draft EIR Cumulative Analysis by Topic

CEQA Topic	Summary
Biological Resources	As discussed on page 4.3-26 in Section 4.3, *Biological Resources*, of the draft EIR, the cumulative geographic context for biological resources is the immediate vicinity of the project site, which is the area where construction activities, including tree removal, could potentially affect biological resources including nesting special-status bird and bat species, nesting migratory birds, and protected trees that may be present on or near the site. Given the distance between the Mills Park Center project and the proposed project, and the separation provided by I-380, the projects would not have the potential to combine and create cumulative impacts on biological resources.
Cultural Resources	As discussed on pages 4.4-28 and 4.4-29 in Section 4.4, *Cultural Resources*, of the draft EIR, the cumulative geographic context for historical resources is the potential South San Francisco industrial historic district area. The cumulative geographic context for archaeological resources and human remains is the immediate vicinity of the project site, which is the area where construction activities, including ground-disturbing activities, could encounter archaeological resources and human remains that may be present on or near the site. The Mills Park Center project is located in the City of San Bruno, outside the potential historic district area. Given the distance between the Mills Park Center project and the proposed project, the projects would not have the potential to combine and create cumulative impacts on cultural resources.
Energy	The Mills Park Center project is located in San Bruno and is served by different natural gas and electricity providers than the project. Therefore, there would be no cumulative impact on energy.

CEQA Topic	Summary
Geology and Soils	In general, a project's potential impacts related to geology and soils are individual and localized, depending on the project site and underlying soils. Given the distance between the Mills Park Center project and the proposed project, the projects would not have the potential to combine and create cumulative impacts on localized geology and soils resources.
Hazards and Hazardous Materials	As discussed on page 4.8-39 in Section 4.8, *Hazards and Hazardous Materials*, of the draft EIR, the cumulative context for hazards and hazardous materials is the project site and nearby properties in the immediate vicinity. Given the distance between the Mills Park Center project and the proposed project, the projects would not have the potential to combine and create cumulative impacts on hazards and hazardous materials resources.
Hydrology and Water Quality	As discussed on page 4.9-42 in Section 4.9, *Hydrology and Water Quality*, of the draft EIR, the cumulative geographic context for impacts related to surface water hydrology and water quality is the Colma Creek-Frontal San Francisco Bay Estuaries Watershed (approximately 32 square miles). The cumulative geographic context for impacts related to groundwater hydrology and water quality is the Westside Groundwater Basin (approximately 40 square miles). The Mills Park Center project is located in the Colma Creek-Frontal San Francisco Bay Estuaries Watershed and Westside Groundwater Basin, and is therefore included in the draft EIR analysis of cumulative hydrology and water quality impacts.
Land Use and Planning	The Mills Park Center project is located in San Bruno and is subject to the local plans and policies of San Bruno. With regard to regional land use plans, the draft EIR analysis determines that the project would have a less-than-significant impact. Therefore, there would be no cumulative impact on land use and planning.
Noise and Vibration	As discussed on page 4.11-54 in Section 4.11, *Noise*, of the draft EIR, the cumulative geographic context for construction noise and vibration and operational stationary noise is the immediate vicinity of the project site. The cumulative geographic context for vehicular traffic noise includes the roadway segments near the project site, which includes traffic increases from all growth in the project area, as predicted in the traffic model. Given the distance between the Mills Park Center project and the proposed project, the projects would not have the potential to combine and create cumulative impacts with respect to construction noise and vibration and operational stationary noise. As discussed below, the cumulative transportation analysis includes land use growth covered in Plan Bay Area 2040, which includes the Mills Park Center project. Therefore, the Mills Park Center project is included in the draft EIR analysis of cumulative traffic noise impacts.
Public Services	The Mills Park Center project is located in San Bruno and is served by different fire, police, school, library, and childcare providers than the project. Therefore, there would be no cumulative impact on public services.
Recreation	The Mills Park Center project is located in San Bruno and is served by different parks and recreational facilities than the project. Therefore, there would be no cumulative impact on recreation.
Tribal Cultural Resources	Given the distance between the Mills Park Center project and the proposed project, and the separation provided by I-380, the projects would not have the potential to combine and create cumulative impacts on localized tribal cultural resources.

CEQA Topic	Summary
Utilities and Service Systems	The Mills Park Center project is located in San Bruno and is served by different water, wastewater, solid waste, stormwater, natural gas, and electricity providers than the project. Therefore, there would be no cumulative impact on utilities and service systems.

Response to Comment A-San Bruno-33

The comment states that City of San Bruno has no comments on the alternatives analysis provided in the draft EIR. Comment noted. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment A-San Bruno-34

The comment provides the City of San Bruno's contact information, and requests that responses to the comments they provided are shared with the City of San Bruno at least 10 days prior to the certification of the EIR. Comment noted. Responses to all comments on the draft EIR will be circulated at least 10 days prior to certification of the EIR, and the City of San Bruno will be notified when the final EIR document is available.

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A-SFO

San Francisco International Airport

November 10, 2021

Adena Friedman
Principal Planner
City of South San Francisco
Economic and Community Development Department
315 Maple Street
South San Francisco, California 94080

TRANSMITTED VIA E-MAIL and U.S. MAIL
adena.friedman@ssf.net

Subject: ***EIR Comments: Southline Specific Plan***

Dear Adena Friedman:

The San Francisco International Airport (SFO or the Airport) staff has reviewed the Draft Environmental Impact Report (DEIR) for the Southline Specific Plan (the Project), located primarily in the jurisdiction of South San Francisco. We appreciate this opportunity to provide comments on the Project DEIR.

1 The 26.5-acre Project site is located approximately two miles north-northwest of the Airport terminals, at the intersection of South Maple Avenue and Tanforan Avenue. The Project includes demolition of all existing on-site uses and construction of commercial office/research and development buildings; a four-story supportive amenities building; up to approximately 3,064 underground parking spaces; a 9-story parking structure; a new east-west connection road; supportive utilities and infrastructure; and approximately 341,800 square feet of open space. Total building area would be up to 2.8 million square feet. The structures would be approximately 75 - 120 feet tall, above a ground elevation ranging from 24 to 26 feet above the North American Vertical Datum of 1988 (NAD88). Rooftop protrusions, including mechanical screens, would be at a maximum elevation of 142 feet above NAVD88 at specific locations on Building B7, as identified in the Project sponsor's communications to the Airport.

2 The Project site is inside Airport Influence Area B as defined by the Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport (ALUCP). As shown in the DEIR (Chapter 4.10, Land Use and Planning), the entire Project site is within the 65 decibel (dB) Community Noise Equivalent Level (CNEL) contour, while the southwestern half of the site is also within the 70 dB CNEL contour. The noise contours are meant to minimize the exposure of residents and occupants of future noise-sensitive development to excessive noise. According to the ALUCP, commercial land uses, including office, business, and professional, and general retail uses, in addition to industrial and production uses, are considered compatible uses within the 65 – 75 dB CNEL areas. However, the DEIR notes that an auditorium would be part of Building 2. This use is conditionally compatible provided that sound insulation is provided to reduce interior noise levels from exterior course to CNEL 45 dB or lower and that an avigation easement is granted to the City and County of San Francisco as operator of SFO.

3 The southwest corner of the Project is within Safety Compatibility Zone 4 (Outer Approach/Departure Zone). The ALUCP defines safety compatibility zones to protect public health and safety by minimizing the public's exposure to the risk associated with potential aircraft accidents. In this zone, Biosafety Level 3 and 4 facilities, children's schools, large child day care centers, hospitals, nursing homes, stadiums, and arenas are considered incompatible and should not be permitted. Additionally, hazardous uses (other than

AIRPORT COMMISSION CITY AND COUNTY OF SAN FRANCISCO
LONDON N. BREED *MAYOR* | LARRY MAZZOLA *PRESIDENT* | ELEANOR JOHNS *VICE PRESIDENT* | EVERETT A. HEWLETT, JR. | JANE NATOLI | MALCOLM YEUNG | IVAR C. SATERO *AIRPORT DIRECTOR*

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3 Con't

Biosafety Level 3 and 4 facilities) and critical public utilities should be avoided unless no feasible alternative is available. The project includes a basketball court and auditorium in Building 2, located in the southwest portion of the Project. However, these spaces are outside of Zone 4, and therefore the proposed site plan is compatible with the ALUCP.

Regarding height, the structures as proposed would be at least 0.08 feet (less than one inch) below the lowest critical airspace surface and therefore compatible with the ALUCP. Please note that the height of the completed structure is measured to its highest point, which includes all parapets, elevator overruns, and other mechanical uses, none of which can extend beyond this roughly 142-foot clearance. This leaves no margin for error for surveying and construction, as the maximum elevations must not be exceeded. This determination does not negate the requirement for the Project proponent to undergo Federal Aviation Administration review as described in 14 Code of Federal Regulations Part 77 for both the permanent structures and any cranes or other equipment taller than the permanent buildings which would be required to construct those structures.

4

We note that in Chapter 4.10 of the DEIR, it states that:

> …there is a contour to establish a limit of 125 feet above ground level running northeast-southwest located south of the Specific Plan area and a contour to establish a limit of 150 feet north of the Specific Plan area. As also shown in Figure 4.10-2, p. 4.10-11, the Specific Plan area falls within the 100 to 150 feet above ground level range for SFO's critical aeronautical surfaces.

Because projects may change the ground level over time, using the existing ground level as a reference is inadequate to ensure the protection of critical airspace surfaces around SFO. Rather than 100 to 150 feet above ground level, the DEIR should state that the critical airspace above the Project site ranges from 139 to 152 feet above *mean sea level as measured from the NAVD88 vertical datum origin*. While the aeronautical surfaces are described incorrectly, the elevations of the structures as proposed in the DEIR are compatible with the ALUCP.

* * *

5

The Airport appreciates your consideration of these comments. If I can be of assistance, please do not hesitate to contact me at (650) 821-9464 or at nupur.sinha@flysfo.com.

Sincerely,

DocuSigned by:
Nupur Sinha
7D552AE6A4CE495...

Nupur Sinha
Director of Planning and Environmental Affairs
San Francisco International Airport

cc: Susy Kalkin, ALUC
Audrey Park, SFO, Acting Environmental Affairs Manager

Letter A-SFO: Nupur Sinha, San Francisco International Airport (November 11, 2021)

Response to Comment A-SFO-1

The comment states that the San Francisco International Airport (SFO) has reviewed the draft EIR, and provides a summarized description of the proposed project. Comment noted. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment A-SFO-2

The comment states that the project site is inside Airport Influence Area B as defined by the Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport (ALUCP), that the entire project site is within the 65 CNEL contour for SFO, and that the southwestern half of the site is within the 70 CNEL contour. The SFO noise contours in relation to the project site are shown in Figure 4.10-3 in Section 4.10, *Land Use and Planning*, of the draft EIR. The comment also states that most of the allowable land uses under the Specific Plan (e.g., commercial, office, business, retail, etc.) are considered compatible with noise levels in the 65 to 75 dBA CNEL range, with the exception of auditoriums, which are considered conditionally compatible provided that interior noise levels can be reduced to below 45 dBA. As discussed in Chapter 3, *Project Description*, of the draft EIR, Phase 1 proposes a 13,800-square-foot auditorium/event space with associated ancillary space. An acoustically well-insulated masonry building with windows and doors closed can provide 30 to 35 dB of noise attenuation, while more-conventional light frame construction provides 20 to 25 dB of noise reduction with windows closed.[6] Achieving sufficient interior noise levels in an auditorium (e.g., reducing noise to below 45 dBA) would therefore be attainable for this use, and would be required as a condition of approval if an auditorium/event space is carried forth in the Phase 1 Precise Plan application.

Response to Comment A-SFO-3

The comment states that a portion of the project site is found within Safety Compatibility Zone 4 under the ALUCP, which includes more restrictive land uses, but that the proposed site plan is compatible with the ALUCP. This is consistent with the analysis on page 4.10-33 in Section 4.10, *Land Use and Planning*, of the draft EIR. The comment does not raise any questions or concerns about the adequacy of the draft EIR. No revisions to the draft EIR are required.

Response to Comment A-SFO-4

The comment confirms that building heights under the Specific Plan would be consistent with the height limitations established by the ALUCP. This is consistent with the analysis on page 4.10-33 in Section 4.10, *Land Use and Planning*, of the draft EIR. Also, as stated on page 4.10-31 of the draft EIR, under federal law, the project applicant is required to comply with all notifications and other requirements described in 14 CFR Part 77. The comment also cites a statement on page 4.10-9 of the

[6] Federal Highway Administration (FHWA). *Highway Traffic Noise: Analysis and Abatement Guidance*, Washington, DC, December 2011. Available: fhwa.dot.gov/ENVIRONMENT/noise/measurement/fhwahep18065.pdf

draft EIR in reference to Figure 4.10-2 on page 4.10-11 of the draft EIR. Figure 4.10-2 depicts Exhibit IV-17 from the ALUCP, which shows the project site as being located within the 100-150 range for "Height of Critical Aeronautical Surfaces, Feet Above Ground Level (AGL)." The statement on page 4.10-9 of the draft EIR is consistent with this language. In making its determination of consistency with the ALUCP, the Airport Land Use Commission will maintain discretion to apply its standard measurement methodology.

Response to Comment A-SFO-5

The comment provides the San Francisco International Airport's Director of Planning and Environmental Affairs contact information. Comment noted. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

From: Samuel Lee
To: Planning Commission Comments
Subject: Southline Specific Plan Project Electronic Comment
Date: Monday, October 25, 2021 7:36:48 AM
Importance: High

I-Lee

[**NOTICE:** This message originated outside of City of South San Francisco -- **DO NOT CLICK** on **links** or open **attachments** unless you are sure the content is safe.]

To whom this may concern:

1 I fully support this project to move forward and looking forward to this new development and its positive impact on our community.

Thank you

Samuel Lee, P.E.
President
Grand Electric & Construction Co.
133 Tanforan Ave. San Bruno, CA 94066
Tel : (650) 588-5678, Fax : (650) 588-6678
Cell : (415) 830-2020

Letter I-Lee: Samuel Lee (October 25, 2021)

Response to Comment I-Lee-1

The comment expresses support for the project. Comment noted. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

City of So. San Francisco
400 Grand Ave.
So. San Francisco, Ca 94080

October 29, 2021

I-Richardson

Project Title: Southline Specific Plan (EIR)

RE: Impact to Resident(s) of So San Francisco, Calif.
Comment Period

ATTN: ADENA Friedman, Sr. Planner
SSF Planning Division - adena.friedman@ssf.net

Dear Ms. Friedman:

1 As a member of this community for over 40 years, this writing is to record my opposition to a plan that would alter the City of South San Francisco General Plan in order to tear down old warehouse businesses to put yet more bio-science labs, .1 mile from transit and West of Hwy 101.

2 The justification for such a project is not made in this plan or any part of this report as described, appears unjustified and unnecessary but as "just because the City can". It will be more building where a community is experiencing building fatigue. I live in proximity to the San Bruno BART transit .3 miles in one of the oldest neighborhoods in South San Francisco, Mayfair Village. This project would impact my neighborhood and neighboring districts of Francisco Terrace, Brentwood and 2 local schools: Los Cerritos Elementary School and South San Francisco High School campuses. They are in proximity within 2 miles from the proposed project.

3 It is not clear whether my opposition counts as reason not to proceed with amending the City General Plan but I have several. Some are financial and some are quality of living concerns and questions.

4 Placing bio-labs on the west side of Hwy 101 in proximity to neighborhoods encompassing 2 cities of San Bruno, and South San Francisco, expose residents to hazards as the bio-medical industry transfer of bio-hazardous waste through neighborhoods periodically pose a risk to the health, in air quality and safety to residents, unless the bio-labs are for bio-medical equipment. This is not mentioned in this report. Will my property insurance increase as a result? What will residents suffer in the event of an accident involving the transport of bio-lab waste materials? Residents are left with the questions and the clean-up.

5 Another concern is the cost of toxic clean-up in the area of the warehouses in this report. The environmental impacts are significant and unavoidable. The report lists 3 hazardous sites under The Cortese List. 160 South Linden Avenue, 30 Tanforan Ave and 50 Tanforan Ave. The clean-up and cost to the City (and Taxpayer) is unescapable pursuant to CEQUA. As in past recent projects such as the Oyster Point Marina (former Dump), the City was forced to consider its liability risk to the community and has taken a $10M insurance policy. The Southline Specific Plan is a burdensome expense to the community's taxpayer, by developing a site that poses financial and health risk unnecessarily.

6 This type of project has a tendency to render the cost of living to spiral out of control and represents unbridled growth. As current housing units near or at completion do not appear to deliver the desired result and solutions to the community's shortage for affordable housing as a majority of the units are

6 Con't not occupied and appear to fail to remediate acute housing needs, due to unaffordability, while commuters swell the community daily to 100K, taxing local police and fire services.

The Cadence, a 160-unit development cannot fill its expensive lease units, reaching its 3rd year. This is not responsible planning, as housing needs continues.

7 The Southline Specific Plan project and others East of 101 at Oyster Point Marina are against the wishes of many in the community because it adds to the infrastructure load and high cost of living for City residents. The Oyster Point development under construction removed once enjoyable vistas of the marina. Every year for the past 5 years sewer fees ,trash, sales tax increases has caused the South San Francisco Community to become unaffordable. Adding the cost of new bio-since labs is not a good idea, fit, and irresponsible in the name of growth. The only reason to continue appears to keep City staff busy.

8 When the So. San Francisco General Plan was approved, the community agreed it was to be implemented in 20 years, yet the speed it is being implemented, by building thousands of units in less than 10 years, has caused construction fatigue. The Southline Specific Plan hopes to amend the General Plan for more unnecessary intrusive building in the lives of a small town that wants to remain a small town. We are losing that small town feel, that jams this small community with more traffic, noise, poor air quality further contributing to aircraft noise from nearby San Francisco Airport and from noisy 24 hr. 7 day science lab operation that permeates the skies further diminishing the quality of living of a community that continues to is disappear with every development the City embarks upon. It is a harbinger of things to come that the quiet life of suburban living won't be achieved living in South San Francisco. This is not a good sign for the City.

Best,

Mina Richardson,
Resident
127 Cherry Ave
So. San Francisco, Ca 94080

Letter I-Richardson: Mina Richardson (October 29, 2021)

Response to Comment I-Richardson-1

The comment expresses opposition to the proposed project, and states that the project would alter the General Plan. As discussed on p. 4.10-35 in Section 4.10, *Land Use and Planning*, of the draft EIR, the project, including Phase 1, was found to be consistent with the relevant land use and planning related policies in the City's existing General Plan. In addition, as explained in the analysis throughout the draft EIR, the project is generally consistent with the General Plan's goals for the Specific Plan area and includes provisions to update the General Plan and Zoning Ordinance consistent with state law to ensure consistency. See Table 4.10-1 beginning on page 4.10-44 of the draft EIR for a detailed evaluation of the project's consistency with relevant General Plan goals and policies. See also Response to Comment PC-7. No revisions to the draft EIR are required.

Response to Comment I-Richardson-2

The comment states that draft EIR does not justify why the project is necessary, and that it would impact nearby neighborhoods and schools. Potential impacts to nearby neighborhoods as a result of project implementation are discussed throughout the draft EIR document. Specifically, impacts to public services, which includes schools, are discussed in Section 4.13, *Public Services*, of the draft EIR. The section concluded that the proposed project would result in less than significant impacts on schools. In addition, the purpose of the draft EIR and the CEQA process is not to provide justification for the project, but to objectively discuss and disclose, to the greatest extent possible, potential environmental impacts that may result from construction and implementation of the proposed project. No revisions to the draft EIR are required.

Response to Comment I-Richardson-3

The comment expresses opposition to the project, including financial and quality of living concerns. CEQA does not consider financial or the quality of life as an environmental impact. The comment does not contain questions or concerns regarding the adequacy of the draft EIR analysis. No revisions to the draft EIR are required.

Response to Comment I-Richardson-4

The comment expresses concern about the hazards and hazardous materials impacts that may result from project implementation. Section 4.8, *Hazards and Hazardous Materials*, of the draft EIR provides information on the existing hazards and hazardous materials found at the project site, as well as details regarding the possible hazards related to the handling of hazardous materials, including biomedical materials and waste, that may occur during operation of the project's R&D uses. Specifically, Impact HAZ-1 of the draft EIR (pages 4.8-28 through 4.8-30) details how construction and operation of both the proposed project and Phase 1 would not create a significant hazard to the public through the routine transport, use, or disposal of hazardous materials. In addition, the section details how the project, with implementation of mitigation measures HAZ-2a, HAZ-2b, and HAZ-2c, would mitigate any potential impacts related to hazardous materials. See also Response to Comment PC-1. Health risk impacts that would result from project-generated pollutants are discussed in Section 4.2, *Air Quality*, of the draft EIR. The comment also questions whether

property insurance rates would increase as a result of the project; this topic is beyond the scope of CEQA, which is intended to analyze potential environmental impacts. No revisions to the draft EIR are required.

Response to Comment I-Richardson-5

The comment request information on how land and ground waste at the project site would be cleaned up and the financial implications to do so. See Response to Comment I-Richardson-4 and Response to Comment PC-1.

Response to Comment I-Richardson-6

The comment expresses concern regarding how the project would affect housing needs in the City of South San Francisco, and the cost of living impacts it would have. Under the General Plan, housing and residential uses are not permitted at the project site. As detailed in section 4.12, *Population and Housing*, of the draft EIR, the proposed project would not directly generate new population or households. Population and housing growth indirectly generated by project employees would be within the Association of Bay Area Government's forecasted growth for the City. See also Response to Comment PC-8. Further, to the extent the comment asserts that the project could contribute to housing costs, these comments are beyond the scope of CEQA, which is intended to analyze potential environmental impacts. No revisions to the draft EIR are required.

Response to Comment I-Richardson-7

The comment expresses concern regarding how the project would affect the housing needs in the City of South San Francisco, and the cost of living impacts it would have. Section 4.13, *Public Services*, and Section 4.17, *Utilities and Service Systems*, of the draft EIR provide detailed information and analysis of the proposed project's impacts related to additional demand placed on public service providers and utility infrastructure providers, respectively. See Response to Comment I-Richardson-6 and Response to Comment PC-8.

Response to Comment I-Richardson-8

The comment states that the proposed project is not consistent with the growth envisioned under the General Plan (by building thousands of units in less than 10 years rather than over 20 years), would result in additional traffic, noise, and air quality impacts, and would not contribute to the City's "small town feel." As a clarification, the existing General Plan was adopted over 20 years ago, in 1999, and is currently undergoing a comprehensive update to cover the next 20-year period. See Response to Comment PC-7 and Response to Comment I-Richardson-6. In addition, impacts related to traffic, noise, and air quality are discussed in section 4.2, *Air Quality*, section 4.11, *Noise and Vibration*, and section 4.15, *Transportation and Circulation*, of the draft EIR, respectively. As explained in response to comment I-Richardson-2, the purpose of the draft EIR and the CEQA process is not to provide justification for the project, but to objectively discuss and disclose, to the greatest extent possible, potential environmental impacts that may result from construction and implementation of the proposed project. No revisions to the draft EIR are required.

Chapter 3
Revisions to the Draft EIR

This section lists revisions that have been made to the draft EIR following the 45-day public comment period. Revisions were made either in response to comments received on the draft EIR or as staff-initiated changes to correct typographical errors. Staff-initiated text changes are indicated by an asterisk (*).

These changes and minor errata do not result in significant new information with respect to the proposed project, including the level of significance of project impacts or any new significant impacts. Therefore, recirculation of the draft EIR pursuant to CEQA Guidelines Section 15088.5 is not required.

3.1 Global Draft EIR Revisions

This section includes staff-initiated global revisions that were not raised in comments on the draft EIR but are relevant to the final EIR.

3.1.1 Final Water Supply Assessment

As discussed on page 4.17-9 in Section 4.17, *Utilities and Service Systems*, of the draft EIR, the proposed project meets the definition of a "project" requiring a Water Supply Assessment (WSA) pursuant to SB 610 (California Water Code Section 10910(a) and 10912(a)(3)). California Water Code Section 10910(g)(1) provides that the governing body of the public water system shall submit a WSA to the requesting city or county not later than 90 days from the date on which the request was received. Pursuant to California Water Code Section 10910(c)(1), the City requested a WSA for the proposed project from California Water Service (Cal Water) in April 2020. Cal Water provided a draft WSA to the City and project applicant in September 2020 and a revised draft WSA in December 2020. In March 2021, Cal Water informed the City and project applicant that Cal Water would be revising the WSA again to include updated language regarding the reliability of wholesale water supplies and provided another draft WSA to the City and project applicant in July 2021. The draft EIR analysis was based on the July 2021 draft WSA, which was included in **Appendix 4.17-1** of the draft EIR. Based on information provided by Cal Water, the final WSA conclusions were anticipated to remain consistent as stated in the July 2021 WSA.

Cal Water provided a final WSA to the City and project applicant in December 2021, after the public comment period for the draft EIR was completed. The following summarizes the main changes made to the WSA:

- The draft WSA stated that the findings of the WSA were contingent upon the project's successful completion of the requirements that were anticipated to be included in Cal Water's pending Water Neutral Development Policy. The final WSA specifies that the findings of the WSA are contingent upon either the successful development of supplemental water supplies and/or the implementation of conservation/demand management measures to offset any net new demands from qualifying projects in specified Cal Water districts under the Water Neutral Development Policy.

- The draft WSA stated that Cal Water had adopted its Water Neutral Development Policy, which Cal Water anticipated to have completed by the time it issued a final WSA. The final WSA clarifies that the Water Neutral Development Policy is under development but has not yet been adopted by Cal Water.
- The draft WSA stated that the implementation of the Bay-Delta Plan Amendment was under negotiation, through Voluntary Settlement Agreement negotiations between the San Francisco Public Utilities Commission (SFPUC) and the State Water Resources Control Board (SWRCB). However, as explained in the final WSA, as of October 2021, these negotiations have ceased, and no agreement has been reached. The final WSA removes references to the Voluntary Settlement Agreement negotiations.

Minor revisions have been made to the analysis in Section 4.17, *Utilities and Service Systems*, of the draft EIR to ensure the draft EIR discussion is consistent with the final WSA. The revisions are shown below in Section 3.2, *Specific Draft EIR Revisions*. The revisions to the final WSA or to Section 4.17 do not result in any changes to conclusions or mitigation in the draft EIR. The draft WSA in **Appendix 4.17-1** has been replaced by the final WSA, which is attached to this RTC document as **Appendix B**.

3.1.2 Reduced Underground Parking Alternative

As discussed in Chapter 5, *Alternatives*, of the draft EIR, the City considered nine alternatives during the scoping process for the draft EIR. Six were rejected from further consideration based on their infeasibility, inability to meet the basic project objectives, and/or inability to reduce or avoid the significant impacts of the project. Three were selected for evaluation in the draft EIR alternatives analysis: the No Project Alternative (Alternative A), as required by CEQA, the No Intersection Alternative (Alternative B), and the Reduced Project Alternative (Alternative C). The draft EIR identified Alternative C as the environmentally superior alternative.

After the draft EIR was released for public review, the City identified a new alternative: the Reduced Underground Parking Alternative, based in part on comments raised during the public comment period. The City reviewed the new alternative and determined that it would be feasible to implement, would meet the basic objectives of the project, and would have the potential to reduce or avoid some of the significant impacts of the project. Accordingly, an analysis of the Reduced Underground Parking Alternative (Alternative D) has been added to the final EIR. The revisions are shown below in Section 3.2, *Specific Draft EIR Revisions*. The revisions include a description of the Reduced Underground Parking Alternative, an analysis of the potential impacts that would result from the Reduced Underground Parking Alternative, and a comparison of the alternative's impacts to those of the project.

CEQA Guidelines Section 15088.5 requires recirculation of an EIR when "significant new information" is added after publication of the draft EIR but before certification. CEQA Guidelines Section 15088.5(a) states that new information added to an EIR is not "significant" unless "the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project proponents have declined to implement." CEQA Guidelines Section 15088.5(a) further defines "significant new information," in part, as a disclosure that notes that "a new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented" or a disclosure that notes

that "a substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted to reduce the impact to a level of insignificance." CEQA Guidelines section 15088.5(b) states that recirculation is not required if "new information in the EIR merely clarifies or amplifies or makes insignificant modifications in an adequate EIR."

As shown below in Section 3.2, *Specific Draft EIR Revisions* (see revisions to Chapter 5, *Alternatives*), the Reduced Underground Parking Alternative would not result in new significant environmental impacts or impacts of increased in severity that were not already disclosed in the draft EIR. In fact, the Reduced Underground Parking Alternative would avoid Phase 1's significant air quality impacts (Impact AQ-2b and C-AQ-2), and would reduce (but not avoid) all of the project's remaining significant and unavoidable impacts to below the proposed project's level of impact, with the exception ofthe significant impact related to meeting traffic signal warrants at the Huntington Avenue/Herman Street/Forest Lane intersection, which would be similar to the project's level of impact. Accordingly, the Reduced Underground Parking Alternative has been identified as the environmentally superior alternative and as the Recommended Alternative proposed for adoption. Furthermore, the project applicant has not declined to implement the Reduced Underground Parking Alternative. Therefore, recirculation of the EIR pursuant to CEQA Guidelines Section 15088.5 is not required.

3.2 Specific Draft EIR Revisions

Table of Contents

* The following correction has been made to page vi in the Table of Contents of the draft EIR (new text is <u>underlined</u> and deleted text is ~~strikethrough~~).

Appendix 4.17-1 ~~Draft~~ <u>Final</u> Water Supply Assessment

Chapter 2, Executive Summary

The following text has been added to Mitigation Measure AQ-2 in Table 2-1, *Summary of Project Impacts and Mitigation Measures*, on page 2-6 of the draft EIR (new text is <u>underlined</u>).

Mitigation Measure AQ-2: Require at Least Tier 4 Final Engines on Construction Equipment (All Phases)

All applicants proposing development of projects within the project site, including the Phase 1 applicant, shall require their contractors, as a condition of contract, to reduce construction-related exhaust emissions by ensuring that all off-road equipment operates with at least EPA-approved Tier 4 Final or newer engines. Exemptions can be made for specialized equipment when Tier 4 engines are not commercially available within 200 miles of the project site. The construction contract must identify these pieces of equipment, document their unavailability, and ensure that they operate on no less than an EPA-approved Tier 3 engine. At least 95 percent of off-road equipment must operate with at least an EPA-approved Tier 4 Final or newer engine. <u>All contractors shall be required to submit a list of equipment and associated Engine Identification Numbers to the California Air Resources Board for Tier 4 verification.</u>

The following text has been added to Mitigation Measure CR-1 in Table 2-1, *Summary of Project Impacts and Mitigation Measures*, on page 2-25 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Mitigation Measure CR-1: Interpretive Signage Program (Phase 1 Only)

The Phase 1 applicant shall prepare an interpretive signage plan document setting forth the process for design and installation of interpretive signage within the Specific plan area. The interpretive signage plan shall be developed in coordination with professionals who meet the Secretary of the Interior's Professional Qualification Standards in History or Architectural History.

The interpretive signage plan shall include details regarding the proposed locations for the signage and the design of the visual components of the interpretive historic district signage program. The interpretive signage plan does not need to include cost analysis or specifications for the fabrication or installation of the signage program.

The interpretive signage plan shall be reviewed and approved by the City of South San Francisco prior to issuance of a ~~demolition~~ building permit for the proposed project. No further discretionary review or approvals are anticipated to be required by the City to implement the interpretive historic district signage program. Implementation of the interpretive signage program shall include the following elements:

The following text has been added to Mitigation Measure CR-2b in Table 2-1, *Summary of Project Impacts and Mitigation Measures*, on page 2-27 of the draft EIR (new text is underlined).

Mitigation Measure CR-2b: Halt Construction Activity, Evaluate Find, and Implement Mitigation for Archaeological and Tribal Cultural Resources (All Phases)

Should a potential archaeological or tribal cultural resource be encountered during project construction activities, the construction contractor shall halt construction within 25 feet of the find and immediately notify the City of South San Francisco Economic and Community Development Director if the resource was discovered in South San Francisco's jurisdiction, or the San Bruno City Planning Manager and Public Works Director if the resource was discovered in San Bruno's jurisdiction. A qualified archaeologist, in consultation with the City in which the resource was discovered, shall 1) evaluate the potential resource to determine if it meets the CEQA definition of a unique archaeological resource pursuant to Public Resources Code Section 21083.2 or a tribal cultural resource pursuant to Public Resources Code Section 21074 and 2) make recommendations about the treatment of the resource, as warranted. If the qualified archaeologist determines the find is not a unique archaeological resource, then proper recordation and identification shall be completed and construction shall continue without delay.

The following text has been added to Mitigation Measure NOI-1c, Mechanical Equipment Noise Reduction Plan (All Phases), on page 2-46 of the draft EIR (new text is underlined).

Mitigation Measure NOI-1c: Mechanical Equipment Noise Reduction Plan (All Phases)

To reduce potential noise impacts resulting from project heating, cooling, and ventilation equipment, the Phase 1 applicant and applicants of future Precise Plans shall conduct a noise analysis to estimate noise levels of project-specific mechanical equipment based on the

selected equipment models and design features, and create a Noise Reduction Plan to ensure noise levels of equipment, once installed, are below the applicable criteria described below. The Noise Reduction Plan shall include any necessary noise reduction measures required to reduce project-specific mechanical equipment noise to a less-than-significant level. The plan shall also demonstrate that with the inclusion of selected measures, noise from equipment would be below the significance thresholds. Feasible noise reduction measures to reduce noise below the significance threshold include, but are not limited to, selecting quieter equipment, utilizing silencers and acoustical equipment at vent openings, siting equipment farther from the roofline, and/or enclosing all equipment in a mechanical equipment room designed to reduce noise. This analysis shall be conducted and the results and final Noise Reduction Plan shall be provided to the City prior to the issuance of building permits for each phase.

The noise analysis and Noise Reduction Plan shall be prepared by persons qualified in acoustical analysis and/or engineering. The Noise Reduction Plan shall demonstrate with reasonable certainty that noise from mechanical equipment selected for the project, including the attenuation features incorporated into the project design, will not exceed the City of South San Francisco property plane threshold of 60 dBA during daytime hours or 55 dBA during nighttime hours for nearby multi-family residential uses, 65 dBA during daytime hours or 60 dBA during nighttime hours for nearby commercial uses, or the City of San Bruno threshold of 10 dB above the ambient noise level, <u>as identified through field noise measurements,</u> at the property plane.

The Phase 1 applicant and applicants of future Precise Plans shall incorporate all feasible methods to reduce noise identified above and any other feasible recommendations from the acoustical analysis and Noise Reduction Plan into the building design and operations as necessary to ensure that noise sources meet applicable requirements of the respective noise ordinances at receiving properties.

The following text has been added to Mitigation Measure NOI-1d, Emergency Generator Noise Reduction Plan (All Phases), on page 2-47 of the draft EIR (new text is <u>underlined</u>).

Mitigation Measure NOI-1d: Emergency Generator Noise Reduction Plan (All Phases)

Prior to approval of a building permit for any proposed development under the Specific Plan, including Phase 1, the Phase 1 applicant and applicants of future Precise Plans shall conduct a noise analysis to estimate noise levels from the testing of project-specific emergency generators, and create a Noise Reduction Plan to ensure noise levels of generator testing are below the applicable criteria This analysis and Noise Reduction Plan may be incorporated together with the analysis described in MM-NOI-1c. This analysis shall be conducted and the Noise Reduction Plan shall be created based on the analysis results. The results, methods, and final Noise Reduction Plan shall be provided to the City prior to the issuance of building permits for each phase. The analysis shall account for proposed noise attenuation features, such as specific acoustical enclosures and mufflers or silences, and the final Noise Reduction Plan shall demonstrate with reasonable certainty that proposed generator(s) will not exceed the City of South San Francisco property plane threshold of 60 dBA for residential uses and 65 dBA for commercial uses during daytime hours, or 55 dBA for residential uses and 60 dBA for commercial uses during nighttime hours, and the City of San Bruno threshold of 10 dB above the ambient noise level, <u>as identified through field noise measurements</u>. Acoustical treatments may include, but are not limited to:

- Enclosing generator(s);
- Installing relatively quiet model generator(s);
- Orienting or shielding generator(s) to protect noise-sensitive receptors to the greatest extent feasible;
- Installing exhaust mufflers or silencers;
- Increasing the distance between generator(s) and noise-sensitive receptors; and/or
- Placing barriers around generator(s) to facilitate the attenuation of noise.

In addition, all project generator(s) shall be tested only between the hours of 7:00 a.m. and 8:00 p.m.

The Phase 1 applicant and applicants of future Precise Plans shall incorporate all recommendations from the acoustical analysis into the building design and operations to ensure that noise sources meet applicable requirements of the noise ordinance.

Chapter 3, Project Description

* The following correction has been made to Table 3 5, *Summary of Off-Site Infrastructure Improvements*, on page 3-23 of the draft EIR (deleted text is ~~strikethrough~~).

Improvement	Agencies with Jurisdiction[a]	Project Phase	Where Described in EIR
~~Upsize sewer mains on Tanforan Avenue and Shaw Road~~	~~City of South San Francisco~~	~~Phase 1~~	~~Section 3.6.2.11, Figure 4.17-2~~

* The following correction has been made to the second sentence in the first paragraph under Section 3.6.2.8, *Vehicle Parking*, on page 3-31 of the draft EIR (new text is underlined).

Pursuant to the development standards shown in **Table 3-7, p.3-26**, parking would be provided at a maximum ratio of 2.2 spaces per 1,000 square feet of commercial use, with an option to incorporate a valet parking strategy within this range.

* The following correction has been made to the first sentence in the second paragraph under Section 3.6.2.8, *Vehicle Parking*, on page 3-31 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

As shown in **Table 3-9, p.3-32**, an estimated 4,291 ~~3,420~~ to 5,769 parking spaces would be provided depending on the total amount of development and parking ratios applied.

* The following correction has been made to the last full paragraph on page 3-35 of the draft EIR (deleted text is ~~strikethrough~~).

As shown in **Figure 4.17-2** in Section 4.17, *Utilities and Service Systems,* several public sewer mains that directly serve the Specific Plan area would be upsized during Phase 1 to account for the additional sanitary sewer flow generation. ~~The proposed project would upsize an existing 24-inch main on Tanforan Avenue from South Maple Avenue/Huntington Avenue east to an existing pump station on Shaw Road (FLS-11). The upsized main would range in size from 27 to~~

~~33 inches.~~ During Phase 1, the proposed project ~~also~~ would relocate a segment of an existing 8-inch sanitary sewer line along South Linden and Dollar Avenues to conform with the proposed realignment of the intersection and proposed reconfiguration of the existing at-grade rail crossing at South Linden Avenue (refer to Section 3.6.2.7). The proposed project would also install a new 8-inch sewer main to proposed development south to Tanforan Avenue. Sanitary sewer improvements anticipated for future phases include upgrading 18-inch mains to 24-inch mains in the northerly portion of South Maple Avenue and from South Maple Avenue to Lowrie Avenue.

* The following correction has been made to the last bullet on page 3-38 of the draft EIR (deleted text is ~~strikethrough~~).

- Water, sewer, and storm infrastructure replacements in ~~Tanforan Avenue, Shaw Road,~~ South Linden Avenue, Dollar Avenue, and Huntington Avenue

Chapter 4, Environmental Setting, Impacts and Mitigation

Section 4.2, Air Quality

The following correction has been made to the second paragraph under Section 4.2.1, *Introduction*, on page 4.2-1 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Issues identified in response to the Notice of Preparation (NOP) (Appendix 1) were considered in preparing this analysis. ~~No questions or concerns related to air quality were raised in the responses to the NOP.~~ The NOP comments pertaining to air quality include comments from the City of San Bruno and the Bay Area Air Quality Management District (BAAQMD). The City of San Bruno identified their air quality policies and recommended use of the BAAQMD air quality significance thresholds. The City of San Bruno also requested an analysis of construction and operation impacts associated with fugitive dust, criteria air pollutants, and toxic air contaminants. The City of San Bruno also requested an analysis of health impacts on nearby sensitive receptors, including single-family residences along Tanforan Avenue and Huntington Avenue, from exposure to toxic air contaminants and particulate matter. The BAAQMD comments recommended analysis of local and regional air quality, analysis of consistency with the 2017 Clean Air Plan, analysis of health risks, incorporation of design features and mitigation measures that reduce air quality impacts, consultation with BAAQMD for permitting for back-up diesel generators, and use of BAAQMD's tools and resources that help analyze air quality impacts. These issues are addressed below in Section 4.2.4, *Impacts and Mitigation Measures*.

* The following text has been deleted from the second paragraph on page 4.2-30 under *Air Dispersion Modeling* in Section 4.2.4.2, *Approach to Analysis* (deleted text is ~~strikethrough~~).

Operational emissions from testing of the new diesel emergency backup generators were characterized as a separate vertical point source (POINT). The location of the generators was estimated, based on the project site plan, and the urban dispersion option was assumed. ~~The modeling of emissions from generator activities utilized a 12-hour testing window per day (7:00 a.m. to 7:00 p.m.) because testing was assumed to occur during daytime hours.~~ Variables, including release height (from 2.85 to 3.73 meters) and stack diameter (from 0.178 to 0.353 meter), were based on the horsepower of the generators (from 500 to 1,250 horsepower), taken from comprehensive modeling information provided by CARB for a range of different generators they tested.

* The following revisions have been made to Table 4.2-5, *Phase 1 Emergency Generator Technical Specifications and Testing Schedules*, on page 4.2-31 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Table 4.2-5. Phase 1 Emergency Generator Technical Specifications and Testing Schedules

Generator	Building[1]	HP Bin[2]	Max Hours per Testing Day (Normal Testing Scenario)[3]	Max Hours per Testing Day (Full Load Testing Scenario)[4]	Average Hours per Year[5]	Max Hours per Year[~~5~~6]
1	1	1,700	0.5	4	7.33	50
2	1	1,700	0.5	4	7.33	50
3	2	700	0.5	4	7.33	50
4	7	1,700	0.5	4	7.33	50
5	7	1,700	0.5	4	7.33	50
Total			**2.5**	**20**	**36.65**	**250**

HP = horsepower; max = maximum

[1] Generators listed include only those known for the buildings constructed as part of Phase 1. Additional generators may be installed as part of development constructed under future Specific Plans, but their locations and specifications are unknown at this time.

[2] The project applicant provided the kilowattage (kW) of each generator. The kW was converted into HP and then conservatively rounded up into the appropriate HP bin used by CalEEMod for calculating generator emissions.

[3] During the normal testing scenario, each generator would be tested for 30 minutes on the same day. The normal testing scenario would occur once a month.

[4] During the full load testing scenario, each generator would be tested for 4 hours on the same day. The full load testing scenario would occur once every 36 months (3 years).

[5] Average hours per year calculated based on normal testing scenario hours per year (30 minutes every month equals 6 hours per year) plus full load testing hours per year (4 hours every 3 years equals 1.33 hours per year).

[~~5~~6] CARB's Airborne Toxic Control Measure for Stationary Compression Ignition Engines and Section 330.3 of BAAQMD Regulation 9, Rule 8, restricts annual generator operation to 50 hours per year.

* The following text has been inserted after the last sentence in the paragraph under Mitigation Measure AQ-2 on page 4.2-42 of the draft EIR (new text is underlined).

Mitigation Measure AQ-2: Require at Least Tier 4 Final Engines on Construction Equipment (All Phases)

All applicants proposing development of projects within the project site, including the Phase 1 applicant, shall require their contractors, as a condition of contract, to reduce construction-related exhaust emissions by ensuring that all off-road equipment operates with at least EPA-approved Tier 4 Final or newer engines. Exemptions can be made for specialized equipment when Tier 4 engines are not commercially available within 200 miles of the project site. The construction contract must identify these pieces of equipment, document their unavailability, and ensure that they operate on no less than an EPA-approved Tier 3 engine. At least 95 percent of off-road equipment must operate with at least an EPA-approved Tier 4 Final or newer engine. All contractors shall be required to submit a list of equipment and associated Engine Identification Numbers to the California Air Resources Board for Tier 4 verification.

* The following revisions have been made to the second paragraph under *Construction* on page 4.2-58 (new text is underlined and deleted text is ~~strikethrough~~).

Construction activities would generate DPM and PM2.5 that could expose adjacent receptors to significant health risks. The receptors affected by the highest concentrations of DPM exhaust and PM2.5 exhaust are adjacent to (i.e., property boundaries are less than a foot away from construction area boundaries) and south of the off-site improvement area at Tanforan Avenue. **Table 4.2-14**, **p. 4.2-54**, presents the unmitigated and mitigated construction-related health risk for the maximally exposed individual receptor (MEIR) within 1,000 feet of Phase 1 construction activities. The construction MEIR is located closest to the residential property of 31 Tanforan Avenue (coordinates of 551583.92, 4166008.02). In an unmitigated scenario, Phase 1 would result in a significant increase in cancer risk (90 per million) and annual PM2.5 concentrations (0.4 µg/m^3) for the ~~maximally exposed individual receptor~~MEIR. As a result of these exceedances of the cancer risk and PM2.5 thresholds, mitigation measures would be required to reduce impacts. Implementation of **Mitigation Measure AQ-1** and **AQ-2** would require BAAQMD's BMPs and Tier 4 engines in construction equipment to reduce fugitive dust and DPM emissions and correspondingly reduce cancer risks and annual PM2.5 concentrations. With these mitigation measures, this impact would be ***less than significant with mitigation***.

* The following corrections have been made to Table 4.2-14, *Phase 1 Cancer and Chronic Hazard Risks and PM2.5 Concentrations during Construction*, on page 4.2-59 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Table 4.2-14. Phase 1 Cancer and Chronic Hazard Risks and PM2.5 Concentrations during Construction

	Unmitigated			Mitigated[a]		
Receptor	**Cancer Risk[a] (cases per million)**	**Non-Cancer Hazard Index**	**Annual PM2.5 Concentration (µg/m^3)**	**Cancer Risk (cases per million)**	**Non-Cancer Hazard Index**	**Annual PM2.5 Concentration (µg/m^3)**
Maximally Exposed Individual Receptor~~[b]~~	~~89.6~~ **137.9**	0.1	~~0.4~~ **0.4**	~~4.5~~ 9.8	< 0.1	0.2
Significance Threshold	10.0	1.0	0.3	10.0	1.0	0.3
Exceed Threshold?	**Yes**	No	**Yes**	No	No	No

Source: See **Appendix 4.2-1** for modeling outputs and calculations.

Note: µg/m^3 = micrograms per cubic meter; PM2.5 = particulate matter no more than 2.5 microns in diameter

Exceedances of BAAQMD thresholds are ~~underlined~~ **bolded**.

[a] The Phase 1 mitigated results account for BAAQMD thresholds regarding fugitive dust (**Mitigation Measure AQ-1**) and 95 percent of offroad equipment with Tier 4 engines (**Mitigation Measure AQ-2**) (see Impact AQ-2a).

~~[b] This receptor is adjacent to the southern boundary of the off-site improvement area (Tanforan Avenue) associated with Phase 1 construction.~~

* The following revisions were made to the second paragraph under *Operation* on page 4.2-59 (new text is underlined and deleted text is ~~strikethrough~~).

Because BAAQMD's permit does not specifically address PM2.5, concentrations from operation of the emergency generators were modeled, and **Table 4.2-15**, **p. 4.2-59**, presents the results of the modeling. Based on applicant-provided information, ~~G~~generators ~~were assumed to~~ would operate for an average of 7.33~~50~~ hours per year (see **Table 4.2-5, p. 4.2-59**)~~, consistent with CARB's Airborne Toxic Control Measure for Stationary Compression Ignition Engines and Section 330.3 of BAAQMD Regulation 9, Rule 8~~. Cancer and non-cancer health risks are

presented for informational purposes. The receptors affected by the highest concentrations of DPM exhaust are adjacent to and south of the off-site improvement area at Tanforan Avenue. The operations MEIR is located closest to the residential property of 771 Tanforan Avenue (coordinates of 551708.92, 4166058.02). As shown in **Table 4.2-15**, **p. 4.2-59**, Phase 1 operations would not result in a significant increase in PM2.5 exhaust concentrations. Therefore, this impact would be ***less than significant***. No mitigation is required.

* The following revisions were made to Table 4.2-15, *Phase 1 Cancer and Chronic Hazard Risks and PM2.5 Concentrations during Operation*, and the paragraph following the table on pages 4.2-59 and 4.2-60 (new text is underlined and deleted text is ~~strikethrough~~).

Table 4.2-15. Phase 1 Cancer and Chronic Hazard Risks and PM.5 Concentrations during Operation

	Unmitigated		
Receptor	**Cancer Risk[a] (cases per million)**	**Non-Cancer Hazard Index**	**Annual PM2.5 Concentration (µg/m³)**
Maximally Exposed Individual Receptor[a]	~~2.7~~0.2	< 0.1	< 0.1
Significance Threshold	10.0	1.0	0.3
Exceed Threshold?	No	No	No

Source: See **Appendix 4.2-1** for modeling outputs and calculations.

Note: µg/m³ = micrograms per cubic meter; PM2.5 = particulate matter no more than 2.5 microns in diameter

~~[a] This receptor is adjacent to the southern boundary of the off-site improvement area (Tanforan Avenue) associated with Phase 1 construction.~~

The cancer risk threshold defined by BAAQMD is for exposure of a maximally exposed sensitive receptor (generally within 1,000 feet) to an individual emissions source, resulting in an excess cancer risk level of more than 10 in 1 million. The approach for estimating cancer risk is based on long-term inhalation, assuming a 24-hour per day, 350-day per year, 30-year exposure for residential receptors. Accordingly, to determine the Phase 1 combined cancer risk, the risk from the 3-year-long mitigated construction period is combined with ~~(approximately three cases per million, per **Table 4.2-14**, **p. 4.2-59**) and~~ the risk from the 30-year-long operational period. Note that the MEIR for the combined risk happens to be the same receptor identified for the construction period risk (located closest to the residential property of 31 Tanforan Avenue) but not the same receptor identified for the operational period risk. ~~(approximately three cases per million, per **Table 4.2-15**, **p. 4.2-59**) are added together (approximately six cases per million).~~ The combined cancer risk (9.84) is equal to the sum of the construction period cancer risk (9.77) plus the operational period cancer risk (0.07). The combined cancer risk would not exceed BAAQMD's threshold of 10.0 cases per million. Therefore, this impact would be ***less than significant with mitigation***.

* The following sentence has been added to the second paragraph on page 4.2-64 under *Localized Criteria Pollutants and Toxic Air Contaminants* (new text is underlined).

Phase 1 construction activities and operation of the five new diesel-fueled generators on the project site would generate DPM and PM2.5. Existing nearby DPM and PM2.5 sources within 1,000 feet of the project site, along with the Phase 1 site, could contribute to a cumulative health risk for existing and future sensitive receptors adjacent to and within the project site (see **Figure 4.2-1**, **p. 4.2-10**). This is a potentially significant impact. Data files and distance

multipliers provided by BAAQMD were used to estimate background impacts and concentrations for existing stationary, roadway, and railway sources, as shown in **Figure 4.2-1**, **p. 4.2-10**. The combined risks from mitigated construction (with implementation of **Mitigation Measures AQ-1** and **AQ-2**) and operation of Phase 1 and ambient sources are summarized in **Table 4.2-16**, **p. 4.2-64**. Note that the MEIR for the cumulative risk is neither the MEIR identified for the construction period risk nor the MEIR identified for the operational period risk. This is because the cumulative MEIR's proximity to the high-risk ambient sources (i.e., the railway and an existing stationary source) is a greater factor in determining its cumulative risk than its proximity to the lower-risk Phase 1 sources of construction and operation. The MEIR is located closest to the residential property of 1275 Herman Street (coordinates of 551733.92, 4166058.02). The methods used to estimate Phase 1 emissions are described above in Section 4.2.4.2, *Approach to Analysis*, and provided in **Appendix 4.2-1**.

* The following revisions were made to Table 4.2-16, *Mitigated Cumulative Health Risks from Phase 1*, on page 4.2-64 (new text is underlined and deleted text is ~~strikethrough~~).

Table 4.2-16. Mitigated Cumulative Health Risks from Phase 1

Source	Cancer Risk (cases per million)	Non-Cancer Hazard Index	Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)
Contribution from Existing Sources[a]			
Stationary Sources	< 1	< 0.1	9.6
Roadway Sources	6	—	0.2
Rail Sources	21	—	< 0.1
Contribution from Phase 1 Construction[b]			
Maximally Exposed Individual Receptor	2~~1~~	< 0.1	0.1
Contribution from Phase 1 Operation			
Maximally Exposed Individual Receptor	< 1~~2~~	< 0.1	< 0.1
Cumulative Totals			
Existing + Phase 1 Construction	29~~8~~	< 0.1	9.9
Existing + Phase 1 Operation	27~~9~~	< 0.1	9.8
Existing + Phase 1 Construction and Operation	29~~30~~	< 0.1	9.9
BAAQMD Thresholds	*100*	*10.0*	*0.8*

Source: See **Appendix 4.2-1** for modeling outputs and calculations.

Notes:

Exceedances of BAAQMD thresholds are underlined.

$\mu g/m^3$ = micrograms per cubic meter

[a] ~~Contributions from existing sources represent the health risks within 1,000 feet of the maximum exposed receptor, which is a residence on the east corner on the south side of Tanforan Avenue.~~ See **Figure 4.2-1**, **p. 4.2-10**, for existing stationary, roadway, and rail sources.

[b] Contributions from Phase 1 construction reported with implementation of **Mitigation Measures AQ-1** and **AQ-2**.

Section 4.4, Cultural Resources

The following revision has been made to the third paragraph of Mitigation Measure CR-1 on page 4.4-25 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Mitigation Measure CR-1: Interpretive Signage Program (Phase 1 Only)

The Phase 1 applicant shall prepare an interpretive signage plan document setting forth the process for design and installation of interpretive signage within the Specific plan area. The interpretive signage plan shall be developed in coordination with professionals who meet the Secretary of the Interior's Professional Qualification Standards in History or Architectural History.

The interpretive signage plan shall include details regarding the proposed locations for the signage and the design of the visual components of the interpretive historic district signage program. The interpretive signage plan does not need to include cost analysis or specifications for the fabrication or installation of the signage program.

The interpretive signage plan shall be reviewed and approved by the City of South San Francisco prior to issuance of a ~~demolition~~ building permit for the proposed project. No further discretionary review or approvals are anticipated to be required by the City to implement the interpretive historic district signage program. Implementation of the interpretive signage program shall include the following elements:

The following addition has been made to the first paragraph of Mitigation Measure CR-2b on pages 4.4-26 and 4.4-27 of the draft EIR (new text is underlined).

Mitigation Measure CR-2b: Halt Construction Activity, Evaluate Find, and Implement Mitigation for Archaeological and Tribal Cultural Resources (All Phases)

Should a potential archaeological or tribal cultural resource be encountered during project construction activities, the construction contractor shall halt construction within 25 feet of the find and immediately notify the City of South San Francisco Economic and Community Development Director if the resource was discovered in South San Francisco's jurisdiction, or the San Bruno City Planning Manager and Public Works Director if the resource was discovered in San Bruno's jurisdiction. A qualified archaeologist, in consultation with the City in which the resource was discovered, shall 1) evaluate the potential resource to determine if it meets the CEQA definition of a unique archaeological resource pursuant to Public Resources Code Section 21083.2 or a tribal cultural resource pursuant to Public Resources Code Section 21074 and 2) make recommendations about the treatment of the resource, as warranted. If the qualified archaeologist determines the find is not a unique archaeological resource, then proper recordation and identification shall be completed and construction shall continue without delay.

Section 4.7, Greenhouse Gas Emissions

* The following correction has been made to the second sentence in the second paragraph under Section 4.7.1, *Introduction*, on page 4.7-1 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

~~No questions or concerns related to GHG emissions were raised in the responses to the NOP.~~ The NOP comments pertaining to GHG emissions include comments from the Bay Area Air Quality Management District (BAAQMD). The BAAQMD comments recommended analysis of consistency with various GHG-related planning documents, legislation, and executive orders; incorporation of design features and mitigation measures that reduce GHG impacts; and use of BAAQMD's tools and resources that help analyze GHG impacts. These issues are addressed below in Section 4.7.4, *Impacts and Mitigation Measures*.

Section 4.11, Noise and Vibration

The following correction has been made to the second paragraph on page 4.11-1 of the draft EIR (new text is underlined).

> Issues identified in response to the Notice of Preparation (NOP) (**Appendix 1**) were considered in preparing this analysis. NOP comments pertaining to noise include concerns related to construction noise and vibration, as well as operational noise issues. These issues are addressed below in Section 4.11.4, *Impacts and Mitigation Measure*s.

The following corrections have been made to Table 4.11-16, *Modeled Traffic Noise Impacts on Existing Land Uses*, on page 4.11-38 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Table 4.11-16. Modeled Traffic Noise Impacts on Existing Land Uses

Roadway	Segment	2040 Without Project (dB L_{dn})	2040 With Project (dB L_{dn})	Project-Related Increase (dB)	Most Sensitive Adjacent Land Use Type	City in Which Segment Is Located	Applicable Compatibility Standard	Exceeds Compatibility Standard?	Allowable Increase	Exceeds Allowable Increase?
Sneath Lane	Between I-280 and Cherry Avenue	67.3	67.7	0.4	MFR	SB	65	Yes	3	No
Sneath Lane	Between Cherry Avenue and El Camino Real	70.0	70.7	0.7	C/O/I	SB	70	Yes	3	No
El Camino Real	Between Sneath Lane and I-380	71.9	72.2	0.3	C/O/I	SB	70	Yes	3	No
El Camino Real	Between I-380 on-/off-ramps	72.3	72.6	0.3	NA	SB	NA	NA	NA	NA
Sneath Lane	Between El Camino Real and Huntington Avenue	65.4	67.1	1.7	C/O/I	SB	70	No	5	No
Huntington Avenue	Between San Bruno Ave and Forest Lane	64.7	65.1	0.4~~5~~	SFR	SB	60	Yes	3	No
Huntington Avenue	Between Forest Lane/Herman Street and Sneath Lane	64.4	64.8	0.4	SFR	SB	60	Yes	3	No
Tanforan Avenue	Huntington Avenue and Dollar Avenue	59.8	55.4	-4.4~~5~~	SFR	SB	60	No	5	No
Dollar Avenue/ Herman Street	Between Tanforan Avenue and Scott Street	62.1	62.3	0.2	SFR	SB	60	Yes	3	No
San Mateo Avenue	Between South Linden and South Airport Boulevard	67.9	68.7	0.8	C/O/I	SSF	70	No	5	No
South Linden Avenue	Between Grand Avenue and San Mateo Avenue	67.6	69.1	1.5	SFR	SSF	65	Yes	3	No
South Linden Avenue	Between Dollar Avenue and San Mateo Avenue	61.8	64.7	2.9	C/O/I	SSF	70	No	5	No
South Maple Avenue	Tanforan Avenue and Victory Avenue	61.7	64.6	2.9~~3.0~~	C/O/I	BOTH	70	No	5	No

Source: Traffic volumes provided by Fehr & Peers. Modeling conducted using a spreadsheet that was based on the FHWA Traffic Noise Model, version 2.5, at a fixed distance of 33 feet from the roadway centerline.

Note: The calculated increases between scenarios are rounded.

NA: Not applicable because the area between the I-380 ramps is undeveloped.

The following text has been added to Mitigation Measure NOI-1c, Mechanical Equipment Noise Reduction Plan (All Phases), on page 4.11-42 of the draft EIR (new text is underlined).

Mitigation Measure NOI-1c: Mechanical Equipment Noise Reduction Plan (All Phases)

To reduce potential noise impacts resulting from project heating, cooling, and ventilation equipment, the Phase 1 applicant and applicants of future Precise Plans shall conduct a noise analysis to estimate noise levels of project-specific mechanical equipment based on the selected equipment models and design features, and create a Noise Reduction Plan to ensure noise levels of equipment, once installed, are below the applicable criteria described below. The Noise Reduction Plan shall include any necessary noise reduction measures required to reduce project-specific mechanical equipment noise to a less-than-significant level. The plan shall also demonstrate that with the inclusion of selected measures, noise from equipment would be below the significance thresholds. Feasible noise reduction measures to reduce noise below the significance threshold include, but are not limited to, selecting quieter equipment, utilizing silencers and acoustical equipment at vent openings, siting equipment farther from the roofline, and/or enclosing all equipment in a mechanical equipment room designed to reduce noise. This analysis shall be conducted and the results and final Noise Reduction Plan shall be provided to the City prior to the issuance of building permits for each phase.

The noise analysis and Noise Reduction Plan shall be prepared by persons qualified in acoustical analysis and/or engineering. The Noise Reduction Plan shall demonstrate with reasonable certainty that noise from mechanical equipment selected for the project, including the attenuation features incorporated into the project design, will not exceed the City of South San Francisco property plane threshold of 60 dBA during daytime hours or 55 dBA during nighttime hours for nearby multi-family residential uses, 65 dBA during daytime hours or 60 dBA during nighttime hours for nearby commercial uses, or the City of San Bruno threshold of 10 dB above the ambient noise level, as identified through field noise measurements, at the property plane.

The Phase 1 applicant and applicants of future Precise Plans shall incorporate all feasible methods to reduce noise identified above and any other feasible recommendations from the acoustical analysis and Noise Reduction Plan into the building design and operations as necessary to ensure that noise sources meet applicable requirements of the respective noise ordinances at receiving properties.

The following text has been added to Mitigation Measure NOI-1d, Emergency Generator Noise Reduction Plan (All Phases), on page 4.11-45 of the draft EIR (new text is underlined).

Mitigation Measure NOI-1d: Emergency Generator Noise Reduction Plan (All Phases)

Prior to approval of a building permit for any proposed development under the Specific Plan, including Phase 1, the Phase 1 applicant and applicants of future Precise Plans shall conduct a noise analysis to estimate noise levels from the testing of project-specific emergency generators, and create a Noise Reduction Plan to ensure noise levels of generator testing are below the applicable criteria This analysis and Noise Reduction Plan may be incorporated together with the analysis described in MM-NOI-1c. This analysis shall be conducted and the Noise Reduction Plan shall be created based on the analysis results. The results, methods, and final Noise Reduction Plan shall be provided to the City prior to the issuance of building permits for each

phase. The analysis shall account for proposed noise attenuation features, such as specific acoustical enclosures and mufflers or silences, and the final Noise Reduction Plan shall demonstrate with reasonable certainty that proposed generator(s) will not exceed the City of South San Francisco property plane threshold of 60 dBA for residential uses and 65 dBA for commercial uses during daytime hours, or 55 dBA for residential uses and 60 dBA for commercial uses during nighttime hours, and the City of San Bruno threshold of 10 dB above the ambient noise level, as identified through field noise measurements. Acoustical treatments may include, but are not limited to:

- Enclosing generator(s);
- Installing relatively quiet model generator(s);
- Orienting or shielding generator(s) to protect noise-sensitive receptors to the greatest extent feasible;
- Installing exhaust mufflers or silencers;
- Increasing the distance between generator(s) and noise-sensitive receptors; and/or
- Placing barriers around generator(s) to facilitate the attenuation of noise.

In addition, all project generator(s) shall be tested only between the hours of 7:00 a.m. and 8:00 p.m.

The Phase 1 applicant and applicants of future Precise Plans shall incorporate all recommendations from the acoustical analysis into the building design and operations to ensure that noise sources meet applicable requirements of the noise ordinance.

The following corrections have been made to Table 4.11-18, *Modeled Cumulative Traffic Noise Impacts*, on page 4.11-57 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Table 4.11-18. Modeled Cumulative Traffic Noise Impacts

Roadway	Segment	Most Sensitive Adjacent Land Use Type	Existing (dB L_{dn})	Cumulative No Project (dB L_{dn})	Cumulative Plus Project (dB L_{dn})	Applicable Compatibility Standard (dB L_{dn})	Exceeds Compatibility Standard?	Allowable Increase (dB)	Cumulative Plus Project Minus Existing (dB)[c]	Potential Cumulative Impact?
Sneath Lane	Between I-280 and Cherry Avenue[1]	MFR	66.5	67.3	67.7	65	Yes	3	1.2	No
Sneath Lane	Between Cherry Avenue and El Camino Real[a]	C/O/I	69.7	70.0	70.7	70	Yes	3	1.0~~1~~	No
El Camino Real	Between Sneath Lane and I-380[a]	C/O/I	71.3	71.9	72.2	70	Yes	3	0.9	No
El Camino Real	Between I-380 on-/off-ramps[a]	NA	71.7	72.3	72.6	NA	NA	NA	0.9	No
Sneath Lane	Between El Camino Real and Huntington Avenue[a]	C/O/I	64.9	65.4	67.1	70	No	5	2.2	No
Huntington Avenue	Between San Bruno Ave and Forest Lane[a]	SFR	63.9	64.7	65.1	60	Yes	3	1.2	No
Huntington Avenue	Between Forest Lane/Herman Street and Sneath Lane[a]	SFR	63.6	64.4	64.8	60	Yes	3	1.2	No
San Mateo Avenue	Between South Linden and South Airport Boulevard[b]	C/O/I	67.6	67.9	68.7	70	No	5	1.1	No
South Linden Avenue	Between Grand Avenue and San Mateo Avenue[b]	SFR	67.1	67.6	69.1	65	Yes	3	2.0~~1~~	No
South Linden Avenue	Between Dollar Avenue and San Mateo Avenue[b]	C/O/I	60.5	61.8	64.7	70	No	5	4.2	No
Tanforan Avenue	Huntington Avenue and Dollar Avenue[a]	SFR	58.6	59.8	55.4	60	No	5	-3.2	No
South Maple Avenue	Tanforan Avenue and Victory Avenue[a,b]	C/O/I	60.5	61.7	64.6	70	No	5	4.1	No
Dollar Avenue/Herman Street	Between Tanforan Avenue and Scott Street[a]	SFR	60.8	62.1	62.3	60	Yes	3	1.5	No

Notes:
[a.] Segment is located in the city of San Bruno.
[b.] Segment is located in the city of South San Francisco.
[c.] The calculated increases between scenarios are rounded.
N/A indicates that there would be no potential cumulative impact and, thus, no cumulatively considerable increase attributable to the proposed project.
Source: Traffic volumes provided by Fehr & Peers. Modeling conducted using a spreadsheet that was based on the FHWA Traffic Noise Model, version 2.5, at a fixed distance of 33 feet from the roadway centerline.

Section 4.15, Transportation and Circulation

The following correction has been made to the first and second sentences in the second paragraph under *Trip Generation Results*, on page 4.15-29 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

> The project at buildout would generate approximately ~~28,461~~ 28,460 daily person trips and 16,876 vehicle trips. These totals include ~~3,918~~ 3,963 AM peak-hour person trips, 2,150 net new AM peak-hour vehicle trips, ~~3,528~~ 3,554 PM peak-hour person trips, and 1,952 PM peak-hour vehicle trips.

The following corrections have been made to Table 4.15-4, *Person-Trip Generation, Project Buildout*, on page 4.15-32 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Table 4.15-4. Person-Trip Generation, Project Buildout

Mode	Mode Share	AM Peak Hour	PM Peak Hour	Daily
Drive alone	55%	2,105	1,879	15,984
Carpool	8%	306	273	2,317
BART	23%	880	786	5,394
Caltrain[a]	10%	383	342	2,345
SamTrans	2%	77	68	469
Walking/bicycling[b]	2%	77	68	469
Total Person Trips Monitored by TDM Ordinance	**100%**	**3,828**	**3,416**	**26,978**
Person trips, public amenity visitors	—	~~90~~ 135	~~112~~ 138	~~1,483~~ 1,482
Total Person Trips	**—**	**~~3,918~~ 3,963**	**~~3,528~~ 3,554**	**~~28,461~~ 28,460**

Notes:

a. Based on travel demand data from high-intensity "tech" office mode-share and person-trip generation surveys from downtown Redwood City near the Redwood City Caltrain station as well as requirements from the City TDM Ordinance.

b. Mode-share estimates based on City TDM surveys and assignment to transit providers, based on local context and expected travel patterns.

Source: Fehr & Peers, 2020.

The following corrections have been made to Table 4.15-7, *Weekday AM and PM Peak-Hour 95th-Percentile Queues – Project*, on page 4.15-41 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Table 4.15-7. Weekday AM and PM Peak-Hour 95th-Percentile Queues – Project

Approach Lanes	Storage Distance (feet)	2040 Future Baseline Queue Length AM	2040 Future Baseline Queue Length PM	2040 Project Buildout Queue Length AM	2040 Project Buildout Queue Length PM
I-280 Southbound Off-Ramp at Rollingwood Drive and Sneath Lane					
Left/through	1,200	105	215	118	230
Right	150	74	91	104	103
I-280 Southbound Off-Ramp at San Bruno Avenue*					
Left	120	232	179	243	195
Left/through	840	221	102	227	120
Through/right	3,615				
Right	80	68	68	74	79
I-280 Northbound Off-Ramp at San Bruno Avenue*					
Left	230	~~93~~ 405	225	~~419~~ 415	~~240~~ 426
Through/left/right	1,335	~~394~~ 1,015	~~818~~ 1,372	~~1,171~~ 959	~~778~~ 1,391
U.S. 101 Southbound Off-Ramp at San Bruno Avenue*					
Left	280	115	87	65	88
Left/through	960	116	87	65	89
Right	280	26	138	26	138
U.S. 101 Northbound Off-Ramp at San Bruno Avenue*					
Left/through	2,600	~~277~~ 201	~~603~~ 424	~~2,299~~ 305	~~1,040~~ 478
~~Right~~	~~560~~	~~324~~	~~335~~	~~961~~	~~498~~
I-380 Westbound Off-Ramp at El Camino Real*					
Left	980	253	212	250	217
Right	980	331	668	359	637
I-380 Eastbound Off-Ramp at El Camino Real*					
Left	520	157	294	234	378
Through/left/right	1,760	170	271	271	312
Right	330	160	252	242	273
U.S. 101 Southbound Off-Ramp at Airport Boulevard					
Left	430	278	253	360	270
Through	720	282	307	368	318
U.S. 101 Southbound Off-Ramp at Produce Avenue					
Left	620	208	182	272	226
Right	100	63	43	63	45
U.S. 101 Northbound Off-Ramp at South Airport Boulevard					
Left/Through	740	526	283	514	274
Right	740	46	39	47	39

Notes: Ramps analyzed using Synchro software.
"*" indicates additional analysis with Simtraffic software.

Storage distance and queues in feet per lane. While some queues exceed available storage, project-related traffic does not contribute to the queues for these lanes.
Source: Fehr & Peers, 2021.

Section 4.17, Utilities and Service Systems

* The following revisions were made to the first bullet point on page 4.17-1 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

  - *Water Supply Assessment for the Southline Specific Plan, South San Francisco District, California Water Service – ~~Draft~~ Final* (WSA), prepared for the proposed project by EKI Environment & Water, Inc. in ~~July~~ December 2021 (**Appendix 4.17-1**);

* Footnote 1 on page 4.17-2, Footnote 7 on page 4.17-3, Footnote 15 on page 4.17-11, Footnote 41 on page 4.17-23, Footnote 47 on page 4.17-30, Footnote 52 on page 4.17-31, Footnote 63 on page 4.17-41, and Footnote 64 on page 4.17-45 of the draft EIR all have the following revisions (new text is underlined and deleted text is ~~strikethrough~~).

  EKI Environment & Water Inc. Water Supply Assessment for the Southline Specific Plan – ~~Draft~~Final, South San Francisco District California Water Service. ~~July~~ December 2021.

* The following text has been added to the fourth paragraph of page 4.17-3 of the draft EIR under *Regional* (new text is underlined).

  The SWRCB has stated that it intends to implement the Bay-Delta Plan Amendment on the Tuolumne River by the year 2022, assuming all required approvals are obtained by that time. However, implementation of the Bay-Delta Plan Amendment is uncertain for multiple reasons, as summarized below (bullets are excerpted from a detailed discussion provided by SFPUC to water agencies in support of 2020 UWMP development).

* The following text has been added to Footnote 8 on page 4.17-4 of the draft EIR (new text is underlined).

  Ibid. As of October 29, 2021, state regulators announced that the Voluntary Agreement negotiations process has ceased, with no agreement reached. San Francisco Chronicle, "California Drought: Key Talks Over Water Use Break Down, SF May Face Tighter Regulation," available at https://www.sfchronicle.com/sf/article/California-drought-Key-talks-over-water-use-16576132.php. Accessed December 3, 2021.

* The following revisions have been made to the source lines for Tables 4.17-1, 4.17-2, 4.17-3, and 4.17-4 on pages 4.17-5, 4.17-6, 4.17-7, and 4.17-9 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

  Source: EKI Environment & Water Inc. Water Supply Assessment for the Southline Specific Plan—~~Draft~~Final, South San Francisco District California Water Service. ~~July~~ December 2021.

* The following text was removed from Table Note a in Tables 4.17-2, 4.17-3, and 4.17-4 on pages 4.17-6, 4.17-7, and 4.17-9 of the draft EIR (deleted text is ~~strikethrough~~).

  [a] Future demand estimates are from Cal Water's 2020 UWMP for the South San Francisco District (June 2021). As discussed in Section 4.17.3 below, the future demand estimates presented in the 2020 UWMP account for an estimated demand of 527 AFY associated with the

project. ~~The project's WSA (**Appendix 4.17-1**) deducts 527 AFY from the future demand estimates for the South San Francisco District under the assumption that the project would comply with Cal Water's pending Water Neutral Development Policy. However, as discussed in Section 4.17.4 below, as of the date of publish of this Draft EIR, Cal Water has not adopted a Water Neutral Development Policy. Therefore, this analysis conservatively does not deduct the project's demand from future demand estimates for the South San Francisco District.~~

* The following revisions were made to the last paragraph under *Specific Plan Area, Including Phase 1 Site* on page 4.17-11 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Based on available metered data, historical water use for the existing uses within the Specific Plan area, inclusive of the Phase 1 site, was approximately ~~11~~ 13 AFY between ~~2018~~ 2017 and ~~2020~~2019.

* A period was added to the last sentence on page 4.17-11 under *Regional* in the draft EIR (new text is underlined).

To accommodate peak wet-weather flows, the WQCP is in the process of conducting facility improvements, which would include installation of a new storage basin to retain excess flows during wet-weather.

* The following revisions were made to the text under *Senate Bill 610 and Southline Specific Plan Water Supply Assessment* on pages 4.17-19 and 4.17-20 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~). The deleted footnotes are Footnotes 39 and 40 in the draft EIR.

Senate Bill (SB) 610 requires cities and counties to confirm through a WSA that sufficient water supply sources are available before certain large developments are approved (see California Water Code Sections 10910 through 10915). The WSA for a project must be included in that project's CEQA documentation. A WSA must be prepared if a project includes, among other things: (1) the equivalent demand of 500 residential units; or (2) a shopping center or business establishment that employs more than 1,000 persons or has a floor space of more than 500,000 square feet; or (3) a commercial office building that employ~~ee~~s more than 1,000 persons or has a floor space of more than 250,000 square feet. The proposed project would result in a maximum of approximately 10,745 net new employees at the project site under the Office Scenario and would include an office/research and development (R&D) campus with a maximum anticipated building area of 2.8 million square feet, which would be greater than the 1,000 persons or 250,000 square feet of floor space associated with a business establishment or commercial office building use under SB 610. Therefore, the proposed project meets the definition of a "project" requiring a WSA pursuant to SB 610 (California Water Code Section 10910(a) and 10912(a)(3)).

~~California Water Code Section 10910(g)(1) provides that the governing body of the public water system shall submit a WSA to the requesting city or county not later than 90 days from the date on which the request was received.~~ Pursuant to California Water Code Section 10910(c)(1), the City requested a WSA for the proposed project from Cal Water in April 2020. Cal Water provided a ~~draft~~ final WSA to the City and project applicant in December 2021~~September 2020 and a revised draft WSA in December 2020~~. ~~In March 2021, Cal Water informed the City and project applicant that Cal Water would be revising the WSA again to include updated language regarding the reliability of wholesale water supplies and provided another draft WSA to the City and project applicant in July 2021. This Draft EIR analysis is based on the July 2021 WSA, which is included in **Appendix 4.17-1.**~~ Notwithstanding the passage of the statutory 90-day period to

~~complete a WSA, Cal Water has stated that it intends to finalize the WSA following preparation of a Water Neutral Development Policy for the South San Francisco District, which is anticipated to occur by the end of 2021.[1] The final WSA is anticipated to be included in the Final EIR, together with a Water Neutral Development Policy, if it has been adopted, as an Appendix B. Based on information provided by Cal Water, the final WSA conclusions are anticipated to remain consistent as stated in the July 2021 WSA.~~ The EIR analysis is based on the December 2021 WSA.

The WSA states that in July 2021, Cal Water began development of a Water Neutral Development Policy for its three Peninsula Districts, which share the same SFPUC supply allocation. The stated purpose of the Water Neutral Development Policy is to ensure that there is enough water at all times to meet the basic needs of the community and increase drought resiliency, among other things. The WSA describes the potential Water Neutral Development Policy based on what Cal Water anticipates will be included in the policy and assumes that the project will be required to comply with a final adopted policy.[2] According to the WSA:

> As currently drafted, ~~T~~the ~~Water Neutral Development~~ Policy ~~[~~will require~~]~~ any new residential, commercial, or industrial development within the South San Francisco District that is expected to ~~use 100 AFY or more in~~exceed a specified amount of new demand to offset its net increase in water demand. The net increase in water demand associated with any new development [will be] calculated as the expected total water use due to the proposed development and/or expansion, minus the amount of existing water use, onsite credits (if available), and/or alternative sources of water supply. Alternative sources may include, but are not limited to: (1) reused graywater, (2) reused blackwater, (3) reused mixed gray/blackwater, (4) captured rainwater/stormwater, and (5) air conditioning condensate.
>
> The offset amount [will be] determined using a detailed projection of total annual water demand resulting from the proposed development, excluding temporary demands such as those required for landscape establishment. The applicant may choose to comply with the defined offset amount by ~~any combination of the following activities~~: (1) paying to the South San Francisco District the required offset amount calculated according to the offset costs ~~table~~ included in the policy, and/or (2) conducting ~~offsite conservation~~other activities as defined in the policy. ~~, or (3) conducting other pre-approved demand offset projects.~~ … Cal Water will verify compliance with this Water Neutral Development Policy (i.e., ensure that all payments for offsets and/or conservation offset measures are completed) prior to establishing a water service connection.

~~[1] Personal communication with Michael Hurley, Water Resources Manager, Cal Water, August 6, 2021.~~

~~[2] Page 11 of the WSA (**Appendix 4.17-1**) states: "In July 2021, prior to the date of publish of this WSA, Cal Water adopted a Water Neutral Development Policy (or Policy) for its three Peninsula Districts, which share the same SFPUC supply allocation. A copy of this Policy is provided in Appendix B." However, as of the date of publish of this Draft EIR, Cal Water has not adopted a Water Neutral Development Policy, and the policy is not included in Appendix B of the July 2021 draft WSA.~~

* The following row was deleted from Table 4.17-5, *Proposed Water, Wastewater, and Storm Drain Improvements*, on page 4.17-32 in the draft EIR (deleted text is ~~strikethrough~~).

~~24-inch and 27-inch sewer main (South San Francisco)~~	~~Tanforan Avenue and Shaw Road~~	~~Upsize mains in Tanforan Avenue and Shaw Road that flow to existing pump station.~~

* The following text was deleted from the third paragraph under *Wastewater Facilities* on page 4.17-35 of the draft EIR (deleted text is ~~strikethrough~~).

> As shown in **Table 4.17-3**, **p. 4.17-7**, and **Figure 4.17-2**, **p. 4.17-14**, the proposed project would ~~upgrade the 24-inch and 27-inch sewer main in Tanforan Avenue and Shaw Road that flows to an existing pump station;~~ relocate the existing 24-inch sewer main east to avoid conflict a with the Huntington Avenue intersection improvements; relocate the existing 8-inch sewer main at Dollar Avenue to connect to the proposed development south to Tanforan Avenue; upsize the 8-inch sewer main in the northerly portion of South Maple Avenue and the main that runs from South Maple Avenue through an easement to Lowrie Avenue; and relocate all existing interior sewer connections by installing new service connections to each building within the Specific Plan area.

* The following text was deleted from the paragraph under *Wastewater Facilities* on page 4.17-39 of the draft EIR (deleted text is ~~strikethrough~~).

> As noted in the project analysis above, the Sanitary Sewer Technical Study, included as **Appendix 4.17-3** of this EIR, evaluates the sufficiency of the local wastewater conveyance system to serve the project's estimated wastewater flow, including Phase 1, and determines that the sewer demands of the proposed project would still be within the anticipated SSMP levels for future demands for the project area. ~~In addition, the wastewater facility improvements to upgrade the 24-inch and 27-inch sewer main in Tanforan Avenue and Shaw Road, as shown in **Figure 4.17-2, p. 4.17-14**, would be completed as part of Phase 1.~~ All ~~other~~ improvements to wastewater facilities would be completed during subsequent phases of the project. Therefore, for the reasons stated above in the project analysis, Phase 1 would not require or result in the relocation or construction of new or expanded wastewater facilities beyond the facilities already included in the Project Description and evaluated in this EIR, the construction or relocation of which could cause significant environmental effects. This impact would be ***less than significant***. No mitigation is required.

* The following revisions were made to the first sentence in the second paragraph under *Projected Water Demand* on page 4.17-41 of the draft EIR (new text is <u>underlined</u> and deleted text is ~~strikethrough~~).

> As shown in **Table 4.17-6,** below, the proposed project, inclusive of Phase 1, would require up to approximately ~~557~~ <u>555</u> AFY of water for each year through 2045 based on the demand factors described above.

* The following revisions were made to Table 4.17-6, *Anticipated Water Demand for Project Buildout (Life Sciences Scenario), Including Phase 1*, on page 4.17-42 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

Table 4.17-6. Anticipated Water Demand for Project Buildout (Life Sciences Scenario), Including Phase 1

Water Use	Area (sf)	Demand Factor (gpd/sf)	Total Water Demand (AFY)				
			2025	2030	2035	2040	2045
R&D	1,936,850	0.21	456	456	456	456	456
Amenity Building							
Restaurant/ Dining	16,400	0.47	8.7	8.7	8.7	8.7	8.7
Cafeteria	9,000	0.80	8.1	8.1	8.1	8.1	8.1
Fitness Center	49,000	0.75	41	41	41	41	41
Auditorium/Other	13,800	0.10	1.5	1.5	1.5	1.5	1.5
Irrigation	260,400	0.070	20	20	20	20	20
Distribution System Losses[1a]	--	--	33	33	33	33	33
Existing Site Demand[2b]	--	--	-13~~11~~	-13~~11~~	-13~~11~~	-13~~11~~	-13~~11~~
Total Annual Water Demand[3c]			**~~557~~555**	**~~557~~555**	**~~557~~555**	**~~557~~555**	**~~557~~555**

Source: EKI Environment & Water Inc. Water Supply Assessment for the Southline Specific Plan—~~Draft~~Final, South San Francisco District California Water Service. ~~July~~ December 2021.

sf = square feet; gpd = gallons per day; AFY = acre-feet per year

[1a] Estimated distribution system water loss is calculated using the 2019 DWR Water Audit Report percent water loss (i.e., 5.8% of project demands), and includes both real and apparent losses.

[2b] Existing demands are subtracted from total projected water demands to show the incremental increase in demands associated with the project. Existing demands are estimated as the average of three years of water use at the Specific Plan area based on available metered data (2017–2019).

[3c] Total may not sum due to rounding.

* The following revisions were made to the first paragraph under *Projected Water Supply* on page 4.17-43 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

> The demand estimate in the 2020 UWMP includes an estimated demand of 527 AFY for the project, including Phase 1. As shown in **Table 4.17-6,** the project's estimated demand at full buildout would be ~~557~~ 555 AFY. Although this is a conservative estimate, as discussed above, the estimated demand in the project's WSA exceeds the assumed project demand in the 2020 UWMP, and excess supplies are not forecasted during normal year conditions. As discussed in Section 4.17-3, Cal Water has stated that it intends to adopt a Water Neutral Development Policy~~in the coming months~~, which would require any new residential, commercial, or industrial development within the South San Francisco District that is expected to ~~use 100 AFY or more in~~exceed a specified amount of new demand to offset its net increase in water demand.

* The following revision was made to a sentence in the third paragraph under *Projected Water Supply* on page 4.17-32 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

> The project's projected increased demand of up to ~~557~~ 555 AFY (up to 527 AFY with implementation of **Mitigation Measure UTIL-1)** would exacerbate existing projected shortages during dry year conditions and assuming implementation of the Bay-Delta Plan Amendment.

* The following revisions were made to Footnote 65 on page 4.17-45 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

> For office use: 612,715 SF x 0.13 gpd/sf = 79,563 gpd (89 AFY). 89 AFY + 59.3 AFY (amenity building demand, **Table 4.17.6**) +20 AFY (irrigation demand, **Table 4.17.6**) + 33 AFY (distribution system loss, **Table 4.17.6**) – ~~11~~ 13 AFY (existing site demand, **Table 4.17.6**) = ~~190.3~~188.3 AFY. Note that irrigation demand and distribution system loss estimates are for the project at buildout, and therefore applying these estimates to Phase 1 alone is conservative.

* The following corrections were made to two sentences in the second paragraph under *Construction* on pages 4.17-48 and 4.17-49 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

> All existing development ~~on~~in the Specific Plan area would be removed during Phase 1, totaling approximately 343,800 square feet of building demolition.
>
> Any demolition and construction debris remaining after recycling would then be transported to the Corinda Los Trancos (Ox Mountain) Sanitary Landfill or the Newby Island Sanitary Landfill.

* The following revision was made to a sentence in the second paragraph under *Operation* on page 4.17-49 of the draft EIR (new text is underlined and deleted text is ~~strikethrough~~).

> As described in *Approach to Analysis*, above, the Office Scenario is evaluated here as the ~~worst case~~worst-case scenario, with a maximum of 10,745 net new employees.

Chapter 5, Alternatives

* The second and third paragraphs under Section 5.1, *Introduction*, on page 5-1 of the draft EIR were revised as follows (new text is underlined and deleted text is ~~strikethrough~~).

> ~~Nine~~ Ten alternatives to the project were considered, including the required No Project Alternative. To determine which of the alternatives should be evaluated in this EIR, each alternative was screened to determine whether it would meet most of the objectives of the project, reduce any of the significant impacts identified in the EIR, and be potentially feasible.
>
> This chapter provides a description of the six alternatives considered but rejected, followed by an analysis of the No Project Alternative (Alternative A) and ~~two~~three additional alternatives selected for evaluation: the No Intersection Alternative (Alternative B~~) and~~), the Reduced Project Alternative (Alternative C), and the Reduced Underground Parking Alternative (Alternative D).

* The following text was added to Footnote 3 on page 5-12 of the draft EIR (new text is underlined).

> City of South San Francisco, 2021. Shape SSF Preferred Alternative. Available: https://shapessf.com/ preferredalternative/. Accessed: September 7, 2021; see also SSF public review draft of the 2040 General Plan, dated February 2022, available: https://shapessf.com/wp-content/uploads/2022/03/SSFGPU_PublicDraft2022_03_Ammended.pdf. Accessed April 21, 2022.

* In Section 5.4, *Alternatives Selected for Further Review*, a fourth bullet point reading "Alternative D— Reduced Underground Parking Alternative" was added to the bullet list on page 5-14 and the following text was added to the first paragraph on page 5-15 of the draft EIR (new text is underlined).

  Under Alternative D— Reduced Underground Parking Alternative, the Specific Plan Area would incorporate the property located at 80 Tanforan Avenue. The existing building at 80 Tanforan Avenue would be demolished and a six-level above-grade parking structure (Parking Structure D) would be constructed, eliminating all subterranean parking south of Southline Avenue, which was included in the proposed project.

* On page 5-15 of the draft EIR, the reference to Table 5-4, p. 5-43 was revised to Table 5-19, p. 5-74.

* Table 5-1, *Comparison of the Proposed Project Features to the Alternatives*, on pages 5-16 and 5-17 was revised as follows (new text is underlined and deleted text is ~~strikethrough~~).

Table 5-1. Comparison of Proposed Project Features to the Alternatives

	Proposed Project[a]	Alternative A- No Project	Alternative B- No Intersection[a]	Alternative C – Reduced Project	Alternative D- Reduced Underground Parking[f]
Total Allowable Building Area (Office, R&D, and Amenity) (sf)[b]	2,800,000	Same as existing	2,800,000	1,404,880	2,800,000
Number of New Buildings	Nine buildings, one above-grade parking structure (Parking Structure C)	None (existing buildings to remain)	Nine buildings, one above-grade parking structure (Parking Structure C)	Nine buildings, one above-grade parking structure (Parking Structure C)	Nine buildings, two above-grade parking structures (Parking Structure C and Parking Structure D)
Building Heights	Four stories (60 feet above grade) to seven stories (115 feet above grade)	Same as existing	Four stories (60 feet above grade) to seven stories (115 feet above grade)	Four stories (80 feet above grade)	Three stories (60 feet above grade) to seven stories (115 feet above grade)
Total Building Footprint (sf) and Building Lot Coverage	543,315 (49 percent)	Same as existing	543,315 (49 percent)	543,315 (49 percent)	605,315 (50 percent)
Total Impervious Surface Area Including Buildings and Hardscape (sf)	897,691	Same as existing	897,691	897,691	987,447
Total Area of Ground Disturbance (sf)	1,435,737	None	1,359,837	1,435,737	1,523,121
Total Excavation volume (cy)[c]	688,400	None	682,800	189,800	435,200
Maximum Depth of Excavation (feet below grade surface)	31	None	31	18	27.5

	Proposed Project[a]	Alternative A- No Project	Alternative B- No Intersection[a]	Alternative C – Reduced Project	**Alternative D- Reduced Underground Parking[f]**
Building Area to be Demolished (sf)	343,800 (all existing buildings in Specific Plan area)	None	343,800 (all existing buildings in Specific Plan area)	343,800 (all existing buildings in Specific Plan area)	386,184 (all existing buildings in Specific Plan area including 80 Tanforan)
Trees to be Removed	162 (all existing trees in Specific Plan area)[d]	None	162 (all existing trees in Specific Plan area)[d]	162 (all existing trees in Specific Plan area)[d]	175[d]
Trees to be Planted	581[e]	None	581[e]	581[e]	591[e]

[a] Where feature differs between the Office Scenario and Life Sciences Scenario, the greater or more impactful value is presented. Refer to Table 3-2 in Chapter 3, *Project Description*, of this EIR for additional detail.

[b] sf = square feet

[c] cy = cubic yards; volumes are inclusive of off-site improvement areas.

[d] For the proposed project, Alternative C, and Alternative D, up to 19 additional tree removals in the off-site improvement areas (within both the cities of South San Francisco and San Bruno) may be required; such removals would be required to comply with any applicable local regulations. Alternative D would also require the removal of up to 13 additional trees on the 80 Tanforan Avenue property (in the City of South San Francisco). For Alternative B, no tree removals in San Bruno would be required.

[e] For the proposed project, Alternative C, and Alternative ~~C~~D, additional trees may be planted in the off-site improvement areas, subject to each city's tree replacement requirements (South San Francisco Municipal Code Chapter 13.30, San Bruno Municipal Code Chapters 8.24 and 8.25). For Alternative B, additional trees may be planted in the off-site improvement areas in South San Francisco, but no trees would be planted in San Bruno.

[f] Under Alternative D, the Phase 1 Precise Plan would include a total square footage of 684,710 sf compared to 700,915 sf under the proposed project. Consistent with the proposed project, under Alternative D, the Specific Plan would allow a total buildout of 2.8 million square feet. The remaining development allocation under Alternative D would be consistent with Specific Plan permitted land uses and may not exceed 2.8 million square feet. Although the specific land use mix for future phases of development is not known at this time, all subsequent development within the Specific Plan area requires approval of project-level Precise Plan approval by the City, which is a discretionary approval requiring consistency with the Specific Plan and compliance with CEQA.

* References to Table 5-5, p. 5-47 on pages 5-19, 5-26, and 5-34 of the draft EIR were revised to refer to Table 5-20, p. 5-75.

* The third paragraph in Section 5.7.1, *Description*, on page 5-29 of the draft EIR was revised (new text is underlined and deleted text is ~~strikethrough~~).

> Under Alternative C, ~~future phases of the project would be allowed to develop~~ up to approximately ~~955,120~~1,404,880 square feet of new office or R&D uses could be developed in the Specific Plan area, in comparison to the up to 2,800,000 square feet of uses that would be developed under the proposed project (Office Scenario).

* Section 5.8, *Alternative D – Reduced Underground Parking Alternative*, was added to Chapter 5. The text of Section 5.8 is provided below (new text is underlined).

> **Section 5.8, Alternative D – Reduced Underground Parking Alternative**
>
> ***Section 5.8.1, Description***
>
> Alternative D— Reduced Underground Parking Alternative would expand the Specific Plan area to incorporate the property located at 80 Tanforan Avenue while eliminating all subterranean parking associated with Phase 1 and constructing an above-ground parking structure. At the time of publication of the Draft EIR and close of the public comment period, the applicant did not have site control over the 80 Tanforan Avenue parcel. As such, alternative site plan layouts incorporating that area had not been explored. Since that time, the applicant acquired rights to purchase 80 Tanforan Avenue, which enabled consideration of Alternative D.
>
> Under Alternative D, the existing industrial warehouse building at 80 Tanforan Avenue, which was constructed in 1986, would be demolished and a parking structure (Parking Structure D) with six levels of above-grade parking would be constructed. With the incorporation of Parking Structure D, the two levels of subterranean parking associated with buildout of Phase 1 under the proposed project would be eliminated, resulting in a reduction of 253,200 cubic yards (cy) of excavation volume. That is, under Alternative D, none of the subterranean development south of Southline Avenue that is proposed under the project would be constructed. In addition, Alternative D would eliminate development of the Parking Structure C located north of Southline Avenue during the Phase 1 project; development of Parking Structure C would still occur under the project buildout condition. Lastly Alternative D would result in slight revisions in the square footages and uses of the Phase 1 Buildings 1, 7, and 2 (amenities building). Alternative D was selected for evaluation based on its potential to reduce impacts related to construction air quality, construction toxic contaminants (TACs), and construction noise. **Figure 5-4** on the following page provides a conceptual site plan of Alternative D at full project buildout under the Life Sciences Scenario. **Figure 5-5** on the following page provides a conceptual site plan of Alternative D at full project buildout under the Office Scenario.
>
> In general, Alternative D would construct the same land use program for both Phase 1 and the proposed project. The same Specific Plan and zoning designations would apply to this alternative. Alternative D would implement the same design features, sustainability features, and open space and pedestrian connections within the Specific Plan area as the proposed project, with the exception that the open space proposed as part of the Tanforan Community Parklet would be expanded by approximately 11,545 square feet compared with the proposed

project. However, under Alternative D, the Specific Plan area would increase by approximately 2.1 acres for a total area of approximately 28.6 acres.

Source: DES Architects/Engineers and Lane Partners, 2022.

Graphics ... 104077 (3-9-2022) JC

Figure 5-4
Reduced Underground Parking Alternative—Life Sciences Scenario

Source: DES Architects/Engineers and Lane Partners, 2022.

Graphics ... 104077 (3-9-2022) JC

ICF

Figure 5-5
Reduced Underground Parking Alternative—Office Scenario

As compared to the proposed project, Alternative D would revise the square footages of Buildings 1, 7, and 2 (amenities building); eliminate all subterranean parking associated with buildout of Phase 1; construct a new above-grade parking structure (Parking Structure D) on the 80 Tanforan Avenue property; and eliminate development of the Parking Structure C located north of Southline Avenue during the Phase 1 project (development of Parking Structure C would still occur under the project buildout condition). In addition, the amenities building would be reduced from four stories to three stories, while the total building area for Buildings 1 and 7 would increase by approximately 2,285 sf from approximately 612,715 sf to approximately 615,000 sf. The overall Phase 1 square footage would decrease by 16,205 sf from 700,915 sf to 684,710 sf due to the decrease in height of the amenities building (see **Table 5-4, below**). Overall, Alternative D includes the following approximate square footage changes: a 2,300 sf increase in office space, a 4,600 sf decrease in public restaurant/retail space, a 13,900 sf decrease in tenant amenity space, and a 11,545 sf increase in open space.

Table 5-4. Phase 1 Precise Plan Square Footage under Alternative D

	Building 1 (sf)	Building 2 (Amenities Building) (sf)	Building 7 (sf)	Total Phase 1 (sf)
Phase 1 (Proposed Project)	317,495	88,200	295,220	700,915
Phase 1 (Reduced Underground Parking Alternative)	318,380	69,710	296,620	684,710
Change in Square Footage	885	-18,490	1,400	**-16,205**

sf = square feet

Table 5-5. Phase 1 Precise Plan Land Use Square Footage Summary under Alternative D

Land Use	Proposed Project (sf)	Reduced Underground Parking Alternative (sf)
Office/R&D	612,715	615,000
Ground Floor Restaurant/Retail	16,400	11,786
Food/Beverage (Private)[a]	9,000	5,027
Fitness Center (Private)[a]	49,000	27,949
Other[b]	13,800	24,948
Total Active Land Uses	**700,915**	**684,710**
Total Open Space[c]	**25,700**	**37,245**

Notes:

[a] The fitness center and food/beverage uses would only be available for use by the tenants of the proposed buildings under Phase 1, and not the general public.

[b] Other land uses including a community room, bike repair kiosk, lobby areas, facilities management office, building circulation (e.g., stairwells), and associated back of house areas.

[c] Tanforan Community Parklet, which would be constructed during Phase 1, would be expanded by approximately 11,545 sf with incorporation of the 80 Tanforan Avenue parcel under Alternative D.

As detailed in the Draft EIR, the proposed project would allow for vehicle parking to be provided at a ratio of a maximum of 2.2 spaces per 1,000 square feet of commercial use. However, after

release of the Draft EIR, the Specific Plan parking development standards were reduced to 1.65 striped spaces per 1,000 square feet of commercial use, with an option to incorporate valet parking up to 2.0 spaces per 1,000 square feet of commercial use. Alternative D would adhere to the reduced allowable parking Specific Plan development standards. Under Alternative D, Phase 1 would include the construction of a total of approximately 1,095 parking spaces, including 972 parking spaces in Parking Structure D, and 103 above-grade spaces in Building 2. Approximately 20 additional surface parking spaces would be located south of Southline Avenue. The long, eastern portion of the "L-shaped" campus Parking Structure C would no longer be developed as part of Phase 1, but would be constructed in future phases. In addition, unlike the proposed project, Alternative D would not include any below-grade parking levels associated with buildout of Phase 1. Phase 1 under Alternative D would provide approximately 1,095 parking spaces at or above grade in comparison to the 1,379 below-grade total parking spaces that would be provided in Phase 1 under the proposed project. Access to Parking Structure D would be provided from Southline Avenue, the same as the proposed project, but would lead to the above-ground parking structure, rather than the below-grade parking proposed under the project. Overall, reduced amounts of subterranean development would occur under Alternative D, and the total lot coverage would increase in comparison with the proposed project with the addition of the 80 Tanforan Avenue property. The total amount of impervious surfaces within the Specific Plan area would increase by approximately 89,756 sf with incorporation of the 80 Tanforan Avenue property, from approximately 897,691 sf under the proposed project to 987,447 sf under Alternative D due to the increase in the size of the Specific Plan area through incorporation of the 80 Tanforan Avenue, which is presently developed with an existing industrial warehouse building and surface parking. However, under the Alternative D proposed landscape improvements, the amount of impervious surfaces within the 80 Tanforan Avenue property would be comparable to existing conditions on the property (i.e., approximately 90 percent impervious surfaces). Overall, the amount of impervious surface area in the Specific Plan area would decrease from approximately 93 percent under existing conditions to approximately 79 percent under proposed conditions based on incorporation of proposed landscape improvements.

All other features of Alternative D would be the same as, or substantially similar to, those of the proposed project, including the potential office or R&D use, open space improvements, building design, TDM program, sustainability features, infrastructure improvements, and the proposed circulation and transportation infrastructure improvements, including the connection of Sneath Lane and Southline Avenue, the extension of Centennial Way Trail, and access improvements to the BART Station, consistent with the adopted policies of the City, City of San Bruno, C/CAG, BART, and MTC.

The construction schedule for Alternative D would be the same duration as the proposed project. In addition, the construction activities for Alternative D would be similar to the proposed project, however, there would be a few key differences. Under Alternative D, the construction of Parking Structure C would be included as part of buildout of future phases of the project rather than Phase 1. In addition, Alternative D would require substantially less sub-surface disturbance overall compared to the proposed project because no subterranean parking would be provided in Phase 1, resulting in a reduction of approximately 253,200 cubic yards (cy) of excavation volume and approximately 14,000 haul truck trips (one-way). Overall, Alternative D would result in a substantially reduced construction program.

Table 5-6 below provides estimates of the amount of new development that could be constructed at buildout under Alternative D.

Table 5-6. Projected 2030 Development under the Reduced Underground Parking Alternative

	Square footage (sf)
Existing Building Area Total	**386,184**
Industrial/Warehouse	*381,733*
Office	*4,451*
Existing to be Removed	
Phase 1 (2024)	386,184
Remaining Specific Plan Buildout	0
Total to be Removed	386,184
Total Existing to Remain	0
Proposed New Construction	
Phase 1 (2024)	684,710
Remaining Specific Plan Buildout	2,115,290
Total New Construction Proposed	**2,800,000**

Like the proposed project, Alternative D would require certain discretionary approvals for implementation, including: Specific Plan adoption, general plan amendments, zoning map and text amendments, TDM plan approval, design review, development agreement, Transportation Demand Management Plan, and precise plan(s) approval. Alternative D would also require standard City engineering, building, fire, and protected tree removal permits, along with other agency approvals (e.g., City of San Bruno, BART, Bay Area Regional Water Quality Control Board, BAAQMD, City/County Association of Governments Airport Land Use Commission, and Federal Aviation Administration).

Section 5.8.2, Ability to Meet Project Objectives

Table 5-20, p. 5-78 provides a summary of the ability of this alternative to meet the objectives of the proposed project. As shown in the table, Alternative D— Reduced Underground Parking would meet the underlying purpose of the project to create a state-of-the-art, transit-oriented commercial campus, including professional offices, R&D (including life science) uses, and supporting amenities (e.g., retail, fitness, restaurants, etc.) in proximity to BART and Caltrain stations. Alternative D would also fully meet all of the project objectives, as it would allow the same land use program and same extent of office/R&D development in the same transit-oriented location, while avoiding the need to provide underground parking in Phase 1. Alternative D would also implement the off-site improvements proposed under the project, consistent with the project objective to promote the City's ongoing development of transit-accessible corridors with high-quality development. For the same reasons, Alternative D would meet General Plan policies that encourage redevelopment and infrastructure improvements in the Lindenville Planning Sub-Area and would optimize high-quality transit-accessible development in the Specific Plan area, which is uniquely located within the Lindenville Planning Sub-Area proximate to high-quality public transit, including the San Bruno BART station and the San Bruno Caltrain station. Additionally, Alternative D would result in increased public open space with the expansion of the Tanforan Community Parklet.

Section 5.8.3, Impacts

The impact analysis below evaluates the potential environmental impacts of Alternative D and compares them to the impacts of the proposed project for each of the topics evaluated in Chapter 4, *Environmental Setting, Impacts, and Mitigation,* of this EIR. This analysis includes project impacts that were found to be significant and unavoidable, less than significant with mitigation, and (for informational purposes) less than significant with no mitigation required. This analysis does not evaluate topics for which the project was found to have no impact, as discussed in Section 4.18, *Impacts Found Not to be Significant*, of this EIR. Cumulative impacts are discussed for the cumulative impacts that were found to be significant and unavoidable for the project or Phase 1 (i.e., Impacts C-AQ-2, C-AQ-3, C-NOI-1, and C-TR-3d). Phase 1 impacts are discussed for the Phase 1 impacts that were found to be significant and unavoidable (Impact AQ-2b and Impact NOI-1a). Unless otherwise noted, the same mitigation measures identified for impact topics for the proposed project would apply to any impacts under Alternative D.

Section 5.8.3.1, Air Quality

Consistency with Applicable Air Quality Plan

The same project goals, policies, and development standards identified in 2017 Clean Air Plan would apply to Alternative D. Alternative D would generally develop the same mix of land uses as the proposed project, albeit with less subterranean parking and slightly more open space area within Tanforan Community Parklet. Alternative D would include the same sustainability features as the project. As such, Alternative D would support the *2017 Clean Air Plan* and would not conflict with its implementation. This impact would be the same as that of the project and would be less than significant. No mitigation would be required.

Construction Emissions

- Specific Plan

Like the proposed project, because the timing and intensity of future development projects are not known at this time, the precise effects of construction activities associated with buildout of the Specific Plan area under Alternative D cannot be accurately quantified. Alternative D would result in a substantially reduced construction program due to the elimination of the subterranean parking garages under Phase 1, which would reduce the overall quantity of construction emissions. However, this alternative would not eliminate the project's significant and unavoidable construction impacts, which are due to the uncertainty around future development that could occur under the Specific Plan. Thus, Mitigation Measures AQ-1 through AQ-6 would continue to apply to Alternative D. Project-level and cumulative-level impacts associated with construction criteria air pollutant emissions (Impact AQ-2a and Impact C-AQ-2) would remain significant and unavoidable under this alternative because, similar to the project, it cannot be concluded that offset programs (as required by Mitigation Measure AQ-6) would always be available in the future at the time and in the amount needed for any given future development under the Specific Plan. However, construction emission impacts would be reduced compared to the proposed project.

Phase 1

Construction of Phase 1 under Alternative D would differ compared to the proposed project, as stated in Section 5.8.1, *Description*. The following key differences would affect the amount of construction emissions.

- The long, eastern portion of the "L-shaped" campus Parking Structure C would no longer be developed as part of Phase 1, but would be constructed with buildout of future phases
- The two levels of below-grade parking under Phase 1 would no longer be developed
- The existing building at 80 Tanforan Avenue would be demolished
- Parking Structure D with six levels of above-grade parking would be constructed

Construction emissions of Phase 1 under Alternative D were quantified using the same methodology used for the proposed project. Assumptions regarding construction activities, equipment, and vehicles were updated based on the development characteristics of Alternative D. Construction dates were also updated based on the status of the EIR and anticipated entitlement schedule at the time the Alternative D analysis was conducted. Estimated unmitigated criteria pollutant emissions are presented in **Table 5-7, p. 5-44**.

Table 5-7. Estimated Unmitigated Criteria Pollutant Average Daily Emissions from Construction of Phase 1 under Alternative D (pounds/day)

				PM10		PM2.5	
Construction Year	**ROG**	**NO_x**	**CO**	**Dust**	**Exhaust**	**Dust**	**Exhaust**
2022	9	**95**	54	17	4	5	3
2023	17	**90**	100	16	4	6	4
2024	37	18	26	12	1	3	1
BAAQMD Threshold	54	54	None	BMPs	82	BMPs	54
Exceed Threshold?	No	**Yes**	N/A	—	No	—	No

Source: See **Appendix 4.2-1** for construction modeling outputs.

Notes:

Exceedances of BAAQMD thresholds are **bolded** and underlined.

ROG = reactive organic gases; NO_X = nitrogen oxide; CO = carbon monoxide; PM10 = particulate matter no more than 10 microns in diameter; PM2.5 = particulate matter no more than 2.5 microns in diameter; BAAQMD = Bay Area Air Quality Management District; BMPs = best management practices.

As shown in **Table 5-7**, construction of Phase 1 would generate NO_x emissions in excess of BAAQMD's significance threshold (a maximum of 95 pounds per day) during two years of construction and result in a potentially significant air quality impact. This impact would be reduced by approximately 25% compared to the impact for Phase 1 under the proposed project, which would also result in NO_x emissions in excess of BAAQMD's significance threshold (a maximum of 127 pounds per day) during two years of construction. Thus, Mitigation Measure AQ-2 requiring the use of at least Tier 4 final engines on construction equipment would continue to apply to Alternative D. Estimated mitigated criteria pollutant emissions are presented in **Table 5-8, p. 5-44**.

Table 5-8. Estimated Mitigated Criteria Pollutant Average Daily Emissions from Construction of Phase 1 under Alternative D (pounds/day)

				PM10		PM2.5	
Construction Year	**ROG**	**NO_x**	**CO**	**Dust**	**Exhaust**	**Dust**	**Exhaust**
2022	3	30	56	12	< 1	3	< 1
2023	8	39	88	11	< 1	4	< 1
2024	36	11	25	12	< 1	3	< 1
BAAQMD Threshold	54	54	None	BMPs	82	BMPs	54
Exceed Threshold?	No	No	N/A	—	No	—	No

Source: See **Appendix 4.2-1** for construction modeling outputs.

Notes:

ROG = reactive organic gases; NO_X = nitrogen oxide; CO = carbon monoxide; PM10 = particulate matter no more than 10 microns in diameter; PM2.5 = particulate matter no more than 2.5 microns in diameter; BAAQMD = Bay Area Air Quality Management District; BMPs = best management practices.

As shown in Table 5-8, with mitigation, construction of Phase 1, with a maximum of 39 pounds per day, would not generate emissions in excess of BAAQMD's significance threshold. This is approximately 17% less than the mitigated impact for Phase 1 under the proposed project (a maximum of 47 pounds per day). Lastly, Mitigation Measure AQ-1, required for Phase 1 under the proposed project to comply with BAAQMD's CEQA Guidelines regarding fugitive dust BMPs, would also apply to Phase 1 under Alternative D. Therefore, Phase 1-level impacts associated with construction criteria air pollutant emissions (Impact AQ-2a and Impact C-AQ-2) would be less than significant with mitigation under this alternative, and reduced compared to the proposed project.

Operation Emissions

Specific Plan

Operation of the Specific Plan, including Phase 1, under Alternative D would differ compared to the proposed project, as stated in Section 5.8.1, *Description*. The following key differences would affect the amount of operation emissions.

- Area and energy source emissions for Phase 1 would decrease slightly due to adjustments in land uses.
- Stationary source emissions would decrease as the emergency diesel generators associated with Phase 1 would be reduced from five to four (i.e., removal of generator #3 listed in **Table 4.2-5** in Section 4.2, *Air Quality*) and would use Tier 4 engines instead of higher emission-intensity standard model engines. Generator #3 would not be needed for Alternative D because ventilation fans would not be required for subterranean parking in Phase 1 given that all subterranean parking would be eliminated under the Alternative D Phase 1 development.
- Mobile source emissions and vehicle miles travelled would be comparable or slightly decrease as the expected daily traffic would decrease, as discussed in 5.8.3.14, *Transportation and Circulation*.

Operation emissions under Alternative D were quantified using the same methodology used for the proposed project except for the use of Tier 4 engine emission factors.[3] **Table 5-8, p. 5-45**, summarizes daily area-, energy-, mobile-, and stationary-source emissions generated under existing conditions (2018) and 2030 conditions with and without the Specific Plan under Alternative D. To evaluate the magnitude of the change in the air quality environment due to implementation of the Specific Plan, emissions under Specific Plan buildout in 2030 are compared to 2030 emissions without the Specific Plan.

Table 5-9. Estimated Average Daily Unmitigated Operational Emissions from the Specific Plan under Alternative D (pounds/day)

Condition/Source	ROG	NO_x	CO	PM10	PM2.5
Existing (2018)					
Area Sources	8	< 1	< 1	< 1	< 1
Energy Sources	< 1	< 1	< 1	< 1	< 1
Mobile Sources	176	268	1,369	300	83
Stationary Sources[a]	—	—	—	—	—
Total Existing[b]	184	268	1,369	300	83
2030 Without Specific Plan					
Area Sources	8	< 1	< 1	< 1	< 1
Energy Sources	< 1	< 1	< 1	< 1	< 1
Mobile Sources	91	117	797	298	81
Stationary Sources[a]	—	—	—	—	—
Total 2030 Without Project[b]	99	117	797	298	81
2030 With Specific Plan					
Area Sources	68	< 1	1	< 1	< 1
Energy Sources	2	14	12	1	1
Mobile Sources	172	222	1,512	566	153
Stationary Sources[c, d]	60	30	154	1	1
Total 2030 With Project[b]	302	266	1,679	569	156
Net Increase with Specific Plan					
2030 With Project v. 2030 Without Project[b]	203	149	882	270	75
Thresholds	54	54	—	82	54

Source: See **Appendix 4.2-1** for operations modeling outputs.

Notes:

a. No stationary sources were identified as part of existing conditions.

b. Values may not add up because of rounding.

c. Does not include emissions from generators under future Precise Plans (other than Phase 1), which are unknown at this time. Conservatively assumes the full load testing scenario for Phase 1 shown in **Table 4.2-5, p. 4.2-31**.

d. Conservatively assumes the full load testing scenario for Phase 1 shown in **Table 4.2-5, p. 4.2-31**

As shown in **Table 5-9, p. 5-46**, the net increase in emissions with the Specific Plan under Alternative D would exceed BAAQMD's project-level thresholds, similar to the proposed project.

[3] DieselNet. 2022. *United States: Nonroad Diesel Engines*. Available: https://dieselnet.com/standards/us/nonroad.php. Accessed: April 2022.

However, Alternative D would result in less ROG, NO_x, and PM emissions and more CO emissions (due to the Tier 4 engines in generators) as compared to the proposed project. This would reduce operation-related emissions impact overall, but would not eliminate the impacts. Mitigation Measure AQ-7 would continue to apply to Alternative D, but similar to the project, there is no guarantee that sufficient offsets would be available to mitigate impacts to a less-than-significant level. Therefore, Project-level and cumulative-level impacts associated with operations criteria air pollutant emissions (Impact AQ-2b and Impact C-AQ-2) would be significant and unavoidable, although their levels would be reduced compared to the proposed project's significant and unavoidable impact.

Phase 1

Operation of Phase 1 under Alternative D would differ compared to Phase 1 under the proposed project, as stated in Section 5.8.1, *Description*. The same key differences outlined above for the Specific Plan (i.e., reduction in land use area, generator usage, and vehicle traffic) would also apply to Phase 1. **Table 5-10, p. 5-47**, summarizes daily area-, energy-, mobile-, and stationary-source emissions generated under existing conditions (2018) and 2024 conditions with and without Phase 1 under Alternative D. Stationary source emissions include emissions from the testing of Phase 1's four generators and are conservatively based on the full load testing scenario of 16 hours per day (which would occur once every 36 months, as shown in **Table 4.2-5**, **p. 4.2-31**). To evaluate the magnitude of the change in the air quality environment due to implementation of Phase 1, emissions in 2024 under Phase 1 buildout in are compared to emissions in 2024 without Phase 1.

Table 5-10. Estimated Average Daily Unmitigated Operational Emissions from Phase 1 under Alternative D (pounds/day)

Condition/Source	ROG	NO_X	CO	PM10	PM2.5
Existing (2018)					
Area Sources	8	< 1	< 1	< 1	< 1
Energy Sources	< 1	< 1	< 1	< 1	< 1
Mobile Sources	176	268	1,369	300	83
Stationary Sources[a]	—	—	—	—	—
Total Existing[b]	184	268	1,369	300	83
2024 Without Phase 1					
Area Sources	8	< 1	< 1	< 1	< 1
Energy Sources	< 1	< 1	< 1	< 1	< 1
Mobile Sources[c]	114	140	951	298	81
Stationary Sources[a]	—	—	—	—	—
Total 2024 without Phase 1[b]	122	140	951	298	81
2024 With Phase 1					
Area Sources	17	< 1	< 1	< 1	< 1
Energy Sources	< 1	4	3	< 1	< 1
Mobile Sources	121	149	1,011	317	86
Stationary Sources[c, d]	60	30	154	1	1
Total 2024 with Phase 1[b]	198	182	1,168	319	88
Net Increase with Phase 1					
2024 With Phase 1 v. 2024 Without Phase 1[b]	77	42	217	21	7
Threshold	54	54	—	82	54
Exceeds Threshold?	Yes	No		No	No

Source: See **Appendix 4.2-1** for operation modeling outputs.

Notes:

a. No stationary sources were identified as part of existing conditions.

b. Values may not add up because of rounding.

c. Mobile source emissions in 2024 are lower than those in 2018 due to forecasted improvements in vehicle engine technologies and emission standards.

d. Conservatively assumes the full load testing scenario for Phase 1 of 16 hours per day.

Table 5-11, **p. 5-48**, compares daily operational emissions from Phase 1 under Alternative D's generator testing scenarios (i.e., 16 hours per day versus 2 hours per day), to assist in understanding the role of generator testing in Phase 1's operational emissions profile.

Table 5-11. Unmitigated Operational Average Daily Emissions from Phase 1 under Alternative D – Comparison of Generator Testing Scenarios (pounds/day)

Condition/Source	ROG	NO_x	CO	PM10	PM2.5
2024 Without Phase 1					
Total 2024 Without Phase 1 [a]	122	140	951	298	81
2024 With Phase 1 – Full Load Testing Scenario (16 hours/day)[b]					
Non-Stationary Sources	138	152	1,014	318	86
Stationary Sources	60	30	154	1	1
Total 2024 With Phase 1 (16-hour)[a]	198	182	1,168	319	88
2024 With Phase 1 v. 2024 Without Phase 1 (16-hour) [a]	77	42	217	21	7
Threshold	54	54	—	82	54
Exceeds Threshold?	Yes	No		No	No
2024 With Phase 1 – Normal Testing Scenario (2 hours/day)[c]					
Non-Stationary Sources	138	152	1,014	318	86
Stationary Sources	8	4	19	< 1	< 1
Total 2024 With Phase 1 (2-hour)[a]	145	156	1,033	318	86
2024 With Phase 1 v. 2024 Without Phase 1 (2-hour) [a]	24	16	83	19	6
Threshold	54	54	—	82	54
Exceeds Threshold?	No	No		No	No

Source: See **Appendix 4.2-1** for operations modeling outputs.

Notes:

[a] Values may not add up because of rounding.

[b] As shown in **Table 4.2-5**, **p. 4.2-31**, the full load testing scenario would occur once every three years.

[c] As shown in **Table 4.2-5**, **p. 4.2-31**, the normal testing scenario would occur once a month.

As shown in **Table 5-10, p. 5-47**, operation of Phase 1 under the full load (16-hour per day) generator testing scenario would result in a net increase of ROG emissions that would exceed BAAQMD's project-level thresholds. This impact would be slightly less than the impact for Phase 1 under the proposed project, which would exceed not only the ROG emission threshold but also the NO_x threshold.

Under the normal (2-hour per day) generator testing scenario, operation of Phase 1 would not exceed BAAQMD's project-level thresholds under Alternative D. This impact would be less than the impact for Phase 1 under the proposed project, which would exceed both the ROG and NO_x emission thresholds. Nonetheless, on the infrequent days when full load generator testing would occur, operation of Phase 1 under Alternative D would exceed BAAQMD's project-level thresholds, and operational criteria pollutant emissions would be potentially significant. Mitigation Measure AQ-8, which limits the testing of Phase 1 emergency generators to one generator per day, would continue to apply to Alternative D. Estimated mitigated criteria pollutant emissions are presented in **Table 5-12**, **p. 5-45**.

Table 5-12. Mitigated Operational Average Daily Emissions from Phase 1 under Alternative D – Comparison of Generator Testing Scenarios (pounds/day)

Condition/Source	ROG	NO_X	CO	PM10	PM2.5
2024 Without Phase 1					
Total 2024 Without Phase 1 [a]	122	140	951	298	81
2024 With Phase 1 – Full Load Testing Scenario (4 hours/day)					
Non-Stationary Sources	138	152	1,014	318	86
Stationary Sources	15	7	38	< 1	< 1
Total 2024 With Phase 1 (4-hour)[a]	153	160	1,053	318	87
2024 With Phase 1 v. 2024 Without Phase 1 (4-hour) [a]	31	20	102	20	6
Threshold	54	54	—	82	54
Exceeds Threshold?	No	No		No	No
2024 With Phase 1 – Normal Testing Scenario (0.5 hours/day)					
Non-Stationary Sources	138	152	1,014	318	86
Stationary Sources	2	1	5	< 1	< 1
Total 2024 With Phase 1 (0.5-hour)[a]	140	153	1,019	318	86
2024 With Phase 1 v. 2024 Without Phase 1 (0.5-hour) [a]	18	13	68	19	5
Threshold	54	54	—	82	54
Exceeds Threshold?	No	No		No	No

Source: See **Appendix 4.2-1** for operations modeling outputs.

Notes:

[a] Values may not add up because of rounding.

[b] As shown in **Table 4.2-5**, **p. 4.2-31**, the full load testing scenario would occur once every three years.

[c] As shown in **Table 4.2-5**, **p. 4.2-31**, the normal testing scenario would occur once a month.

As shown in **Table 5-12, p. 5-49**, with implementation of Mitigation Measure AQ-8, operation of Phase 1 under both the normal and full load generator testing scenarios would not result in an exceedance of any of BAAQMD's project-level thresholds under Alternative D. In contrast, the proposed project would result in exceedances of the ROG and NO_x thresholds after implementation of mitigation. Therefore, Alternative D would avoid the significant impact related to Phase 1 generator emissions that would occur under the proposed project (Impact AQ-2b and Impact C-AQ-2).

Localized Criteria Pollutants

Construction of the Specific Plan under Alternative D, inclusive of Phase 1, would generate localized fugitive dust. This impact would be the same as that of the project and would be less than significant with implementation of Mitigation Measure AQ-1.

Operation of the Specific Plan under Alternative D, inclusive of Phase 1, would elevate localized CO concentrations from continuous engine exhaust. As discussed in Section 5.8.3.14, *Transportation and Circulation*, traffic volumes at affected intersections would be slightly reduced compared to the proposed project, which would not exceed the CAAQS (see **Table 4.2-12** and **Table 4.2-13** in Section 4.2, *Air Quality*). Therefore, this impact (Impact AQ-3 and Impact C-AQ-3) would be slightly less than that of the project and would be less than significant.

Toxic Air Contaminants

Construction of the Specific Plan under Alternative D, inclusive of Phase 1, could disperse particulates containing asbestos-containing material (ACM) adjacent to the locations of sensitive receptors. Regulatory mechanisms regarding management of ACM would apply to demolition activities and ensure that impacts from ACM, if present during demolition activities, would be less than significant. Therefore, this impact would be the same as that of the project and would be less than significant.

Specific Plan

Construction of the Specific Plan under Alternative D would generate DPM that could expose adjacent receptors to significant health risks. Like the proposed project, because the timing and intensity of future development projects are not known at this time, the precise health risks of construction activities associated with buildout of the Specific Plan area under Alternative D cannot be accurately quantified. Alternative D would result in a substantially reduced construction program due to the elimination of the subterranean parking garages under Phase 1, which would reduce the overall quantity of construction emissions. However, this alternative would not eliminate the Project's significant and unavoidable construction impacts, which are due to the uncertainty around future development that could occur under the Specific Plan. Thus, Mitigation Measures AQ-1 through AQ-4, AQ-6, and AQ-9 would continue to apply to Alternative D. Project-level and cumulative-level impacts associated with construction criteria air pollutant emissions (Impact AQ-3 and Impact C-AQ-3) would remain significant and unavoidable under this alternative because, similar to the project, Mitigation Measure AQ-9 (which requires future projects within 1,000 feet of sensitive receptors to prepare health risk assessments) does not ensure that all future impacts can be mitigated to a less-than-significant level. However, construction TAC impacts would be reduced compared to the proposed project.

Operation of the Specific Plan under Alternative D would generate various ROG emissions from solvents and chemicals used in wet laboratories and process boilers in R&D buildings under the Life Sciences Scenario. Operation would also generate DPM and PM2.5 emissions from diesel-fueled generators that could expose adjacent receptors to significant health risks. This impact would be the same as that of the proposed project and would be significant and unavoidable with implementation of Mitigation Measure AQ-9.

Phase 1

Construction of Phase 1 would generate DPM and PM2.5 emissions that could expose adjacent receptors to significant health risks. **Table 5-13**, **p. 5-51**, presents the unmitigated and mitigated construction-related health risk for the maximally exposed individual receptor (MEIR) within 1,000 feet of Phase 1 construction activities. The construction MEIR is located closest to the residential property of 31 Tanforan Avenue.

Table 5-13. Phase 1 Cancer and Chronic Hazard Risks and PM.5 Concentrations during Construction Under Alternative D[a]

	Unmitigated			Mitigated[a]		
Receptor	Cancer Risk[a] (cases per million)	Non-Cancer Hazard Index	Annual PM2.5 Concentration (µg/m³)	Cancer Risk (cases per million)	Non-Cancer Hazard Index	Annual PM2.5 Concentration (µg/m³)
Maximally Exposed Individual Receptor	**83.0**	0.1	0.4	8.4	< 0.1	0.2
Significance Threshold	10.0	1.0	0.3	10.0	1.0	0.3
Exceed Threshold?	**Yes**	No	**Yes**	No	No	No

Source: See **Appendix 4.2-1** for modeling outputs and calculations.
Note: µg/m³ = micrograms per cubic meter; PM2.5 = particulate matter no more than 2.5 microns in diameter
Exceedances of BAAQMD thresholds are **bolded** and underlined.
[a] The Phase 1 mitigated results account for BAAQMD thresholds regarding fugitive dust (**Mitigation Measure AQ-1**) and 95 percent of offroad equipment with Tier 4 engines (**Mitigation Measure AQ-2**) (see Impact AQ-2a).

In an unmitigated scenario, construction of Phase 1 would result in a significant increase in cancer risk and annual PM2.5 concentrations for the maximally exposed individual receptor. As a result of these exceedances of the cancer risk and PM2.5 thresholds, mitigation measures would be required to reduce impacts. With implementation of Mitigation Measure AQ-1 and AQ-2 this impact would be reduced to less than significant and health risks would be less than those associated with the proposed project.

Operation of Phase 1 would generate DPM emissions from emergency generators that could expose adjacent receptors to significant health risks. **Table 5-14**, **p. 5-51**, presents the operations-related health risk for the MEIR within 1,000 feet of Phase 1 operations activities. The operations MEIR is located closest to the residential property of 57 Tanforan Avenue.

Table 5-14. Phase 1 Cancer and Chronic Hazard Risks and PM.5 Concentrations during Operation Under Alternative D

Receptor	Cancer Risk[a] (cases per million)	Non-Cancer Hazard Index	Annual PM2.5 Concentration (µg/m³)
Maximally Exposed Individual Receptor	0.1	< 0.1	< 0.1
Significance Threshold	10.0	1.0	0.3
Exceed Threshold?	No	No	No

Source: See **Appendix 4.2-1** for modeling outputs and calculations.
Note: µg/m³ = micrograms per cubic meter; PM2.5 = particulate matter no more than 2.5 microns in diameter
No mitigation measures are applicable to these operational results.

The cancer risk threshold defined by BAAQMD is for exposure of a maximally exposed sensitive receptor (generally within 1,000 feet) to an individual emissions source, resulting in an excess cancer risk level of more than 10 in 1 million. The approach for estimating cancer risk is based on long-term inhalation, assuming a 24-hour per day, 350-day per year, 30-year exposure for residential receptors. Accordingly, to determine the Phase 1 combined cancer risk, the risk from the 3-year-long mitigated construction period is combined with the risk from the 30-year-long

operational period. Note that the MEIR for the combined risk happens to be the same receptor identified for the construction period risk (located closest to the residential property of 31 Tanforan Avenue) but not the same receptor identified for the operational period risk. The combined cancer risk (8.47) is equal to the sum of the construction period cancer risk (8.41) plus the operational period cancer risk (0.05); numbers may not sum due to rounding. The combined cancer risk would not exceed BAAQMD's threshold of 10.0 cases per million. Therefore, this impact would be less than significant with mitigation, and slightly reduced from the proposed project's less than significant impact.

Existing nearby DPM and PM2.5 sources within 1,000 feet of the project site, along with the construction and operation at the Phase 1 site, could contribute to a cumulative health risk for existing and future sensitive receptors adjacent to and within the project site. The combined risks from mitigated construction (with implementation of Mitigation Measures AQ-1 and AQ-2) and operation of Phase 1 and ambient sources are summarized in **Table 5-15**, **p. 5-52**. The methods used to quantify risks are the same as those used for the proposed project. Note that the MEIR for the cumulative health risk analysis is different from the MEIR identified for the construction period risk and the MEIR identified for the operational period risk. This is because the cumulative MEIR's proximity to the higher-risk ambient sources (i.e., the railway and an existing stationary source) is a greater factor in determining its cumulative risk than its proximity to the lower-risk Phase 1 sources of construction and operation. The MEIR is located closest to the residential property of 1275 Herman Street.

Table 5-15. Mitigated Cumulative Health Risks from Phase 1 Under Alternative D

Source	Cancer Risk (cases per million, rounded)	Non-Cancer Hazard Index	Annual $PM_{2.5}$ Concentration ($\mu g/m^3$)
Contribution from Existing Sources[a]			
Stationary Sources	< 1	< 0.1	9.6
Roadway Sources	6	—	0.2
Rail Sources	21	—	< 0.1
Contribution from Phase 1 Construction[b]			
Maximally Exposed Individual Receptor	8	< 0.1	0.1
Contribution from Phase 1 Operation			
Maximally Exposed Individual Receptor	< 1	< 0.1	< 0.1
Cumulative Totals			
Existing + Phase 1 Construction	35	< 0.1	10.1
Existing + Phase 1 Operation	28	< 0.1	9.8
Existing + Phase 1 Construction and Operation	36	< 0.1	10.1
BAAQMD Thresholds	*100*	*10.0*	*0.8*

Source: See **Appendix 4.2-1** for modeling outputs and calculations.

Notes:

Exceedances of BAAQMD thresholds are underlined.

$\mu g/m^3$ = micrograms per cubic meter

[a] Contributions from existing sources represent the health risks within 1,000 feet of the maximum exposed receptor.

[b] Contributions from Phase 1 construction reported with implementation of **Mitigation Measures AQ-1** and **AQ-2**.

As shown in **Table 5-14, p. 5-52**, the combined PM2.5 concentration from Phase 1 construction, Phase 1 operation, and ambient sources would exceed the BAAQMD cumulative threshold. This is largely a result of the existing stationary sources—specifically, the multiple emission sources at Central Concrete Supply, Inc., an asphalt concrete plant approximately 900 feet northeast of the maximally exposed individual receptor. This facility accounts for 97 percent of the cumulative PM2.5 concentration. Therefore, for Phase 1, there is a significant cumulative impact for receptors in the project area. The contribution of Phase 1 is a very small proportion of the PM2.5 concentration, however, and below BAAQMD's project-level threshold. Therefore, while a cumulative impact exists with respect to annual PM2.5 emissions, Phase 1's contribution is considered less than cumulatively considerable. This impact (Impact C-AQ-3) would be the same as that of the proposed project.

Odor Emissions

Similar to the project, Alternative D would not result in any odor-generating land uses and would not violate BAAQMD Regulation 7. Accordingly, odor impacts under Alternative D would be the same as under the project (Impact AQ-4) and would be less than significant. No mitigation would be required.

Section 5.8.3.2, Biological Resources

Alternative D would be located on the same project site as the proposed project with the addition of the approximately 2.1-acre property located at 80 Tanforan Avenue. The existing property at 80 Tanforan Avenue is developed with an approximately 40,000 sf industrial warehouse with 13 trees and limited landscaping.[4] Eight of the 13 trees are considered protected under the City of South San Francisco's Tree Preservation Ordinance.[5] With the addition of the 80 Tanforan Avenue property, there are 175 existing trees on the project site, including 10 protected trees.

Alternative D would require slightly more demolition and tree removal than the proposed project with the addition of the 80 Tanforan property. However, no sensitive natural communities, wetlands, streams, or other aquatic features are present on 80 Tanforan that differ from the project site; 80 Tanforan is a developed parcel with approximately 78,884 sf developed with impervious surfaces of the total 87,384 sf parcel. Therefore, there would be no impacts to riparian habitat or other sensitive natural communities; state or federally protected wetlands; the movement of fish species, the use of wildlife corridors or native wildlife nursery sites for fish and terrestrial, non-avian species; or provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan similar to the proposed project. No mitigation would be required. Additionally, impacts on movement of terrestrial, non-avian species would be the same as the proposed project and would be less than significant for Alternative D.

Under Alternative D, there would be slightly increased amounts of tree removal and structure demolition than the proposed project. Therefore, impacts on peregrine falcon, roosting special-status bat species, and resident and migratory nesting birds protected under state and federal laws, and impacts on native wildlife nursery sites for birds and bats would be similar, but

[4] Urban Tree Management, Inc. 2022. Arborist Report—80 Tanforan Avenue, South San Francisco, CA, 94080. January 25, 2022.

[5] Ibid.

slightly greater than, the proposed project and would be less than significant with mitigation for Alternative D. Thus, Mitigation Measures BIO-1a and BIO-1b would continue to apply to Alternative D. Additionally, Alternative D would comply with the South San Francisco Municipal Code and San Bruno Municipal Code when conducting tree removal; therefore, impacts on local policies or ordinances protecting biological resources would be the same as that of the proposed project and would be less than significant for Alternative D.

Under Alternative D, building size, building surfaces, and operational lighting of buildings would be substantially similar as the proposed project. Therefore, impacts on the movement of migratory birds and the use of the site as a migratory bird corridor would be the same as the proposed project and would be less than significant with mitigation. Thus, Mitigation Measures BIO-2a and BIO-2b would continue to apply to Alternative D. Overall, biological resources would be less than significant with mitigation under Alternative D but slightly greater than those of the proposed project due to the 13 additional tree removals and the additional demolition proposed.

Section 5.8.3.3, Cultural Resources

Alternative D includes additional demolition and above-grade construction compared to the proposed project. Specifically, Alternative D would include the demolition of the existing building at 80 Tanforan and the construction of a six level above-grade parking structure (Parking Structure D) in its place. The existing building at 80 Tanforan was constructed in 1986 and therefore not age-eligible for consideration as a historical resource. Therefore, Alternative D's impacts on historic resources and the potential historic district would be less than significant with implementation of Mitigation Measure CR-1 and the same as those of the proposed project.

Under Alternative D the Phase 1 subterranean parking garages would not be constructed, thereby resulting in substantially less ground disturbance compared to the proposed project. Although the depth of ground disturbance and volume of excavation would be significantly less, the overall footprint of the project would be expanded and the subterranean parking garages in future phases would still be constructed. Therefore, potential impacts to archaeological resources and human remains would still occur under Alternative D, and implementation of Mitigation Measures CR-2a, CR-2b, and CR-3, would continue to apply to this alternative. Overall, impacts would be less than significant with mitigation and reduced compared to the proposed project.

Section 5.8.3.4, Energy

Unlike the proposed project, Alternative D would also include the demolition of the existing building located at 80 Tanforan Avenue and the construction of a six-level, above-grade parking structure (Parking Structure D) in its place. With Parking Structure D, the two-levels of subterranean parking associated with buildout of Phase 1 under the proposed project would be eliminated, and the entirety of Parking Structure C would be constructed in future phases, rather than partially constructed during Phase 1, as proposed under the project. Accordingly, total construction activity under Phase 1 would be reduced, which would reduce the amount of energy consumed during construction-related activities. Specifically, construction of Phase 1 would require approximately 749 mBTUs of electricity under Alternative D, compared to the approximately 789 mBTUs of electricity that would be consumed under the proposed project. While Alternative D would reduce construction-related energy consumption, it would not

eliminate the impact entirely, thus, Mitigation Measure GHG-1 would still apply. Overall, construction of Alternative D would consume less energy and would have a lesser impact than the proposed project's project-level and cumulative-level energy impacts, which would be less than significant with mitigation.

Operation of Alternative D would result in similar operations-related energy usage and consumption compared to the proposed project given that the total developed square footage remains the same under Alternative D and the project. As with the project, Alternative D would be designed to meet LEED version 4 Silver rating, water efficient devices and landscaping, passive heating and cooling design strategies, on-site recycling and composting facilities, electric vehicle charging infrastructure, and TDM measures. Overall building square footage would be comparable or slightly reduced, as would operational vehicle trip generation. Consequently, project-level and cumulative-level operational energy impacts under Alternative D would be slightly reduced compared to the impacts of the proposed project, and still less than significant. No mitigation would be required.

Section 5.8.3.5, Geology and Soils

Under Alternative D the Phase 1 subterranean parking garages would not be constructed, resulting in substantially less ground disturbance compared to the proposed project. Although, the depth of ground disturbance and volume of excavation would be significantly less, the overall footprint of the project would be expanded and the subterranean parking garages in future phases would still be constructed.

Because Alternative D would be constructed at the same location as the proposed project, with only a slight extension to the south, the distance to seismic sources and underlying sediments would be the same as for the proposed project. Therefore, impacts related to surface fault rupture, strong seismic ground shaking, and seismic-related ground failure, including liquefaction and landslide, would be the same as the proposed project. In addition, because Alternative D would be constructed on the same underlying sediments as the proposed project, impacts related to expansive soils would be the same as the proposed project.

Because Alternative D would be constructed at the same general location and groundwater is close to ground surface, even though Alternative D would involve shallower excavation in the Phase 1 site, it would nevertheless encounter groundwater and require temporary dewatering and shoring during construction. The extent of dewatering and shoring would be less under Alternative D than under the proposed project. Because Alternative D would be constructed on the same underlying sediments as the proposed project, there would be a potential for static settlement. While structural loads are not currently known for Parking Structure D, they are expected to be typical of similar structures, and due to the onsite soil composition, potential for significant differential seismic settlement is considered low.[6]

Alternative D, like the proposed project, would connect to South San Francisco's sewer and stormwater collection and treatment system and would not involve use of septic tanks or alternative wastewater disposal system. The impact relating to soils incapable of supporting alternative wastewater systems would be the same as under the proposed project.

[6] Cornerstone Earth Group. 2022. Preliminary Geotechnical Investigation, Southline Development Parcel 8, 80 Tanforan Avenue, South San Francisco California. Project Number 129.3.9. January 12, 2022.

As Alternative D would not include the Phase 1 subterranean parking garages, and Parking Structure D would be constructed at-grade, this alternative would involve excavation to a shallower maximum depth than the proposed project, although it would include a larger overall footprint. Because the sensitive Colma Formation extends to a shallow depth, and 80 Tanforan is also known to be underlain by Colma Formation,[7] this alternative has potential to disturb paleontological resources. However, because Alternative D would involve shallower excavation than the proposed project, it has correspondingly less likelihood of encountering these resources. The same mitigation to reduce impacts on paleontological resources would be required under Alternative D as under the proposed project.

Overall, project-level and cumulative impacts related to geology, soils, and seismicity as well as impacts on paleontological resources would be less than significant with mitigation under Alternative D, and reduced compared to those of the proposed project.

Section 5.8.3.6, Greenhouse Gas Emissions

Construction Emissions

Specific Plan

Like the proposed project, because the timing and intensity of future development projects are not known at this time, the precise effects of construction activities associated with buildout of the Specific Plan area under Alternative D cannot be accurately quantified. Alternative D would result in a substantially reduced construction program, which would reduce the overall quantity of construction emissions. The air district recommends evaluating whether construction activities would conflict with statewide emission reduction goals and implementing feasible BMPs. If a project does not implement feasible BMPs, it is anticipated that it would conflict with statewide emissions goals. Therefore, construction-related GHG emissions from the Specific Plan under Alternative D would be required to comply with Mitigation Measure GHG-1, which would reduce construction emissions, consistent with BAAQMD guidance and statewide emission reduction goals, to less than significant. This impact (Impact GHG-1a) would be less than significant with mitigation, similar to the proposed project, but would be reduced compared to the project due to the reduction in overall emissions (refer to Phase 1 analysis below).

Phase 1

Construction of Phase 1 under Alternative D would differ compared to the proposed project, as stated in Section 5.8.1, *Description*. The following key differences would affect the amount of construction emissions.

- The long, eastern portion of the "L-shaped" campus Parking Structure C would no longer be developed as part of Phase 1, but would be constructed with buildout of future phases
- The two levels of below-grade parking under Phase 1 would no longer be developed
- The existing building at 80 Tanforan Avenue would be demolished
- Parking Structure D with six levels of above-grade parking would be constructed

[7] Atlas. ND. Limited Phase II Environmental Site Assessment Report: 80 Tanforan Avenue, South San Francisco, California, Atlas Project No. NPGS2129. July 28, 2020.

Construction emissions of Phase 1 under Alternative D were quantified using the same methodology used for the proposed project. Assumptions regarding construction activities, equipment, and vehicles were updated based on the development characteristics of Alternative D. Construction dates were also updated based on the status of the EIR and anticipated entitlement schedule at the time the Alternative D analysis was conducted. Estimated unmitigated GHG emissions are presented in **Table 5-15, p. 5-56**.

Table 5-15. Estimated Construction GHG Emissions from Phase 1 under Alternative D (metric tons)

Construction Year	CO_2	CH_4	N_2O	CO_2e
2022	1,958	< 1	< 1	2,012
2023	2,767	1	< 1	2,818
2024	768	< 1	< 1	780
Total[a]	**5,492**	**1**	**< 1**	**5,610**

Source: Refer to **Appendix 4.2-1** for construction modeling outputs.
Notes:
[a] Totals may not add up because of rounding.

While GHG emissions from construction of Phase 1 under Alternative D would be less than the proposed project, BAAQMD has not established a quantitative threshold for assessing construction related GHG emissions and therefore the emissions quantity is not relevant to the impact analysis. Rather, the air district recommends evaluating whether construction activities would conflict with statewide emission reduction goals and implementing feasible BMPs. Construction-related GHG emissions from Phase 1 under Alternative D would be mitigated to less than significant with implementation of Mitigation Measure GHG-1. Therefore, construction-related GHG emissions from the Specific Plan under Alternative D would be required to comply with Mitigation Measure GHG-1, which would reduce construction emissions, consistent with BAAQMD guidance and statewide emission reduction goals, to less than significant. This impact (Impact GHG-1a) would be less than significant with mitigation, similar to the proposed project, but would be reduced compared to the project due to the reduction in overall emissions.

Operation Emissions

Specific Plan

Operation of the Specific Plan, including Phase 1, under Alternative D would differ compared to the proposed project, as stated in Section 5.8.1, *Description*. The following key differences would affect the amount of operation emissions.

- Energy source emissions for Phase 1 would decrease slightly due to adjustments in land uses.
- Stationary source emissions would decrease as the emergency diesel generators associated with Phase 1would be reduced from five to four (i.e., removal of generator #3 listed in **Table 4.2-5** in Section 4.2, *Air Quality*)
- Mobile source emissions and vehicle miles travelled would be comparable or slightly decrease as the expected daily traffic would decrease, as discussed in 5.8.3.14, *Transportation and Circulation*

Operation emissions under Alternative D were quantified using the same methodology used for the proposed project. **Table 5-16**, **p. 5-58**, summarizes daily area-, energy-, mobile-, and stationary-source emissions generated under existing conditions (2018) and 2030 conditions with and without the Specific Plan under Alternative D. Emissions under Specific Plan buildout in 2030 are compared to 2030 emissions without the Specific Plan.

Table 5-16. Estimated Annual Specific Plan Operational GHG Emissions under Alternative D (Office Scenario) (metric tons)

Condition/Source	CO_2	CH_4	N_2O	CO_2e	% of Total CO_2e
Existing (2018)					
Area sources	< 1	< 1	< 1	< 1	< 0.1%
Energy sources	346	< 1	< 1	347	0.9%
Mobile sources	37,643	2	2	38,282	98.2%
Stationary sources[a]	0	0	0	0	0.0%
Waste generation	63	4	< 1	155	0.4%
Water consumption	117	2	< 1	196	0.5%
Land use	-128	0	0	-128	-0.4%
Total existing[b]	38,169	8	2	38,981	—
2030 without Project					
Area sources	< 1	< 1	< 1	< 1	< 0.1%
Energy sources	140	< 1	< 1	141	0.5%
Mobile sources	30,126	1	1	30,567	99.0%
Stationary sources[a]	0	0	0	0	0.0%
Waste generation	63	4	< 1	155	0.5%
Water consumption	55	2	< 1	134	0.4%
Land use	-128	0	0	-128	-0.4%
Total 2030 without Specific Plan[b]	30,384	7	1	30,998	—
2030 with Project					
Area sources	< 1	< 1	< 1	< 1	< 0.1%
Energy sources	2,880	< 1	< 1	2,897	4.6%
Mobile sources	57,172	2	3	58,009	92.6%
Stationary sources	177	< 1	< 1	178	0.3%
Waste generation	591	35	< 1	1,464	2.3%
Water consumption	125	13	< 1	537	0.9%
Land use	< 1	< 1	< 1	-432	< 0.1%
Total 2030 with Specific Plan[b]	60,946	50	3	62,653	—
Net Increase with Project					
2030 with Project vs. 2030 without Project	30,689	43	< 1	31,784	

Source: Refer to **Appendix 4.2-1** for operation model outputs and mobile emissions calculations.
Notes: CO_2 = carbon dioxide; CH_4 = methane; N_20 = nitrous oxide; CO_2e = carbon dioxide equivalent
a. No stationary sources were identified as part of existing conditions.
b. Values may not add up because of rounding.

Operation of the Specific Plan under Alternative D would result in comparable or slightly reduced operation-related GHG emissions compared to the proposed project (36,818 MT CO2e per year versus 37,739 MT CO2e per year). Furthermore, emissions from emergency generator testing (178 MT CO_2e per year) would be well below BAAQMD's stationary-source threshold (10,000 MT CO_2e per year). Accordingly, Project-level and cumulative-level operations GHG impacts under Alternative D (Impact GHG-1b and Impact C-GHG-1) would be less than significant and less than those of the proposed project. No mitigation would be required.

Phase 1

Operation of the Phase 1 under Alternative D would differ compared to the proposed project, as stated in Section 5.8.1, *Description*. The same key differences outlined above for the Project (i.e., reduction in land use area, generator usage, and vehicle traffic) would also apply to Phase 1. **Table 5-17**, **p. 5-61**, summarizes by source emissions generated under existing conditions (2018) and 2024 conditions with and without Phase 1.

Table 5-17. Estimated Annual Unmitigated Phase 1 Operational GHG Emissions under Alternative D (metric tons)

Condition/Source	CO_2	CH_4	N_2O	CO_2e	% of Total CO_2e
Existing (2018)					
Area sources	< 1	< 1	< 1	< 1	< 0.1%
Energy sources	346	< 1	< 1	347	0.9%
Mobile sources	37,643	2	2	38,282	98.2%
Stationary sources[a]	0	0	0	0	0.0%
Waste generation	63	4	< 1	155	0.4%
Water consumption	117	2	< 1	196	0.5%
Land use	-128	0	0	-128	-0.4%
Total existing[b]	38,169	8	2	38,981	—
2024 without Phase 1					
Area sources	< 1	< 1	< 1	< 1	< 0.1%
Energy sources	182	< 1	< 1	183	0.5%
Mobile sources	33,045	2	2	33,544	99.3%
Stationary sources[a]	0	0	0	0	0.0%
Waste generation	63	4	< 1	155	0.5%
Water consumption	68	2	< 1	147	0.4%
Land Use	-237	0	0	-237	-0.7%
Total 2024 without Phase 1[b]	33,121	8	2	33,793	—
2024 with Phase 1					
Area sources	< 1	< 1	< 1	< 1	< 0.1%
Energy sources	735	< 1	< 1	739	2.0%
Mobile sources	35,142	2	2	35,673	96.5%
Stationary sources	177	< 1	< 1	178	< 0.1%
Waste generation	195	12	< 1	483	1.3%
Water consumption	30	3	< 1	131	< 0.1%
Land Use	-237	0	0	-237	-0.6%
Total 2024 with Phase 1[b]	36,280	16	2	36,967	—
Net Increase with Phase 1					
2024 with Phase 1 vs. 2024 without Phase 1[b]	2,922	9	< 1	3,173	—

Source: Refer to **Appendix 4.2-1** for operation model outputs and mobile emissions calculations.
Notes: CO_2 = carbon dioxide; CH_4 = methane; N_20 = nitrous oxide; CO_2e = carbon dioxide equivalent
a. No stationary sources were identified as part of existing conditions.
b. Values may not add up because of rounding.

Operation of Phase 1 under Alternative D would result in comparable or slightly reduced operation-related GHG emissions compared to the proposed project (8,081 MT CO2e per year versus 10,912 MT CO2e per year). Furthermore, emissions from emergency generator testing (178 MT CO_2e per year) would be well below BAAQMD's stationary-source threshold (10,000 MT CO_2e per year). Accordingly, Phase 1-level and cumulative-level operations GHG impacts under Alternative D (Impact GHG-1b and Impact C-GHG-1) would be less than significant and less than those of the proposed project. No mitigation would be required.

Consistency with Applicable GHG Plans

As stated in Section 5.8.1, *Description*, Alternative D would implement the same design features, sustainability features, and open space and pedestrian connections within the Specific Plan area as the proposed project. The Project would be consistent with the applicable GHG plans with implementation of Mitigation Measure GHG-1 and Mitigation Measure AQ-4. Phase 1 would be consistent with the applicable GHG plans with implementation of Mitigation Measure GHG-1. These impacts (Impact GHG-2) would be the same as those of the proposed project.

Section 5.8.3.7, Hazards and Hazardous Materials

Alternative D would have a larger footprint than the proposed project, increasing by 2.1 acres; however, the alternative would have the same utility and road improvements and same permitted land use options as the proposed project. Excavation under Alternative D would be shallower and less extensive, as all the subterranean parking associated with Phase 1 would be eliminated, and Parking Structure D would be constructed at-grade. Although Alternative D would require less ground disturbance, it would still require the routine handling of hazardous materials. As such, handling of hazardous materials would still be subject to applicable regulations for both construction and operation. Furthermore, operational use of hazardous materials under the Life Sciences Scenario would be similar to the proposed project. Therefore, Life Science/R&D tenants would still be required adhere to all applicable federal, state and local regulations and apply for applicable permits for regulated substances. Impacts associated with the routine transport, use, or disposal of hazardous materials would be less than significant.

Although excavation would be shallower and less extensive, Alternative D would be constructed within the larger footprint than the proposed project and therefore, the potential to encounter contaminated soil and/or groundwater during ground disturbance and hazardous building materials during demolition would still exist, although to a lesser extent given reduction in subterranean excavation compared to the project. As with the proposed project, future development associated with Alternative D would be required to implement recommendations included in various site-specific investigations conducted within the project footprint (prior investigations are detailed in Section 4.8, *Hazards and Hazardous Materials,* of this EIR). A Phase II Environmental Site Assessment (ESA) prepared for the parcel at 80 Tanforan Avenue identified risks associated with potential soil and groundwater contamination, similar to the known hazards present on the remaining project site.[8] As there is a potential for exposure to contaminated soil, contaminated groundwater and hazardous building materials under Alternative D, including within the 80 Tanforan Avenue parcel, implementation of Mitigation Measures HAZ-2a through HAZ-2c and HWQ-1 would still be required. Development would also be required to adhere to deed restrictions and DTSC oversight as part of 160 South Linden Avenue. Impacts associated with foreseeable upset and accident conditions involving the release of hazardous materials and Alternative D being located on a Cortese List site would be less than significant.

Alternative D would be implemented in the same general area as the proposed project. As shown in Figure 4.10-1, *ALUCP Safety Compatibility Zones*, 80 Tanforan Avenue, like the vast

[8] Atlas. ND. Limited Phase II Environmental Site Assessment Report: 80 Tanforan Avenue, South San Francisco, California, Atlas Project No. NPGS2129. July 28, 2020.

majority of the Project Site, is not located within any identified Safety Compatibility Zone. Development would be subject to the same ALUCP compatibility criteria as the proposed project, including noise and height restrictions described under Impact HAZ-5 in Section 4.8, *Hazards and Hazardous Materials,* of this EIR. Impacts associated with aviation hazards and excessive noise as a result of Alternative D being located near an airport would be less than significant.

Construction activities would be similar in nature to the proposed project, and thus, construction under Alternative D would still require compliance with City requirements regarding circulation and access and would also require a final inspection by the South San Francisco Fire Department prior to use of the buildings. Similar to the proposed project, R&D tenants under the Life Sciences Scenario under Alternative B would be required to adhere to all applicable regulations (as described under Impact HAZ-6 in Section 4.8, *Hazards and Hazardous Materials,* of this EIR). Adherence to applicable regulations and plans would ensure proper emergency response and evacuation if a release of hazardous materials would occur. Moreover, off-site improvements would also occur as part of Alternative D – consisting of roadways, sidewalks, and utility easements along roadways surrounding the project site – and would improve roadway circulation and adjacent intersections, resulting in improved access to the project site and the surrounding area. Therefore, impacts associated with impairment or interference of an adopted emergency response plan or emergency evacuation plan would be less than significant.

Alternative D would be developed within a slightly larger footprint than the proposed project. Thus, Alternative D would be constructed in a highly developed industrial area, with no wildlands nearby and would not be susceptible to significant risk of loss, injury or death involving wildland fires. No impact involving wildland fires would occur.

Overall, like the proposed project, project-level and cumulative impacts to hazards and hazardous materials would be less than significant with mitigation under Alternative D, and reduced compared to the proposed project due to the reduced extent of ground disturbance.

Section 5.8.3.8, Hydrology and Water Quality

Under Alternative D, excavation would be shallower and less extensive, as the two levels of subterranean parking south of Southline Avenue would no longer be required for buildout of Phase 1 in comparison to the proposed project. In addition, the overall footprint of the project would be expanded slightly to incorporate the 80 Tanforan Avenue property. New stormwater facilities associated with Phase 1 development would be constructed along a portion of the proposed Southline Avenue, and would connect to the existing 42-inch storm drain within Tanforan Avenue through a new public storm drain line and easement to be installed with buildout of Phase 1. With this improvement, proposed stormwater facilities under the proposed project would no longer connect from Dollar Avenue to the existing facilities within Tanforan Avenue. In addition, with the development of Parking Structure D, the drainage pattern on site would change slightly and more drainage would occur in the northern portion of the project site as shown in Figure 4-3: Conceptual Storm Drainage Improvement Plan of the revised Specific Plan. Otherwise, Alternative D would have the same general footprint as well as the same utility improvements and roads as the proposed project. In addition, Alternative D would be constructed at the same location as the proposed project, along with addition of the 80 Tanforan Avenue property. Furthermore, Alternative D would be subject to the same hydrology and water

quality regulatory requirements as the proposed project. Therefore, based on the Alternative D site location and proposed improvements, impacts related to conflicting or obstructing a water quality control plan or sustainable groundwater management plan would be the same as the proposed project.

Because Alternative D would be constructed at the same location as the proposed project, surface water features, water quality conditions, the underlying groundwater basin and conditions, and flood hazards would be the same as for the proposed project. The total amount of impervious surfaces within the Specific Plan area would increase by approximately 89,756 sf with incorporation of the 80 Tanforan Avenue property, from approximately 897,691 sf under the proposed project to 987,447 sf under Alternative D. This is due to the increase in the size of the Specific Plan area. However, with the proposed landscape improvements, the proposed amount of impervious surfaces within the 80 Tanforan Avenue property would be comparable to existing conditions on the property (i.e., approximately 90 percent impervious surfaces). Overall, the amount of impervious surface area in the Specific Plan area would decrease from approximately 93 percent under existing conditions to approximately 79 percent under proposed conditions. In addition, Alternative D would be subject to the same BMPs, LID, and hydrology and water quality regulatory requirements as the proposed project. Therefore, impacts related to water quality, alterations in drainage patterns, flooding, or release of pollutants due to project inundation would be less than significant and similar to the proposed project

Although Alternative D would involve less excavation than the proposed project, it would be constructed at the same location as the proposed project, where groundwater is close to the ground surface (i.e., approximately 8 to 27 feet below ground surface). It is likely that groundwater would be encountered and require temporary dewatering during construction of Alternative D. The extent of dewatering would be less under Alternative D than under the proposed project, as Phase 1 would no longer require dewatering since no subterranean parking garages would be constructed (dewatering would still be required during future phases). However, the same mitigation as the proposed project would be required to reduce impacts on groundwater quality during construction dewatering. Therefore, with implementation of Mitigation Measure HWQ-1, impacts on water quality under Alternative D would be less than significant with mitigation and reduced compared to the proposed project. Under Alternative D, Mitigation Measure HWQ-1 would only be required during future phases proposing subterranean parking.

In addition, because infrastructure improvements associated with Alternative D would be similar to those described for the proposed project, impacts related to changes in impervious cover, groundwater recharge, peak storm drain flow, and flood hazards would also be the same. Alternative D, like the proposed project, would connect to South San Francisco's stormwater collection and treatment system. The impact relating to alterations in drainage patterns resulting in erosion or flooding or exceeding the drainage system capacity would be the same as under the proposed project.

Overall, project-level and cumulative impacts to hydrology and water quality would be less than significant with mitigation under Alternative D, and reduced compared to the impacts of the proposed project due to the reduced extent of ground disturbance and excavation.

Section 5.8.3.9, Land Use and Planning

The existing building at 80 Tanforan is an approximately 43,000 sf industrial warehouse located on an approximately 2.1-acre parcel that is designated as an office use under the City's General Plan and zoned Business Professional Office (BPO), which is consistent with the designations and general uses of the other existing properties on the project site.

Alternative D would have the same land use impacts with incorporation of the property located at 80 Tanforan Avenue into the Specific Plan area. The Reduced Underground Parking Alternative would slightly reduce the density at which the program would occur under Phase 1, but would still involve the same land use program and permitted uses for both Phase 1 and future phases proposed under the Specific Plan. With the incorporation of the 80 Tanforan Avenue property, the proposed project would not result in a new impact related to the physical division of a community as the overall project layout would remain the same and there are no existing residential or community uses associated with the building at 80 Tanforan Avenue. Alternative D would help to further certain City of South San Francisco General Plan policies aimed at maximizing land uses and enhancing transportation capacity, such as policies 2-G-2, 2-G-3, 2-G-8, or 4.2-G-1 (see Section 4.10.3.4, in Section 4.10, *Land Use and Planning*, of the Draft EIR for a full description of land use policies), as it would continue to incorporate the same circulation and connectivity infrastructure improvements as the proposed project, while maximizing land uses. Therefore, Alternative D would not result in an environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect. Alternative D impacts related to land use and planning would be less than significant, and similar to those of the proposed project.

Section 5.8.3.10, Noise and Vibration

Daytime Construction Noise. Alternative D would involve the expansion of the Specific Plan buildout area to incorporate the property at 80 Tanforan Avenue. Although the footprint of the overall construction activities would change, construction activities would take place no closer to off-site sensitive land uses (e.g., near residences south of Tanforan Avenue) than would occur under the project. In addition, the types of equipment required and the intensity of construction activity near off-site noise-sensitive uses would also be similar, and the construction schedule for Alternative D would be shorter than the proposed project due to the substantial reduction in excavation required under this alternative. As is the case with the proposed project, construction that occurs during the "daytime hours" defined by the City of San Bruno and the City of South San Francisco would comply with local standards and would result in less-than-significant noise impacts for Alternative D.

Non-Daytime Construction Noise. Since construction outside of defined "daytime hours" for San Bruno and South San Francisco would be expected for Alternative D (as is the case with the proposed project), construction noise for the Specific Plan and for Phase 1 during nighttime hours may be in excess of the applicable criteria for both jurisdictions. As is the case for the proposed project, nighttime construction noise impacts would be considered significant for Alternative D during Phase 1 and for the project as a whole. Implementation of Mitigation Measure NOI-1a, which includes measures to reduce construction noise levels, but not to a less-than-significant level for the reasons stated in the project analysis in Section 4.11, *Noise*, of this EIR. Therefore, Alternative D would reduce but would not avoid the significant and unavoidable

project-level and cumulative impacts associated with construction noise for Phase 1 and the project (Impact NOI-1a and Impact C-NOI-1).

Construction Haul Truck Noise. With regard to construction haul truck noise, Alternative D would result in approximately 14,000 fewer haul truck trips (one-way) than the proposed project and would use the same haul routes as the project. In addition, on a worst-case day, the expected daily haul trucks for Alternative D would be similar to the number expected for the project. Therefore, as is the case with the proposed project, temporary noise impacts related to haul truck use for the Specific Plan and for Phase 1 would be less than significant and less than the impacts of the proposed project.

Loading Activity Noise. Loading dock activity under Alternative D would be similar to loading dock activity under the project, with up to 12 heavy trucks using the Phase 1 loading bays (i.e., the closest loading docks to off-site sensitive uses) for loading/unloading activities on a given day. As with the project, it is estimated that up to four loading or unloading activities would occur per day at each loading bay. With the Project, it was assumed that up to eight total per day could occur at the Building 2 loading bays because of the existence of 2 bays at this dock. Since the two loading bays located at Building 1 under the project would no longer be located adjacent to one another, activity at each of these loading docks would be halved as compared to the project (i.e., half of the 8 trips occurring at each of the two bays). As with the project, it is unlikely that there would be more than one truck loading or unloading at a given loading dock during a single hour.

Note that under existing conditions, part of the southernmost portion of the project site is currently occupied by a warehouse and distribution center (Watchpoint Logistics, Inc.). This use involves much higher volumes of daily loading and unloading activities at these existing loading docks near Tanforan Avenue than would occur with the proposed project or Alternative D implementation. Specifically, approximately ten loading bays for large trucks are currently located less than 200 feet north of the nearest residence along Tanforan Avenue. More frequent loading occurs at this location under existing conditions than would occur with project implementation or Alternative D implementation. In addition, this warehouse and distribution center is currently accessed from a driveway along Tanforan Avenue. With project implementation or Alternative D implementation, vehicles (including trucks) would no longer travel along Tanforan Avenue (south of the Project site) to access the project site. They would instead access the project loading bays via Southline Avenue (to the north of the Phase 1 area). In addition to the above warehouse and distribution center, a used car buying and selling company (Shift) is located near Watchpoint Logistics, Inc. along the southern perimeter of the project site under existing conditions. This use also is accessed from a driveway along Tanforan Avenue and involves the frequent entrance and exit of automobiles from the project site to Tanforan Avenue throughout a given day, which generates noise. Watchpoint Logistics and Shift would no longer be located on the Project site under project or Alternative D conditions.

Under Alternative D, the two loading bays associated with Building 1 would be relocated such that they are slightly closer to off-site residences south of Tanforan Avenue as compared with the project. Under the project, the nearest sensitive receptor to the Building 1 loading bays (2 bays located at a single dock) would be located more than 250 feet from the loading dock. Under Alternative D, one of the loading bays at Building 2 loading dock would be located approximately 230 feet north of the nearest residences along Tanforan Avenue, and one at Building 1 would be located approximately 100 feet north of these residences. As described

previously, approximately half of the volume of loading activity would occur at each bay under Alternative D than would occur under the Project (since two bays were located at a single loading dock under the Project). In addition, under both the project and Alternative D, far fewer loading and unloading activities would occur in this area than currently occur under existing conditions.

Regarding the Building 2 loading dock under Alternative D, the location for this dock is fully shielded by Building 2 from the nearest off-site residences. Noise from this loading dock would not be expected to result in substantial increases to the ambient noise level at the nearest residences. In addition, although the Building 1 loading dock under Alternative D would be located closer to residences than analyzed under the Project, daily loading activities at this loading bay would be half of what is expected at the Building 1 loading bays with proposed project's implementation (an estimated 4 activities per day instead of 8).

Overall, as is the case for the proposed project, although there may be a direct line of sight between some nearby residences and some loading dock areas, the temporary loading and unloading activities at the Phase 1 buildings (up to 4 heavy trucks per day per dock) would be short term and occur intermittently and occurring only during daytime hours when people are generally less sensitive to noise. In addition, more frequent loading and unloading activities currently occur at the existing site due to the existence of the Watchpoint Logistics warehouse and distribution use, in addition to the adjacent car distribution use. Therefore, project and Alternative D implementation would not result in an increase in loading and unloading activities at the site, and would instead result in a decrease in these activities at the site. For these reasons, and as was the case for the proposed project, the temporary and short-term increases in noise from project loading activities would not be considered substantial. Impacts related to loading dock noise from Alternative D would be less than significant.

Operational Traffic Noise. During operations, Alternative D is expected to generate a similar, though slightly lower, number of vehicle trips as the proposed project. Therefore, traffic noise impacts from Alternative D would be comparable or slightly reduced to those disclosed for the project. As project-related traffic noise impacts were determined to be less than significant, traffic noise impacts from Alternative D would also be less than significant.

Operational Noise from Gathering Spaces. Noise from outdoor gathering spaces during project operations would be the same as the proposed project and would be less than significant, as there would be no changes to the proposed land uses or outdoor gathering areas that could host outdoor events. Furthermore, these areas would remain screened by surrounding proposed buildings. The expansion of Tanforan Community Parklet would not result in greater noise impacts since that space would be used for passive recreation uses.

Mechanical Equipment Noise. Under Alternative D, the types and amount of mechanical equipment (e.g., heating, cooling and ventilation equipment, etc.) would be similar. In addition, Parking Structure D would have a mechanical equipment room with relatively similar equipment to that evaluated under the Project (i.e., pumps and electrical equipment). However, the equipment would be no closer to adjacent sensitive land uses than analyzed under the project, and would therefore result in similar noise levels at nearby sensitive uses to those presented in the project analysis.

Although the makes and models of the equipment at Parking Structure D, and at other Specific Plan buildings, is not known with certainty at this time, noise from this equipment would be

similar to that evaluated for proposed project. As is the case with the proposed project, noise mechanical equipment at the project site may exceed the daytime and nighttime thresholds outlined in the Municipal Codes of the City of South San Francisco and the City of San Bruno and at nearby buildings. Implementation of project Mitigation Measure NOI-1c, which requires a mechanical equipment noise reduction plan for equipment installed under all phases, would be required under Alternative D and would reduce this impact to less than significant levels for this alternative.

Parking Garage Activity. Alternative D would include the development of Parking Structure D (in lieu of the Phase 1 subterranean parking and partial development of Parking Structure C), located in the southeast portion of the Phase 1 area. Access to Parking Structure D would be provided by Southline Avenue. The garage will utilize gate arms with card key access, and is anticipated to be open 24 hours per day and 7 days a week to Specific Plan tenants, but the typical operation of the garage is anticipated to occur during normal business hours with limited after-hours usage. According to the Project traffic engineer,[9] it is estimated that during a peak hour, up to 450 vehicles may enter or exit the garage. Traffic-related noise associated with Parking Structure D can be estimated based on this information.

The nearest noise-sensitive land uses are the residences located approximately 100 feet south of the southern perimeter of Parking Structure D, or approximately 200 feet from the center of the parking structure. The distance to the center of the parking structure is used because it represents the average location of all vehicles circulating in and out of the structure at any given time.

According to FTA's *Transit Noise and Vibration Impact Assessment Manual*,[10] 1,000 cars in a peak activity hour would generate a sound equivalent level (SEL) of 92 dBA at 50 feet. This value was converted to an hourly L_{eq} (average) noise level and used to calculate the L_{eq} noise level of a maximum of 450 vehicles per hour using the parking garage. At a distance of 50 feet, 450 vehicles using the garage per hour (conservatively assuming all vehicles were located close to one another within the multi-story structure) would result in an hourly L_{eq} noise level of 53 dBA L_{eq}. At a distance of 200 feet, the distance to the nearest residential land use from the approximate center of the structure, this would be reduced to 41 dBA L_{eq} without accounting for shielding from intervening buildings. A two- to eight-foot-tall crash wall would be located around the perimeter of the garage, as would decorative panels and screens (along Tanforan and Dollar Avenue frontages), as well as landscaping. In areas where a solid perimeter wall is located at a given floor of the parking structure, noise from automobiles in the garage is anticipated to be further reduced.

These noise levels associated with Parking Structure operations are well below all estimated existing ambient noise levels in the project area, as shown in **Table 4.11-6, p. 4.11-10** in Section 4.11, *Noise*. For example, the existing ambient noise along Huntington Avenue south of Sneath Lane (estimated from traffic noise levels) was approximately 64 dBA L_{dn} and along Dollar Avenue near Tanforan Avenue was estimated from traffic volumes to be approximately 60.8 L_{dn}. Existing ambient noise along Tanforan Avenue was estimated to be 58.6 L_{dn}. Parking lot noise in

[9] Jacobson, Daniel. Pers. Comm. Email to Heidi Mekkelson on February 15, 2022.

[10] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, FTA Report No. 0123, 2018, https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf, accessed August 10, 2020.

this area from Parking Structure D activity would therefore be below the estimated existing ambient noise levels. Because parking structure noise would not be expected to perceptibly increase ambient noise levels at nearby sensitive receptors under Alternative D, parking garage activity noise impacts would be less than significant for Alternative D.

Emergency Generator Testing Noise. With regard to emergency generator testing, Alternative D would include one fewer emergency generator. However, the Building 1 generator may be relocated to be slightly closer to the residences south of Tanforan Avenue. Specifically, the proposed location for the 1,250 kW Building 1 generator under Alternative D would be approximately 130 feet north of the nearest residences. Therefore, unattenuated noise levels from intermittent emergency generators would be slightly higher under this alternative than the levels presented for the project. As with the proposed project, even though the testing of emergency generators would be short term (i.e., 30 minutes each time) and intermittent (i.e., approximately once per month), the testing of emergency generators under the Specific Plan and Phase 1 would result in noise levels in excess of applicable municipal code criteria in both San Bruno and South San Francisco. Noise impacts from emergency generator testing would be significant under this alternative, and mitigation would be required. Implementation of project Mitigation Measure NOI-1d would reduce this potentially significant impact related to emergency generator testing noise to a less-than-significant level in both jurisdictions for the project, and for Alternative D.

Construction Vibration. With regard to damage and annoyance-related vibration impacts, since the proximity of construction activities to nearby residences would be similar under this alternative (e.g. along the western terminus of Tanforan Avenue and the southern perimeter of the project site) and since equipment proposed for use would be similar, vibration impacts during construction would also be similar. Specifically, nighttime construction activities would all occur at least 100 feet from the nearest residences and would generate vibration levels well below the "barely perceptible" level. Daytime construction activities would generally occur at the same approximate distances from off-site residential or commercial/office and industrial buildings. Therefore, as is the case with the proposed project, construction activities for Alternative D would result in vibration levels below the applicable damage and annoyance criteria for nearby buildings and sensitive uses. Annoyance and damage-related vibration impacts would be less than significant for Alternative D.

Conclusion. Overall, construction noise impacts under Alternative D (Impact NOI-1a and Impact C-NOI-1) would remain significant and unavoidable and would be similar to those of the project. Alternative D would reduce but would not avoid the significant and unavoidable project-level and cumulative impacts associated with construction noise for Phase 1 and the project. Operational noise impacts under Alternative D would be less than significant with mitigation, which is the same conclusion as Phase 1 and the project.

Section 5.8.3.11, Population and Housing

Alternative D would have the same population and housing impacts as the proposed project. The existing property at 80 Tanforan Avenue is an industrial warehouse, and does not include any housing units. Therefore, with the inclusion of this property, Alternative D would not displace existing housing units or people, and no replacement housing would be needed. In addition, a six-level, above-grade parking structure (Parking Structure D) would be constructed under Alternative D, and total building size (approximately 2,800,000 sf) would remain the same as

the proposed project. Therefore, Alternative D would be expected to generate the same number of direct and indirect employees, households, and residents as the proposed project. Consequently, Alternative D impacts related to population and housing would be the same as that of the proposed project and would be less than significant and less than cumulatively considerable.

Section 5.8.3.12, Public Services

Alternative D would have the same public services impacts as the proposed project. Under Alternative D, building size would be the same as the proposed project, and approximately 2,800,000 sf would be developed. Therefore, Alternative D would be expected to generate the same number of direct and indirect employees, households, and residents as the proposed project that would be added to the City's police, fire, school, childcare, and library service populations. Therefore, Alternative D impacts related to public services would be the same as that of the proposed project and would be less than significant and less than cumulatively considerable.

Section 5.8.3.13, Recreation

Alternative D would have the same recreation impacts as the proposed project. Under Alternative D, building size would be the same as the proposed project and would offer the same amenities and open spaces such as the Tanforan Avenue Community Parklet (which would be increased in size by 11,545 sf compared with the proposed project), and Southline Commons. Therefore, impacts related to recreation would be less than significant under Alternative D, the same as under the proposed project. Cumulative impacts related to recreation would also be the same under Alternative D as under the proposed project for the same reasons stated above. Therefore, cumulative impacts would be less than significant for Alternative D, the same as under the proposed project.

Section 5.8.3.14, Transportation and Circulation[11]

Alternative D would include the same types of land uses as the proposed project, although at a slightly reduced density. The Reduced Underground Parking Alternative would implement all transportation infrastructure changes identified in Phase 1, including the connection of Sneath Lane and Southline Avenue, the extension of the Centennial Way Trail, and access improvements to the BART Station, consistent with the adopted plans and policies of the City, the City of San Bruno, C/CAG, BART, and MTC. Therefore, Alternative D would not conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicyclist, and pedestrian facilities, and impacts would be less than significant.

As shown in **Table 5-18, p. 5-68**, Alternative D would result in a slight reduction in total trip generation compared to the project.

[11] The transportation and circulation analysis prepared for Alternative D is based on the *Southline Transportation Impact Analysis* (TIA) prepared by Fehr & Peers (April 2022), which was updated to incorporate an analysis for the proposed Alternative D. See Appendix 4.15-1 for the updated TIA.

Table 5-18. Revised Specific Plan Alternative Trip Generation (Office Scenario)

Scenario		Phase 1		Buildout	
		Project	Reduced Underground Parking Alternative	Project	Reduced Underground Parking Alternative
Office / R&D		612,700	615,000	2,711,800	2,730,300
Public Restaurant/Retail		*16,400*	*11,800*	*16,400*	*11,800*
Other Amenities		*71,800*	*57,900*	*71,800*	*57,900*
Total Active Land Use		**700,900**	**684,700**	**2,800,000**	**2,800,000**
Vehicle Parking Stalls (# south of Southline Avenue)		1,103 to 1,379 (1,103 to 1,194)	1,095 (1,095)	4,594 to 5,395 (1,194)	4,586 to 5,111 (1,095)
Vehicle Trip Generation	AM	656	617	2,321	2,281
	PM	605	565	2,102	2,061
	Daily	5,458	4,986	18,380	17,909
Net New Vehicle Trip Generation	AM	485	446	2,150	2,110
	PM	455	415	1,952	1,911
	Daily	3,954	3,482	16,786	16,405

Source: Fehr & Peers, 2022.

Like the project, given its proximity to transit and location on an infill site, Alternative D would qualify for a presumption of less-than-significant impacts to VMT. Total VMT impacts would be less than significant and comparable or slightly reduced compared to those of the proposed project due to the slight reduction in trip generation. Impacts to freeway queuing, hazards at at-grade rail crossings, and transit and pedestrian crowding, all of which would be less than significant under the proposed project, would remain the same under Alternative D.

Alternative D would not substantively change circulation within the Specific Plan area, and therefore, would not pose any design hazards. The primary change associated with the Reduced Underground Parking Alternative would be extending the park walkway along Tanforan Avenue to Dollar Avenue. Otherwise, project driveways would remain in the same locations under Alternative D, including a single right in/right out driveway for Building 2 (the amenities building), a signalized driveway connecting Southline Avenue as the primary garage entrance, and an unsignalized driveway connecting Dollar Avenue as the secondary garage entrance. Alternative D would have the same access plan as the proposed project. Under Alternative D, access to the shuttle and mobility hubs would occur at the Southline Avenue and Dollar Avenue driveways, along with pedestrian connections to adjacent buildings. No new driveways or other changes to circulation patterns would occur under Alternative D. Therefore, impacts related to design hazards and emergency access would be less than significant, as with the proposed project.

Like the project, Alternative D would result in the Huntington Avenue/Herman Street/Forest Lane intersection meeting the peak hour signal warrant during PM peak hour for both Phase 1 and Specific Plan buildout. Phase 1 would add 11 PM peak hour trips, and Specific Plan buildout would add approximately 301 PM peak hour trips, the same number of trips as the project. Although Alternative D's changes related to buildout of Phase 1 would unlikely change the

intersection's operations, buildout of Alternative D and future phases may exacerbate the risk of collisions at this multi-lane stop-controlled intersection. Therefore, Impact TR-3d and Impact C-TR-3d would remain significant and unavoidable under Alternative D, similar to the proposed project at buildout.

Section 5.8.3.15, Tribal Cultural Resources

Alternative D includes similar construction activities as the proposed project with incorporation of Parking Structure D. However, the depth and amount of ground disturbance associated with Alternative D is substantially less than the proposed project. Under Alternative D, with incorporation of Parking Structure D, the two levels of subterranean parking associated with buildout of Phase 1 would be eliminated. The depth of ground disturbance associated with Phase 1 would be significantly less, and therefore impacts to tribal cultural resources impacts would be less than those compared to the proposed project.

However, the overall footprint of the project and associated construction remains similar to the proposed project. Therefore, potential impacts to archaeological resources and human remains that would occur under the proposed project would also occur under Alternative D. These resources can also be considered tribal cultural resources; thus implementation, of Mitigation Measures CR-2a, CR-2b, and CR-3 would continue to apply to Alternative D. Overall, tribal cultural resources impacts would be less than significant with mitigation, and less than those compared to the proposed project.

Section 5.8.3.16, Utilities and Service Systems

The total amount of square footage constructed under Alternative D would be comparable or slightly reduced compared to the project. Therefore, Alternative D would be expected to generate the same or slightly reduced demand for utilities and service systems as the proposed project. Thus, Mitigation Measures UTIL-1 and UTIL-2 would continue to apply to Alternative D. Alternative D would construct the same utility improvements as the proposed project. Therefore, with construction of the proposed improvements, additional construction or relocation of utility infrastructure would not be required to serve Alternative D. Overall, impacts to utilities and service systems under Alternative D would be less than significant with mitigation, less than cumulatively contributable with mitigation, and comparable or slightly reduced compared to the project.

* Section 5.8, *Comparison of Alternatives*, in the draft EIR was renumbered in the final EIR to be Section 5.9. Section 5.9 was revised as follows (new text is underlined and deleted text is ~~strikethrough~~).

CEQA Guidelines Section 15126.6 requires a comparison of the alternatives to the project (presented above), and suggests that a matrix may be used to summarize the comparison. ~~**Table 5-4, p. 5-43**~~**Table 5-19, p. 5-72**, compares the significant and less than significant with mitigation impacts of the proposed project to those of the alternatives. ~~**Table 5-5, p. 5-47**~~**Table 5-20, p. 5-77**, compares the ability of the alternatives to meet the objectives of the proposed project.

* Section 5.9, *Environmentally Superior Alternatives* in the draft EIR was renumbered in the final EIR to be Section 5.10. The third paragraph of Section 5.10 on page 5-77 was revised as follows (new text is underlined and deleted text is ~~strikethrough~~).

> As shown in **~~Table 5-4,~~Table 5-19, p. 5-71**, Alternative C, Reduced Project Alternative, would reduce, but would not avoid, all of the project's significant and unavoidable impacts. Alternative C also would not result in any new significant and unavoidable impacts. Alternative D, the Reduced Underground Parking Alternative, would avoid Phase 1's significant air quality impact related to generator testing (Impact AQ-2b and Impact C-AQ-2), and would also reduce (but would not avoid) all of the project's remaining significant and unavoidable impacts to below the proposed project's level of impact, with the exception of significant impacts related to meeting traffic signal warrants at the Huntington Avenue/Herman Street/Forest Lane intersection, which would be similar to the project's level of impact. Therefore, Alternative ~~C~~D is the environmentally superior alternative.

* Table 5-4, *Comparison of Proposed Project's Significant Impacts to Alternatives' Impacts*, in the draft EIR was renumbered in the final EIR to be Table 5-19. Table 5-5, *Ability of Alternatives to Meet Project Objectives*, in the draft EIR was renumbered in the final EIR to be Table 5-20. The tables were revised as follows (new text is underlined and deleted text is ~~strikethrough~~).

Table 5-419. Comparison of Proposed Project's Significant Impacts to Alternatives' Impacts

Potential Environmental Impacts	Proposed Project	Alternative A—No Project Alternative	Alternative B—No Intersection Alternative	Alternative C —Reduced Project Alternative	Alternative D—Reduced Underground Parking Alternative
Significant and Unavoidable Impacts					
Impact AQ-2a: Construction of future Precise Plans under the Specific Plan, not including Phase 1, could result in a cumulatively considerable net increase in criteria pollutants for which the project region is classified as a nonattainment area under an applicable federal (ozone) or state (ozone and particulate matter [PM]) ambient air quality standard during construction.	Significant and Unavoidable	No Impact (Less than Project)	Significant and Unavoidable (Less than Project)	Significant and Unavoidable (Less than Project)	Significant and Unavoidable (Less than Project)
Impact AQ-2b: Project operation, including operation of Phase 1, could result in a cumulatively considerable net increase in criteria pollutants for which the project region is classified as a nonattainment area under an applicable federal or state ambient air quality standard during operation.	Significant and Unavoidable*	No Impact (Less than Project)	Significant and Unavoidable (Greater than Project)*	Significant and Unavoidable (Less than Project)*	Significant and Unavoidable (Less than Project)
Impact AQ-3: The project and Phase 1 could expose sensitive receptors to substantial pollutant concentrations.	Significant and Unavoidable	No Impact (Less than Project)	Significant and Unavoidable (Similar to Project)	Significant and Unavoidable (Less than Project)	Significant and Unavoidable (Less than Project)
Impact C-AQ-2: The project, inclusive of Phase 1, together with the cumulative projects identified, could result in a cumulatively considerable net increase in any criteria pollutant for which the project region is a non-attainment area under an applicable federal or state ambient air quality standard.	Significant and Unavoidable*	No Impact (Less than Project)	Significant and Unavoidable (Construction: Less than Project; Operations: Greater than Project)*	Significant and Unavoidable (Less than Project)*	Significant and Unavoidable (Less than Project)
Impact C-AQ-3: The project, inclusive of Phase 1, together with cumulative project identified, could expose sensitive receptors to substantial pollutant concentrations.	Significant and Unavoidable	No Impact (Less than Project)	Significant and Unavoidable (Less than Project)	Significant and Unavoidable (Less than Project)	Significant and Unavoidable (Less than Project)
Impact NOI-1a: Project construction would generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies.	Significant and Unavoidable*	No Impact (Less than Project)	Significant and Unavoidable (Less than Project)*	Significant and Unavoidable (Less than Project)*	Significant and Unavoidable (Less than Project)*
Impact C-NOI-1: The project, inclusive of Phase 1, together with the cumulative projects identified would not result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies.	Significant and Unavoidable*	No Impact (Less than Project)	Significant and Unavoidable (Less than Project)*	Significant and Unavoidable (Less than Project)*	Significant and Unavoidable (Less than Project)*
Impact TR-3d: The project would contribute to existing hazardous conditions due to project-related traffic, leading to unsignalized intersections meeting signal warrants.	Significant and Unavoidable	No Impact (Less than Project)	Significant and Unavoidable (Greater than Project)*	Significant and Unavoidable (Less than Project)	Significant and Unavoidable (Similar to Project)*
Impact C-TR-3D: The project, together with the cumulative projects identified would contribute to existing hazardous conditions due to project-related traffic, leading to unsignalized intersections meeting signal warrants.	Significant and Unavoidable	No Impact (Less than Project)	Significant and Unavoidable (Greater than Project)*	Significant and Unavoidable (Less than Project)	Significant and Unavoidable (Similar to Project)*
Significant Impacts That Can Be Mitigated to a Less-Than-Significant Level					
Impact BIO-1:* The project would not have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by CDFW or USFWS.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Similar to Project)	Less than Significant with Mitigation (Similar to Project)	Less than Significant with Mitigation (Greater than Project)

Potential Environmental Impacts	Proposed Project	Alternative A———No Project Alternative	Alternative B—No Intersection Alternative	Alternative C —Reduced Project Alternative	Alternative D—Reduced Underground Parking Alternative
Impact BIO-4:* The project would not interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Similar to Project)	Less than Significant with Mitigation (Similar to Project)	Less than Significant with Mitigation (Similar to Project)
Impact C-BIO-1:* The project, inclusive of Phase 1, together with the cumulative projects identified, would not result in a cumulatively considerable contribution to significant cumulative impacts on biological resources.	Less than Cumulatively Considerable with Mitigation	No Impact (Less than Project)	Less than Cumulatively Considerable with Mitigation (Similar to Project)	Less than Cumulatively Considerable with Mitigation (Similar to Project)	Less than Cumulatively Considerable with Mitigation (Greater than Project)
Impact CR-1:* The project would not cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Similar to Project)
Impact CR-2:* The project would not cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)
Impact CR-3:* The project would not disturb any human remains, including those interred outside of formal cemeteries.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)
Impact C-CR-2:* The Project, inclusive of Phase 1, together with the cumulative projects identified, would not result in a cumulatively considerable contribution to significant cumulative impacts on archaeological resources or human remains.	Less than Cumulatively Considerable with Mitigation	No Impact (Less than Project)	Less than Cumulatively Considerable with Mitigation (Less than Project)	Less than Cumulatively Considerable with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)
Impact EN-1a:* The project would not result in potentially significant environmental impact due to the wasteful, inefficient, or unnecessary consumption of energy resources during project construction.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Construction: Less than Project; Operations: Greater than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)
Impact GEO-6:* The project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)
Impact C-GEO-2:* The project, inclusive of Phase 1, together with the cumulative projects identified would not result in a cumulatively considerable contribution to significant cumulative impacts on paleontological resources.	Less than Cumulatively Considerable with Mitigation	No Impact (Less than Project)	Less than Cumulatively Considerable with Mitigation (Less than Project)	Less than Cumulatively Considerable with Mitigation (Less than Project)	Less than Cumulatively Considerable with Mitigation (Less than Project)
Impact GHG-1a:* The project would not generate GHG emissions, either directly or indirectly, that would have a significant impact on the environment during construction.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Construction: Less than Project; Operations: Greater than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)
Impact GHG-2:* The project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs during construction and operation.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Construction: Less than Project; Operations: Greater than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)
Impact HAZ-2:* The project would not create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Similar to Project)
Impact HAZ-4:* The project would not be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Similar to Project)	Less than Significant with Mitigation (Similar to Project)	Less than Significant with Mitigation (Similar to Project)

Potential Environmental Impacts	Proposed Project	Alternative A———No Project Alternative	Alternative B—No Intersection Alternative	Alternative C —Reduced Project Alternative	Alternative D—Reduced Underground Parking Alternative
Impact HWQ-1:* The project would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Surface Water: Similar to Project; Groundwater: Less than Project)	Less than Significant with Mitigation (Surface Water: Greater than Project; Groundwater: Less than Project)
Impact C-HWQ-1:* The Project, inclusive of Phase 1, together with the cumulative projects identified would not result in a cumulatively considerable contribution to significant cumulative impacts on hydrology and water quality.	Less than Cumulatively Considerable with Mitigation	No Impact (Less than Project)	Less than Cumulatively Considerable with Mitigation (Less than Project)	Less than Significant with Mitigation (Surface Water: Similar to Project; Groundwater: Less than Project)	Less than Significant with Mitigation (Surface Water: Greater than Project; Groundwater: Less than Project)
Impact NOI-1b:* Project operation would not generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant (Greater than Project)	Less than Significant (Mobile Noise: Less than Project; Stationary Noise: Greater than Project)	Less than Significant with Mitigation (Similar to Project)
Impact TR-3b: The project would not substantially increase hazards due to freeway ramp queuing.[a]	Less than Significant	No Impact (Less than Project)	Significant and Unavoidable (Greater than Project)	Less than Significant (Similar to Project)	Less than Significant (Similar to Project)
Impact TR-5b: The project would not have a detrimental impact on bicycle or pedestrian facilities.[a]	Less than Significant	No Impact (Less than Project)	Significant and Unavoidable (Greater than Project)	Less than Significant (Similar to Project)	Less than Significant (Similar to Project)
Impact TCR-1:* The project would not cause a substantial adverse change in the significance of a tribal cultural resource, defined in PRC Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe and that is listed or eligible for listing in the CRHR or in a local register of historical resources, as defined in PRC Section 5020.1(k), or is a resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC Section 5024.1.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)
Impact C-TCR-1:* The project, inclusive of Phase 1, together with the cumulative projects identified, would not result in a cumulatively considerable contribution to significant cumulative impacts on tribal cultural resources.	Less than Cumulatively Considerable with Mitigation	No Impact (Less than Project)	Less than Cumulatively Considerable with Mitigation (Less than Project)	Less than Cumulatively Considerable with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)
Impact UTIL-2: The project would not have insufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years.	Less than Significant with Mitigation	No Impact (Less than Project)	Less than Significant with Mitigation (Similar to Project)	Less than Significant with Mitigation (Less than Project)	Less than Significant with Mitigation (Less than Project)

* = Impact is also significant for Phase 1.

[a] As discussed in Section 5.6, Impact TR-3b, Freeway Queueing, and Impact TR-5b, Crowding at Pedestrian and Bicycle Facilities, would be significant and unavoidable for Alternative B. These impacts would not occur under the proposed project.

Table 5-~~5~~20. Ability of Alternatives to Meet Project Objectives

Project Objective	Alternative A — No Project Alternative	Alternative B —No Intersection Alternative	Alternative C — Reduced Project Alternative	Alternative D — Reduced Underground Parking Alternative
Create a commercial campus development consistent with the General Plan designation for the Specific Plan area.	No	Yes	Yes, but reduced compared to project	Yes
Promote the City's ongoing development of its transit-accessible corridors with high-quality development.	No	Yes, but reduced compared to project	Yes, but reduced compared to project	Yes
Establish a commercial campus development with sophisticated, unified architectural and landscape design and site planning, resulting in a distinctive campus identity and strong sense of place.	No	Yes	Yes, but reduced compared to project	Yes
Allow for well-designed, flexible buildings and floor plates that can accommodate a variety of commercial building uses over time to ensure that the Specific Plan is responsive to market conditions and demands.	No	Yes	Yes, but reduced compared to project	Yes
Establish flexibility to build the proposed project in phases that respond to market conditions.	No	Yes	Yes, but reduced compared to project	Yes
Redevelop underutilized parcels within the Specific Plan area to realize the highest and best use of the land by increasing the intensity of land uses.	No	Yes	No	Yes
Provide a positive fiscal impact on the local economy through the creation of jobs, enhancement of property values, and generation of property tax and other development fees.	No	Yes	Yes, but reduced compared to project	Yes
Provide well-designed retail and publicly available open spaces to increase local participation and usage of the Specific Plan area.	No	Yes	Yes	Yes
Create new publicly accessible open spaces, including plazas, courtyards, and green spaces within the Specific Plan area.	No	Yes	Yes	Yes
Provide an extensive pedestrian network that links buildings and outdoor recreational spaces through paving, wayfinding signage, street furniture, and lighting.	No	Yes	Yes	Yes
Promote alternatives to automobile transportation to further the City's transportation objectives by emphasizing public transit linkages, TDM, and pedestrian access and ease of movement between buildings.	No	Yes, but reduced compared to project	Yes	Yes
Create convenient and safe pedestrian and bike access from the Specific Plan area to the San Bruno BART station and the Centennial Way Trail.	No	No	Yes	Yes
Construct a new east-west public street through the Specific Plan area to improve site access and regional roadway circulation, in furtherance of City General Plan policies.	No	No	Yes	Yes
Enhance vehicular, bicycle, and pedestrian circulation and access in the area surrounding the Specific Plan area.	No	No	Yes	Yes
Work cooperatively with relevant agencies to implement off-site improvements with planned regional circulation and safety improvements.	No	Yes, but reduced compared to project	Yes	Yes
Design roadways within and adjacent to the Specific Plan area to ensure that all police, fire, and emergency medical service vehicles can safely and efficiently navigate.	No	Yes, but reduced compared to project	Yes	Yes
Incorporate sustainable and environmentally sensitive design and equipment, energy conservation features, water conservation measures and drought-tolerant or equivalent landscaping, and sustainable stormwater management features.	No	Yes	Yes	Yes

Figures

Figure 4.17-2 in Section 4.17, *Utilities and Service Systems*, of the draft EIR has been revised. The revised figure is shown on the following page.

Source: Lane Partners, Kimley-Horn & Associates, DES Architects, BKF Engineers, 2021.

ICF Graphics ... 00082.20 (12/28/21) JC

Revised Figure 4.17-2
Existing and Proposed Wastewater Infrastructure

Appendices

Revised Appendix 4.15-1, Revised Transportation Impact Analysis

Appendix 4.15-1, *Transportation Impact Analysis*, of the draft EIR, has been replaced in its entirety with the *Southline Transportation Impact Analysis* prepared for the project by Fehr & Peers in April 2022. The appendix has been renamed *Revised Transportation Impact Analysis*. The *Revised Transportation Impact Analysis* includes a new analysis for Alternative D (Reduced Underground Parking Alternative), revisions to Table 7, and new text clarifying that the Traffic Operations Analysis Memorandum accounts for Alternative D.

The revised Appendix 4.15-1 is included in **Appendix A** of this RTC document.

Revised Appendix 4.17-1, ~~Draft~~ Final Water Supply Assessment

As discussed in Section 3.1.1, Appendix 4.17-1, *Draft Water Supply Assessment*, of the draft EIR, has been replaced in its entirety with the *Water Supply Assessment for the Southline Specific Plan, South San Francisco District, California Water Service – Final*, prepared for the project by EKI Environment & Water, Inc. in December 2021. The appendix has been renamed *Final Water Supply Assessment*.

The revised Appendix 4.17-1 is included in **Appendix B** of this RTC document.

New Appendix 2.1, Revised Southline Specific Plan

The Draft Southline Specific Plan included in Appendix 2 of the draft EIR has been updated to align with Alternative D (Reduced Underground Parking Alternative). The revised Specific Plan has been added to the EIR as new Appendix 2.1 (it does not replace Appendix 2 of the draft EIR). The new appendix is named *Revised Southline Specific Plan*.

The new Appendix 2.1 is included in **Appendix C** of this RTC document.

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Appendix A:

Revised Appendix 4.15-1, *Revised Transportation Impact Analysis*

Southline

Transportation Impact Analysis

Prepared for:
City of South San Francisco and ICF

April 2022

SF20-1089

FEHR & PEERS

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1. Project Description

This transportation impact analysis (TIA) evaluates potential transportation effects associated with the Southline Specific Plan and associated transportation infrastructure changes ("Project"). The Project would redevelop a 26.5-acre industrial site in the City of South San Francisco's Lindenville District, adjacent to the San Bruno Bay Area Rapid Transit (BART) rail station. The Project would demolish all existing on-site uses and construct a transit-oriented office/research and development (R&D) campus with a maximum anticipated building area of 2.8 million square feet. New development would include about 2.8 million square feet of office/R&D and amenity space serving up to about 11,000 employees; approximately 4,594 to 5,769 parking spaces; a new east-west street connection between Sneath Lane and South Linden Avenue (referred to as "Southline Avenue"); supportive utilities and related infrastructure; and open space. The Project would also modify off-site transportation infrastructure including constructing a new intersection connecting Sneath Lane, Huntington Avenue, Maple Avenue, and Southline Avenue; extending the Centennial Way Trail to the San Bruno BART Station; providing a signalized driveway to the SamTrans Transit Center; and enhancing pedestrian access to the San Bruno BART station with new bulbouts and high visibility crosswalks. Most of this off-site transportation infrastructure is located within the City of South San Francisco; however, certain improvements, including portions of the new intersection connecting Sneath Lane, Huntington Avenue, and Maple Avenue, are located in the City of San Bruno.

Development associated with the Project would be implemented under the proposed Southline Specific Plan, which would establish new land use development standards and design guidelines for development within the Specific Plan extents. A phased development process for buildout of the Specific Plan is anticipated. Phase 1 would include construction of the new Southline Avenue east-west connection road described above and the following development, most of which will be development south of the new Southline Avenue: two new office/R&D buildings with a total building area of up to approximately 613,000 square feet; the four-story, approximately 88,000-square foot amenity building (with some ground floor uses open to the public); approximately 1,103 to 1,379 parking spaces in a combination of below-grade parking and the eastern portion of a parking structure (located north of the new Southline Avenue); and landscaping and open space amenities. Phase 1 also includes the majority of the onsite and off-site infrastructure, roadway and pedestrian/bicycle circulation improvements. The remaining development allowed under the Specific Plan is anticipated to occur in later phases.

As a transit-oriented development fully within a ½ mile walkshed of the San Bruno BART Station and SamTrans ECR bus route, the Project is presumed to have a less than significant vehicle miles traveled (VMT) impact under the City of South San Francisco's adopted VMT Thresholds (City Council Resolution 77-2020). VMT analysis is presented in Section 4.2.

Project land use and infrastructure by development Phase 1s shown in Table 1-1. The Project location and study area, Phase 1 Project site plan, and Project Buildout site plan are shown in Figure 1-1, Figure 1-2, and Figure 1-3, respectively.

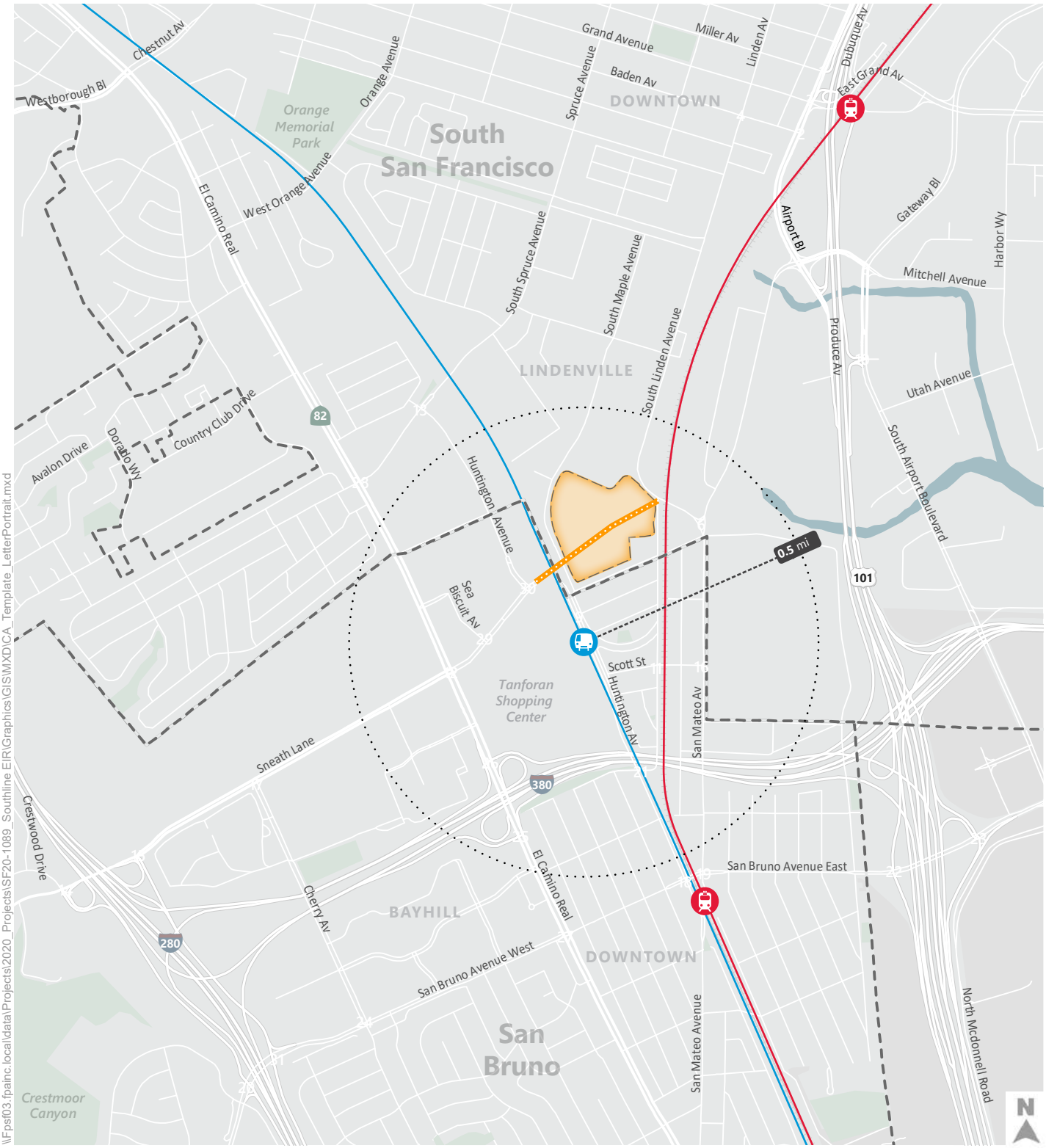
Table 1-1. Project Land Use by Phase, Office Scenario

Scenario	Phase 1	Future Phases	Total at Buildout
Office / R&D	612,715	2,099,085	2,711,800
Public Restaurant/Retail	*16,400*	*0*	*16,400*
Cafeteria (Private)	*9,000*	*0*	*9,000*
Fitness Center (Private)	*49,000*	*0*	*49,000*
Auditorium/Other (Private)	*13,800*	*0*	*13,800*
Total Active Land Use	**700,915**	**2,099,085**	**2,800,000**
Vehicle Parking Stalls	1,103 to 1,379	3,491 to 4,390	4,594 to 5,769
Long-Term Bicycle Parking Spaces	188	572	760
Short-Term Bicycle Parking Spaces	18	42	60

Notes:

1. The Project includes two land use scenarios – an office use and a life science use. For purposes of this analysis, the office use was analyzed to reflect a land use with a higher trip generation and more employees.
2. The ground floor restaurant/retail would be a public use. All other amenity uses would be for the private use of Project tenants.

Source: ICF, 2020.



Project Site

New Street - Southline Avenue

City Boundary

BART Station

Caltrain Station

Figure 1-1

Project Location

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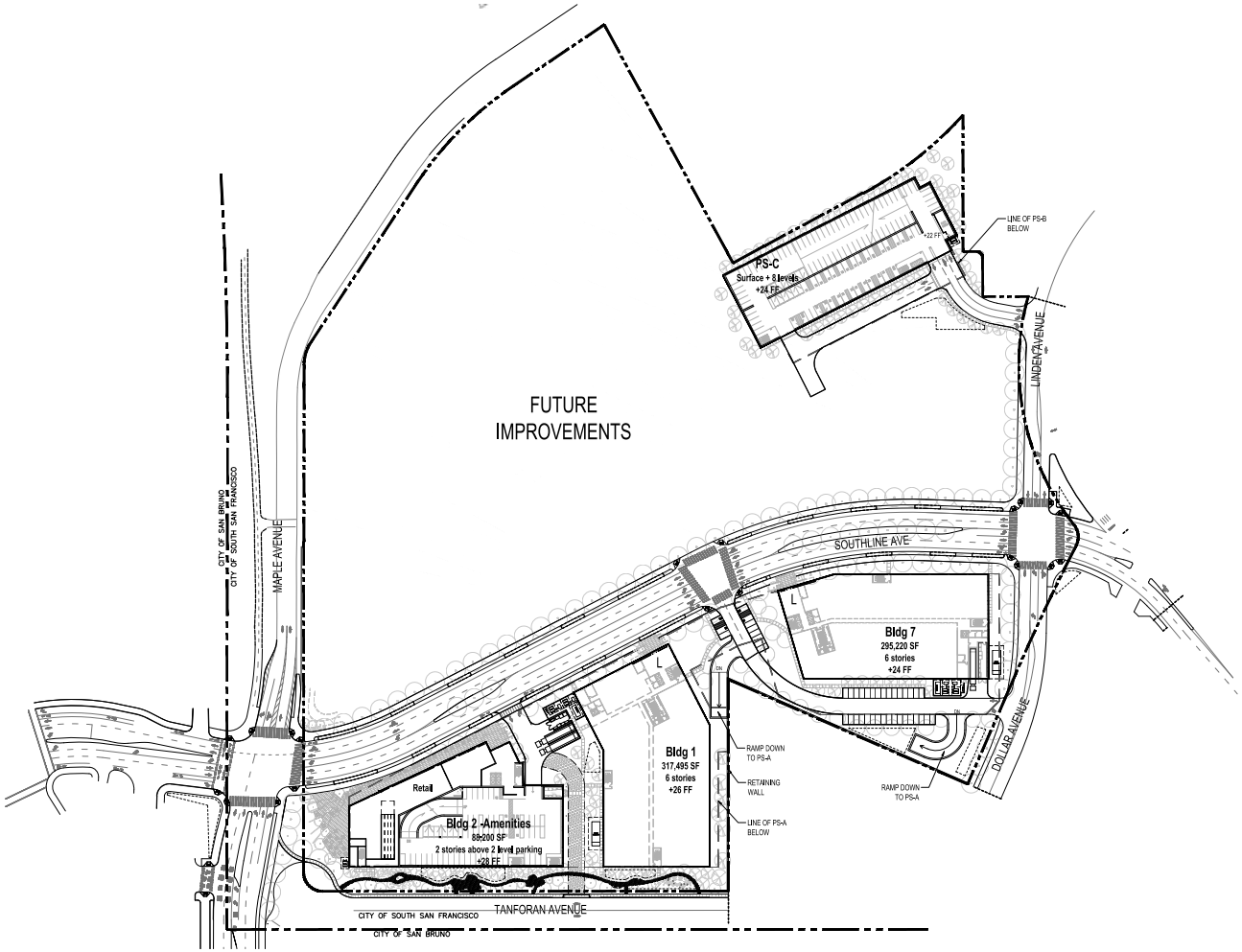

0' 40' 80' 160'
SCALE: 1" = 80'-0"

Figure 1-2
Site Plan

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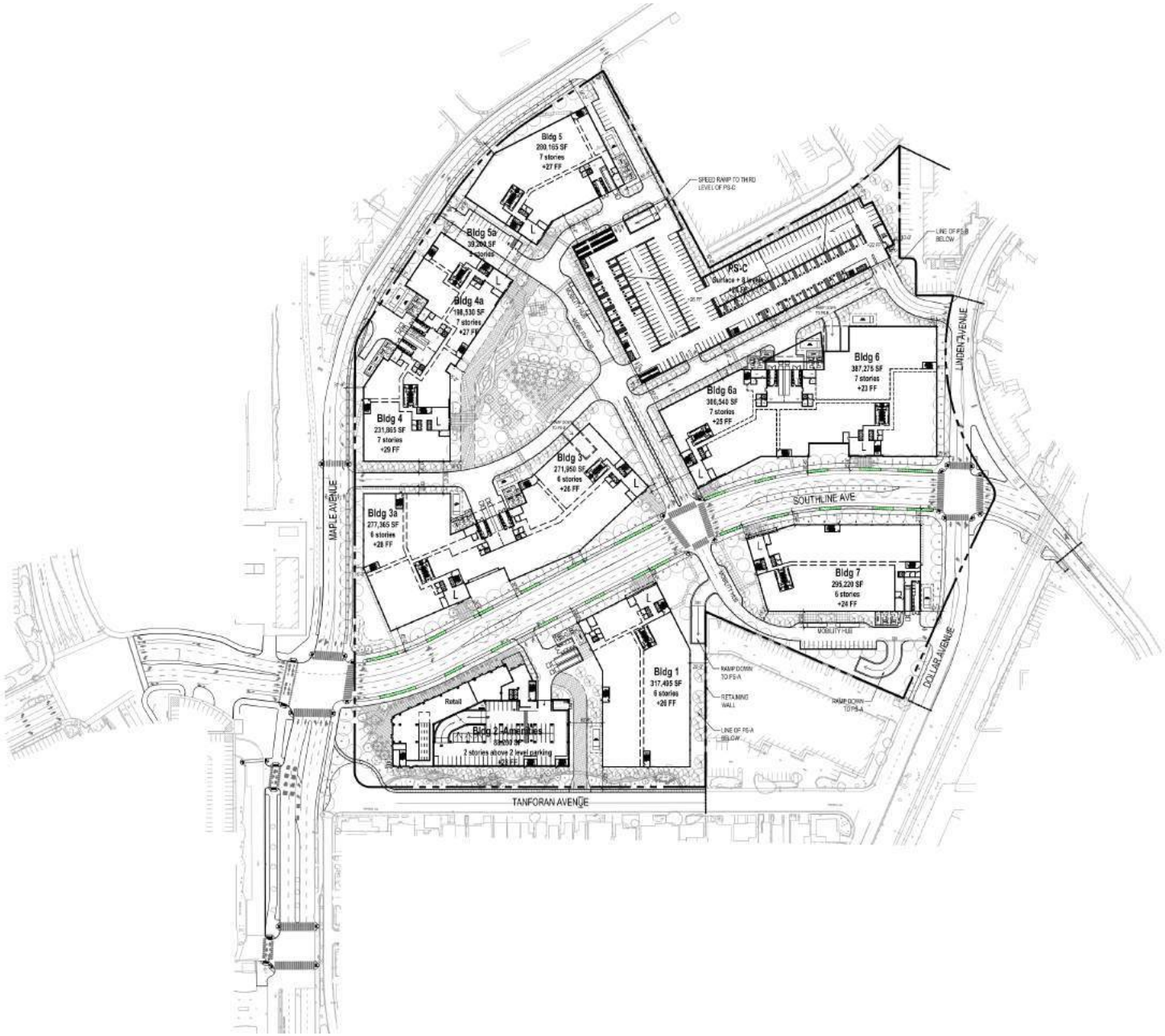


Figure 1-3

Project Buildout Site Plan

1.1 Transportation Demand Management Program

The Project includes a transportation demand management (TDM) program designed to reduce the Project's single-occupancy vehicle trips and parking demand consistent with the goals set forth in the City's municipal code. The Project Sponsor has developed a Preliminary TDM program designed to achieve a 45 percent alternative mode share, consistent with City requirements for projects proposing a floor area ratio (FAR) up to 2.5 (per Chapter 20.400 of the City's Zoning Ordinance). The preliminary TDM Plan includes a number of program measures to build upon the proposed infrastructure and on-site facilities in order to reduce single-occupancy vehicle trips to meet the required 45 percent alternative mode share target. The specific measures have not been determined as they will depend significantly on tenant needs, market and technological conditions at the time of development, and in some instances, review and approval of other agencies. Project-specific Draft TDM Plans will be required for each project phase as part of the entitlements approval, and Final TDM Plans will be provided as part of the building permit process. TDM measures may include:

- Direct Access to Transit – The Project's access improvements to the San Bruno BART Station and SamTrans Transit Center enable convenient use of BART and bus service.
- Shuttle Service to Caltrain – The TDM program may provide first/last mile shuttle service for employees to the South San Francisco and/or San Bruno Caltrain stations.
- Carpooling & Vanpooling Services – The TDM program would offer ride-matching services for carpools and vanpools users thorough 511.org and/or other programs; and provide reserved parking spaces for such vehicles.
- Other TDM program features – The TDM program would include a range of features such as a computer app-based commute monitoring system, carshare program; guaranteed ride home program; onsite kiosks and information boards displaying transportation options available for employees; onsite showers and changing rooms; and TDM coordinator(s).

As required by the City of South San Francisco Municipal Code, the Final TDM Plan would include requirements for monitoring and auditing the performance of the measures, which may be revised or amended as needed to meet the TDM performance objectives. Implementation of the Final TDM Plan would be monitored annually and adjusted accordingly, if necessary, in order to meet the required mode share targets. Leases for all tenants would include provisions regarding the mandatory TDM measures and appointment of a TDM coordinator (which may be shared among multiple tenants).

2. Existing Conditions

This section describes the existing transportation and circulation setting in the vicinity of the Project site: the existing roadway network, transit network and service, pedestrian conditions, and bicycle conditions. Descriptions provided in this section reflect conditions prior to changes associated with the COVID-19 pandemic, which has resulted in reduced travel and changes to transit services.

2.1 Environmental Setting

The Project site is transit-oriented, located within proximity to the San Bruno BART station (across Huntington Avenue) and the South San Francisco and San Bruno Caltrain stations (both within one mile of the Project site). The Project site is located at the northeast corner of the Sneath Avenue and Huntington Avenue intersection in the City of South San Francisco at the city's boundary with the City of San Bruno. Under existing conditions, the Project site is not accessible from Huntington Avenue, as there is no vehicular connection to Tanforan Avenue. Instead, regional access to the site under existing conditions is provided via US-101 and I-380, with vehicles connecting to Maple Avenue, Dollar Avenue, or South Linden Avenue via surface streets. Figure 1-1 shows the Project location and the surrounding roadway system. The Project includes construction of a new street (Southline Avenue) connecting the Project site to Huntington Boulevard at the intersection with Sneath Avenue.

Key local roadways in the vicinity of the Project are described below:

- *I-380* is an approximately 1.7-mile eight-lane freeway linking I-280 to the west and US-101 to the east. I-380 is located approximately one half-mile south of the Project site and provides the closest freeway access to the Project via El Camino Real (SR-82). Near the Project, I-380 carries about 170,000 vehicles per day.
- *I-280* is an eight-lane north-south freeway connection between San Francisco to San Jose that follows the western urbanized edge of the San Francisco Peninsula. At the freeway's north and south endpoints, the route directly serves Daly City, Colma, and southwestern San Francisco neighborhoods. I-280 is located approximately 1.25 miles west of the Project site. Near the Project, I-280 carries about 200,000 vehicles per day. I-280 may be accessed via ramps at Sneath Lane and San Bruno Avenue.
- *US-101* is an eight-lane freeway and principle north-south roadway connection between San Francisco, San Jose, and intermediate San Francisco Peninsula cities. US-101 is located approximately one half-mile east of the Project site. Near the Project, US-101 carries about 265,000 vehicles per day. US-101 may be accessed via ramps at San Bruno Avenue, Produce Avenue/South Airport Boulevard, and Grand Avenue.
- *El Camino Real (SR-82)* is a north-south arterial roadway and State Highway that spans the San Francisco Peninsula between San Francisco and San Jose. It has six travel lanes in the vicinity of the

Project site and connects with I-380 approximately one half mile from the Project site, providing regional vehicle access in all directions. El Camino Real carries about 45,000 vehicles per day.

- *Huntington Avenue* is a north-south arterial and local roadway within the City of San Bruno that parallels the Caltrain corridor between Sneath Lane to the north San Felepe Avenue to the south. The San Bruno General Plan classifies the roadway as an arterial between Sneath Lane and San Mateo Avenue and as a local street south of San Mateo Avenue. *Huntington Avenue East* is a one-way residential street that runs alongside Huntington Avenue.
- *South Linden Avenue* is a north-south collector roadway within the City of South San Francisco that connects Downtown South San Francisco to the north at Airport Boulevard with the Lindenville Area and the City of San Bruno to the south at San Mateo Avenue. South Linden Avenue includes an at-grade rail crossing of Caltrain.
- *Sneath Lane* is an east-west local and arterial roadway within the City of San Bruno that connects Sweeny Ridge open space to the west and Huntington Avenue to the East. The road intersects and provides access to three major north-south regional roadways: Skyline Boulevard (SR-35), I-280, and El Camino Real (SR-82) and is one of the primary Project access roadways. The City of San Bruno General Plan classifies the roadway as an arterial east of SR-35 and a local street to the west of SR-35.
- *San Bruno Avenue* is a four-lane east-west arterial roadway within the City of San Bruno. San Bruno Avenue provides freeway access to both I-280 and US 101.
- *South Maple Avenue* is a two lane north-south collector street within South San Francisco that primarily provides access to destinations within the Lindenville industrial district between South Canal Street to the north and Tanforan Avenue to the south. The roadway will provide direct access to the Project site's northern and western edges and connect with Southline Avenue and Huntington Avenue.
- *Dollar Avenue* and *Herman Street* comprise a two lane north-south collector street within the City of South San Francisco and City of San Bruno, respectively, alongside the Caltrain railroad corridor and eastern edge of the Project site. Dollar Avenue and Herman Street function as the primary connection between Lindenville and the City of San Bruno to the west of the Caltrain railroad corridor, connecting to South Linden Avenue and Huntington Avenue.
- *Scott Street* is a two lane, east-west local street in the City of San Bruno connecting Herman Street and San Mateo Avenue. Scott Street includes an at-grade rail crossing of Caltrain.
- *Tanforan Avenue* is a two lane, local street at the border of South San Francisco and San Bruno that connects Maple Avenue and Dollar Avenue/Herman Street. Tanforan Avenue serves a mix of local residential trips and truck traffic to industrial sites in Lindenville.
- *Southline Avenue (South Linden Avenue Extension)* is identified in the City of South San Francisco's General Plan as a new, approximately 1,500-foot long roadway connection between Sneath Lane and South Linden Avenue. The Project includes the roadway alignment as envisioned in the General Plan.

2.2 Transit Facilities and Service

The Project site is directly served by the San Bruno BART station located across Huntington Avenue, and SamTrans buses at the San Bruno BART Transit Center, which is within one half mile from all buildings on the Project site. The Project is within about three-quarters of one mile of the San Bruno Caltrain station and 1.5 mile of the South San Francisco Caltrain station as well. The existing transit services are shown on Figure 2-1 and described in detail below.

2.2.1 Regional Transit and Shuttle Service

The following transit services operate within the City of South San Francisco and City of San Bruno:

- *Bay Area Rapid Transit (BART)* provides regional rail service between the East Bay, San Francisco, and San Mateo County, connecting between San Francisco International Airport and Millbrae Intermodal Station to the south, San Francisco to the north, and Oakland, Richmond, Pittsburgh/Bay Point, Dublin/Pleasanton and Fremont in the East Bay. The San Bruno Station is located adjacent to the Project site. During weekday peak commute periods, the station is served by the Richmond-Millbrae and Antioch-San Francisco International Airport lines, both of which operate on 15-minute headways with a combined headway of 7.5 minutes throughout the day. During off-peak periods, the station is served by the Antioch-San Francisco International Airport line which operates every 20 minutes.
- *Caltrain* provides passenger rail service on the Peninsula between San Francisco and San Jose, and limited service trains to Morgan Hill and Gilroy during weekday commute periods. Caltrain operates five trains per hour, per direction during peak periods. The Peninsula Corridor Electrification Project is currently under construction to increase Caltrain service levels to six trains per hour per direction during peak periods, to provide faster, more frequent service. The Peninsula Corridor Electrification Project is anticipated to be completed by 2022. The Project site is near two Caltrain stations:
    - *South San Francisco Caltrain Station:* The station is currently located approximately 1.5 mile north of the Project site at 590 Dubuque Avenue, on the east side of US-101, immediately north of East Grand Avenue. In 2021, Caltrain plans to open a relocated South San Francisco Caltrain Station near the Grand Avenue/Airport Boulevard intersection. The South San Francisco Caltrain station will be served by 23 northbound and 23 southbound local or limited trains during a typical weekday. Service is expected to increase upon completion of the Peninsula Corridor Electrification Project in 2022.
    - *San Bruno Caltrain Station:* The station is located approximately three-quarter miles directly south of the Project site at the intersection of San Bruno Avenue and Huntington Avenue, within Downtown San Bruno. The station is served by 26 northbound and 26 southbound local or limited trains during a typical weekday. Service is expected to increase upon completion of the Peninsula Corridor Electrification Project in 2022.
- *SamTrans* provides bus service in San Mateo County and serves the Project site. The SamTrans Transit Center is located at the San Bruno BART station, located adjacent to the Project site. The

SamTrans Transit Center is located less than one-half mile from all proposed buildings at the Project site and is served by routes ECR, 140, 141, and 398. A shuttle to the San Bruno Bayhill Office Park also operates during peak periods. The SamTrans service span and average peak hour frequencies are summarized in Table 2-1.

Table 2-1. BART and SamTrans Service at the San Bruno BART Station

Route	Service Endpoints	Service Span	Average Peak Hour Frequency
BART Red Line	Richmond Station-Millbrae Station via Oakland and San Francisco	5:15 AM to 12:00 AM (NB) 6:00 AM to 1:30 AM (SB)	15 minutes
BART Yellow Line	Pittsburg Bay Point & Antioch Stations-San Francisco International Airport Station via Oakland and San Francisco	5:15 AM to 12:00 AM (NB) 6:00 AM to 1:30 AM (SB)	15 minutes
SamTrans ECR	Daly City BART / Palo Alto Transit Center via El Camino Real	5:15 AM to 1:00 AM	15 minutes
SamTrans 140	Pacifica / San Francisco International Airport	6:30 AM to 12:00 AM	30 minutes
SamTrans 141	Shelter Creek (San Bruno) / Airport & Linden (South San Francisco)	6:45 AM to 7:45 PM	30 minutes
SamTrans 398	Redwood City Transit Center / Downtown San Francisco	5:00 AM to 11:00 PM	60 minutes
Bayhill Shuttle	San Bruno BART Station to Bayhill Office Park	7:00 AM to 10:00 AM, 4:00 PM to 6:40 PM	15 Minutes

Notes: Table summarizes conditions prior to COVID-19. The Bayhill Shuttle is operated independently through SamTrans' shuttle program and is open to the public.
Source: Fehr & Peers; SamTrans, 2020.

2.3 Pedestrian and Bicycle Facilities

This section reviews existing pedestrian and bicycle conditions. Pedestrian facilities include sidewalks, crosswalks, trails, and pedestrian signals. Bicycle facilities consist of separated bikeways, bicycle lanes, routes, trails, and paths, as well as bike parking, bike lockers, and showers for cyclists. Caltrans recognizes four classifications of bicycle facilities:

- Class I – Shared-Use Pathway: Provides a completely separated right-of-way for the exclusive use of cyclists and pedestrians.
- Class II – Bicycle Lane: Provides a striped lane for one-way travel on a street or highway. May include a "buffer" zone consisting of a striped portion of roadway between the bicycle lane and the nearest vehicle travel lane.
- Class III – Bicycle Route: Provides for shared use with motor vehicle traffic; however, are often signed or include a striped bicycle lane.
- Class IV – Separated Bikeway: Provides a right-of-way designated exclusively for bicycle travel adjacent to a roadway and which are protected from vehicular traffic. Types of separation include, but are not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

The following pedestrian and bicycle facilities are present near the Project site. Existing and proposed bicycle facilities are shown on Figure 2-2.

- *Sneath Lane* in San Bruno has sidewalk on both sides of the street and intermittent Class II bike lanes. Bike lanes are present west of El Camino and along a two-block segment between Sea Biscuit Avenue to Huntington Avenue, but a gap occurs between El Camino Real and Sea Biscuit Avenue.
- *The Centennial Way Trail* is a Class I shared pedestrian and bicycle pathway in South San Francisco along the BART tunnel alignment. It connects the South San Francisco BART Station with schools, parks, and neighborhoods within the City. It presently terminates adjacent to the Project site about 400 feet north of the San Bruno BART Station.
- *Huntington Avenue* is a designated Class III bicycle route in San Bruno and South San Francisco and has sidewalks on both sides of the street.
- *Tanforan Avenue* is a designated Class III bicycle route and has sidewalks on both sides of the street.
- *South Linden Avenue* is a designated Class III bicycle route with sidewalks on both sides of the street.
- *Dollar Avenue/Herman Street* is a designated Class III bicycle route and has sidewalks on the west side of the street only.
- Maple Avenue is not designated as a bicycle facility and has a sidewalk along the east side of the street only alongside the Project site.

Under existing conditions, the Project site is located in a mostly auto-oriented industrial and commercial area with several barriers to walking and bicycling, shown in Figure 2-3**.** Specifically, the following challenges to bicycle and pedestrian circulation exist:

- *Access barriers to the San Bruno BART Station:* When exiting the San Bruno BART Station walking or biking toward the Project site, pedestrians and bicyclists encounter Huntington Avenue, a wide multilane arterial street with narrow sidewalks and no dedicated bicycle facilities. There is no marked crosswalk directly connecting the BART Station entrance and the eastern sidewalk along Huntington Avenue, so pedestrians instead must cross two legs of the intersection to walk across the street. Both crosswalks have actuated pedestrian crossings, which add delay to pedestrians by defaulting to a "Don't Walk" signal during a green light unless a button is pushed in advance.
- *Centennial Way Trail Gap:* The Centennial Way Trail terminates 400 feet north of the San Bruno BART station and connects to the narrow sidewalk on the east side of Huntington Avenue. Pedestrians and bicyclists share this narrow sidewalk space, which meanders alongside Huntington Avenue and Huntington Avenue East with relatively abrupt changes in grade.
- *Narrow sidewalks with obstructions, limited pedestrian-scaled lighting, unmarked crosswalks, and lack of accessible curb ramps:* Although sidewalks are present on most streets, pedestrians contend with indirect routes along narrow facilities that at times are inaccessible to mobility-impaired pedestrians. Areas of particular concern related to the Project include: the grade changes for the narrow eastern sidewalk along Huntington Avenue, the lack of curb ramps and marked crosswalks across Tanforan Avenue and Maple Avenue, the lack of a direct pedestrian and bicycle crossing between the Centennial Way Trail and SamTrans Transit Center at the San Bruno BART Station, and the omission of a southern crosswalk across Huntington Avenue at the San Bruno BART Station entrance. Pedestrian conditions are illustrated on Figure 2-3.
- Lack of bicycle connectivity: While some bike trail and bike lane facilities are present near the Project site as shown in Figure 2-2. However, there is limited connectivity between dedicated bicycle facilities and to major destinations. For example, bike lanes along Sneath Lane do not connect to the Centennial Way Trail; the Centennial Way Trail does not connect to the San Bruno BART Station or elsewhere in San Bruno; and there is no dedicated connection between the Project site and downtown South San Francisco. Consequently, bicyclists who seek to access the Project site must share street space with cars and trucks operating on streets with posted speed limits of 25 to 30 MPH.

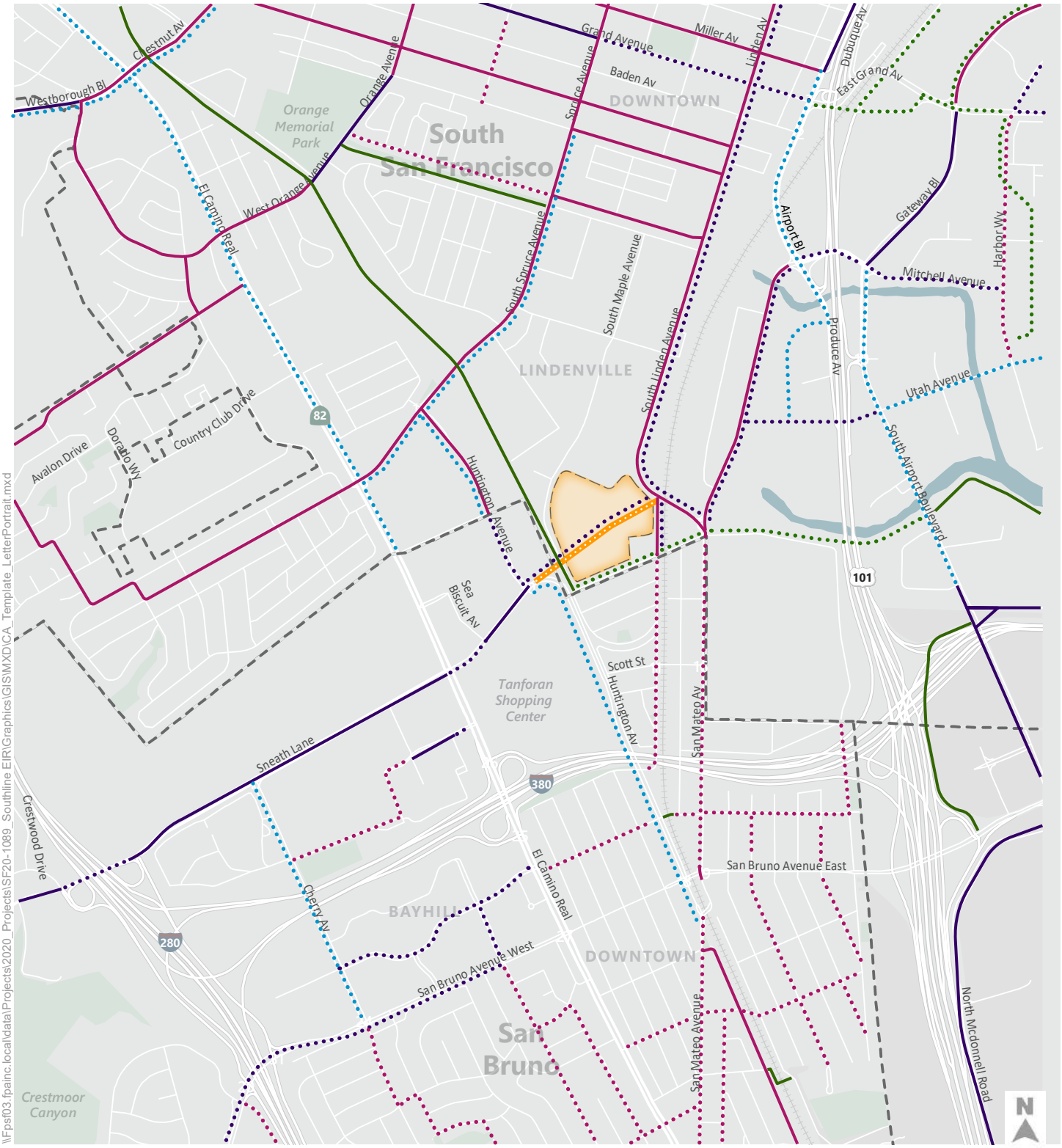
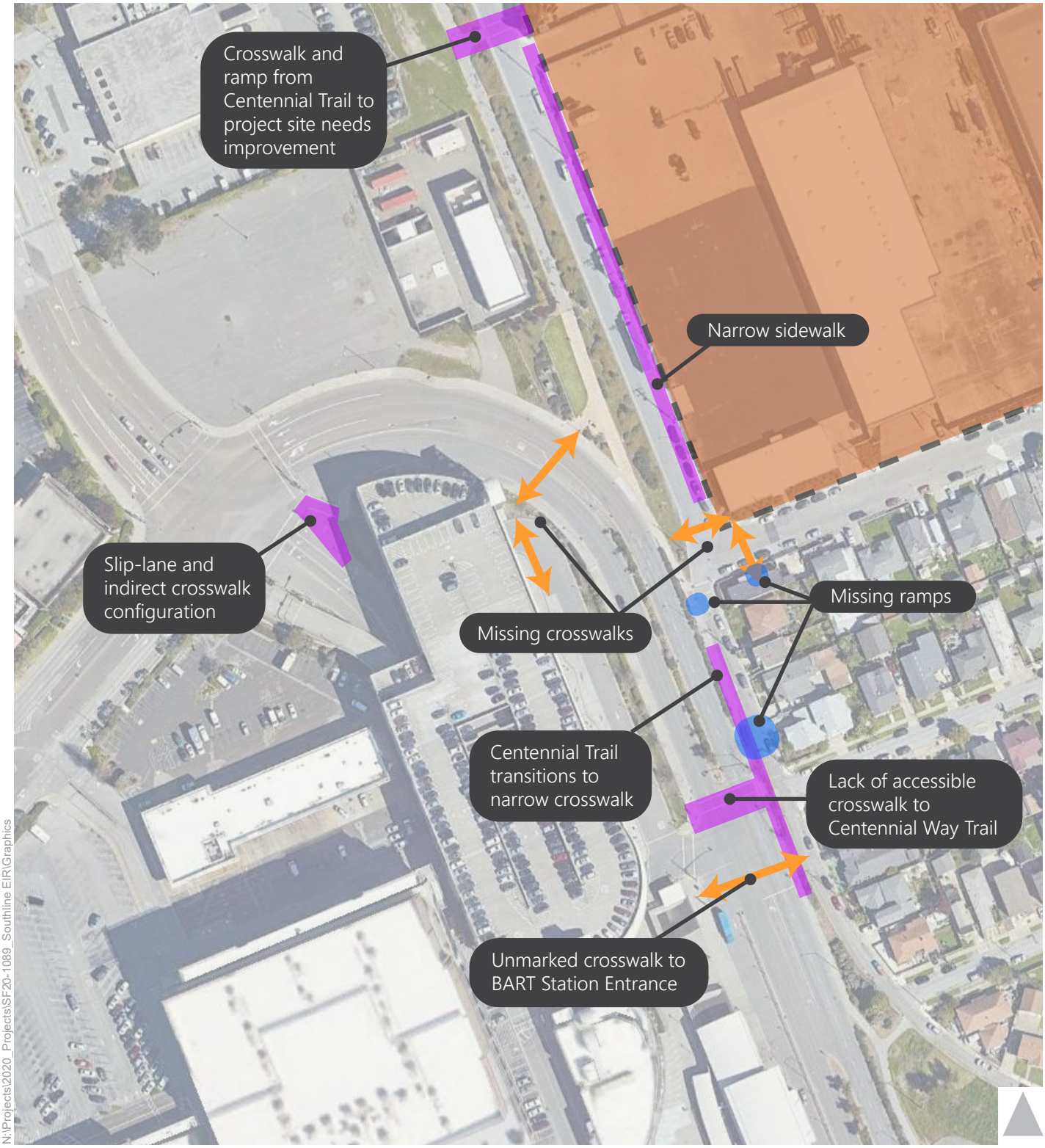


Figure 2-2
Bicycle Facilities



Project Site

Figure 2-3

Pedestrian Circulation Barriers

3. Analysis Methodology

3.1 Recent Changes to CEQA

Senate Bill (SB) 743[1], codified in Section 21099 of the California Public Resources Code, intends to better align California Environmental Quality Act (CEQA) transportation impact analysis practices and mitigation outcomes with the State's goals to reduce greenhouse gas (GHG) emissions, encourage infill development, and improve public health through more active transportation. SB 743 creates several key statewide changes to CEQA as described below.

First, SB 743 requires the Governor's Office of Planning and Research (OPR) to establish new metrics for determining the significance of transportation impacts of Projects within transit priority areas (TPAs)[2] and allows OPR to extend use of these metrics beyond TPAs. OPR selected vehicle miles traveled (VMT) as the preferred transportation impact metric and applied their discretion to require its use statewide.

Second, SB 743 establishes that aesthetic and parking impacts of a residential, mixed-use residential, or employment center Projects[3] on an infill site[4] within a TPA shall not be considered significant impacts on the environment.

Third, the new CEQA Guidelines that implement SB 743 requirements state that vehicle level of service (LOS) and similar measures related to auto delay shall not be used as the sole basis for determining the significance of transportation impacts, and that as of July 1, 2020, this requirement applies statewide. Prior to that date, lead agencies were permitted to elect to rely on VMT rather than LOS to analyze transportation impacts.

Finally, SB 743 establishes a new CEQA exemption for a residential, mixed-use, or employment center Project that is a) within a transit priority area, b) consistent with a specific plan for which an EIR has been certified, and c) consistent with a Sustainable Communities Strategy (SCS). This exemption requires further review if the Project or circumstances changes significantly.

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[1] Full text of SB 743: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB743

[2] "Transit priority area" means an area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Transportation Improvement Program adopted pursuant to Section 450.216 or 450.322 of Title 23 of the Code of Federal Regulations . (PRC 21099(a)(7))

[3] "Employment center Project" means a Project located on property zoned for commercial uses with a floor area ratio of no less than 0.75 and that is located within a transit priority area. (PRC 21099(a)(1))

[4] "Infill site" means a lot located within an urban area that has been previously developed, or on a vacant site where at least 75 percent of the perimeter of the site adjoins, or is separated only by an improved public right-of-way from, parcels that are developed with qualified urban uses. (PRC 21099(a)(4))

The City of South San Francisco has adopted VMT thresholds (Resolution 77-2020) in accordance with OPR's *Technical Advisory on Evaluating Transportation Impacts in CEQA*.

3.2 Significance Criteria

The impacts of the proposed Project related to transportation would be considered significant if any of the following Standards of Significance are exceeded, in accordance with Appendix G of the CEQA Guidelines:

- The Project or its effects conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities;
- The Project or its effects conflicts with or is inconsistent with CEQA Guidelines section 15064.3, subdivision (b);
- The Project substantially increases hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or
- The Project results in inadequate emergency access.

Thresholds of significance used in this document are based on Appendix G criteria as well as local considerations from adopted policies by the City of South San Francisco and City of San Bruno. Neither the City of South San Francisco nor the City of San Bruno has adopted a standard set of thresholds of significance for transportation impact analyses beyond the Appendix G criteria.

3.2.1 Vehicle Miles Traveled (VMT)

Pursuant to City of South San Francisco Resolution 77-2020 and CEQA Guidelines Section 15064.3, subdivision (b)(1), the following screening criteria applies to land use projects:

> ***Presumption of Less Than Significant Impact Near Transit Stations:*** *CEQA Guideline Section 15064.3, subdivision (b)(1), states that lead agencies generally should presume that certain projects (including residential, retail, and office projects, as well as projects that are a mix of these uses) proposed within ½ mile of an existing major transit stop or an existing stop along a high quality transit corridor will have a less-than-significant impact on VMT. This presumption would not apply, however, if Project-specific or location-specific information indicates that the Project will still generate significant levels of VMT. For example, the presumption might not be appropriate if the Project:*
>
> - Has a Floor Area Ratio (FAR) of less than 0.75
> - Includes more parking for use by residents, customers, or employees of the Project than required by the jurisdiction (if the jurisdiction requires the Project to supply parking)
> - Is inconsistent with the applicable Sustainable Communities Strategy (as determined by the lead agency, with input from the Metropolitan Planning Organization)
> - Replaces affordable residential units with a smaller number of moderate- or high-income residential units

If a land use Project is not presumed to have a less than significant impact, the following criteria applies:

- A significant impact would occur if development of the Project would generate per-employee vehicle miles traveled (VMT) greater than the City's adopted threshold of greater than 15 percent below the regional average.

For transportation infrastructure Projects (such as a street extension), the following criteria applies:

- A significant impact would occur if the Project would result in a net increase in Total VMT.

3.2.2 Design Hazards

3.2.2.1 Geometric Design Hazards

- A significant impact would occur if the Project substantially increases hazards to street users due to a design feature or land uses incompatible with the surrounding street network.

3.2.2.2 Vehicle Queueing at Freeway Ramps

- A significant impact would occur if 95th-percentile vehicle queues were to extend beyond the available storage space and substantially exacerbate a risk of collision.

3.2.2.3 Queueing Across an At-Grade Rail Crossing

- A significant impact would occur if 95th percentile vehicle queues extend beyond available storage and may substantially exacerbate risk of collisions.

3.2.2.4 Traffic Signal Warrant

- A significant impact would occur if Project-related vehicle traffic at an unsignalized intersection or driveway would increase baseline volumes to meet peak hour or pedestrian volume signal warrant criteria levels, and Project-related traffic volumes may substantially increase risk of collisions.

3.2.3 Emergency Vehicle Access

- A significant impact would occur if the Project results in inadequate emergency access

3.2.4 Bicycle, Pedestrian, and Transit

3.2.4.1 Consistency with Adopted Bicycle, Pedestrian, or Transit Plans & Policies

- A significant impact would occur if the Project conflicts with adopted policies, plans, or programs regarding transit, bicycle, or pedestrian facilities.

3.2.4.2 Bicycle, Pedestrian, and Transit Performance & Safety

- A significant impact would occur if the project were to cause a detrimental impact on the performance of transit services.

- A significant impact would occur if the project were to cause a detrimental impact on the performance or safety of bicycle or pedestrian facilities.

3.3 Analysis Scenarios

The impacts of the proposed Project to the surrounding transportation system were evaluated for the five scenarios listed below:

- Scenario 1: Existing Conditions
- Scenario 2: 2024 Baseline (No Project)
- Scenario 3: 2024 Baseline Plus Project Phase 1 Conditions
- Scenario 4: Cumulative 2040 Conditions
- Scenario 5: Cumulative 2040 Plus Project Buildout Conditions

A description of the methods used to estimate the amount of traffic and VMT generated by the proposed Project is provided below.

3.3.1 Existing Conditions (Pre-COVID-19)

Existing conditions represent the baseline condition upon which Project impacts are measured. The existing condition reflects transportation conditions prior to the COVID-19 pandemic. Due to the atypical travel patterns and transit service levels during the COVID-19 pandemic, new data was not collected for this analysis. Instead, to establish a representative existing condition, this analysis utilized local traffic data collected in 2017 and 2018 and transit service levels prior to the COVID-19 pandemic (including Caltrain service levels of five trains per hour, per direction). This approach enables analysis of an observed condition and no major developments have since been completed in the immediate Project area that might substantially affect traffic patterns; however, there is inherently some uncertainty in the data's representation of existing conditions due to its age and the unusual circumstances of the COVID-19 pandemic.

3.3.2 2024 Baseline

The 2024 Baseline condition represents a near-term condition after the COVID-19 pandemic is presumed to have ended, in which travel patterns have returned to pre-COVID-19 status. The 2024 Baseline condition includes prorated local and regional growth consistent with the 2040 forecasts, reflecting the 2017/2018 conditions plus the addition of roughly one quarter of total growth between the 2017/2018 condition and 2040 forecasts. There remains substantial uncertainties around the COVID-19 pandemic's effects on travel behavior and the duration of these effects; this approach assumes travel behavior returns to typical conditions and the effects of the pandemic are short term in nature. The 2024 Baseline also includes the completion of the Caltrain Electrification Project, a Project currently under construction that will increase Caltrain service levels to six trains per hour, per direction.

3.3.3 2024 Baseline Plus Project Phase 1 Conditions

The 2024 Baseline Plus Phase 1 conditions represent the 2024 condition with the addition of Phase 1 of the Project based on the anticipated Phase 1 construction schedule. Phase 1 of the Project includes several major transportation network improvements, including the construction of Southline Avenue; constructing a new intersection connecting Sneath Lane, Huntington Avenue, Maple Avenue, and Southline Avenue; providing a signalized driveway to the SamTrans Transit Center; and extension of various bicycle and pedestrian facilities, including extending the Centennial Way Trail to the San Bruno BART station and enhancing pedestrian access to the San Bruno BART station with new bulbouts and high visibility crosswalks. As such, under 2024 Baseline Plus Phase 1 conditions, traffic volumes reflect the existing traffic volumes, some redistribution of traffic to the new Southline Avenue, and traffic associated with the land uses in Phase 1 of the Project.

3.3.4 Cumulative 2040 Conditions

Cumulative 2040 conditions include transportation demand resulting from reasonably foreseeable land use changes and conditions associated with planned transportation Projects. Cumulative conditions are based on forecasted land use and transportation conditions included in Plan Bay Area 2040, as represented in the C/CAG Model. Forecasts for cumulative conditions include several adjustments to reflect reasonably foreseeable Projects affecting the study area, including completion of all approved employment Projects within the City of South San Francisco as of May 2020,[5] and completion of the Bayhill Specific Plan in the City of San Bruno (a plan that may be considered reasonably foreseeable even though it is not yet approved). Along the Caltrain railroad corridor, cumulative conditions include the operation of 12 trains per hour, per direction during peak periods; this service level reflects completion of the California High Speed Rail Project to operate four high speed trains per hour, per direction (as described in Plan Bay Area) as well as the Caltrain Business Plan's adopted service vision of operating eight trains per hour, per direction during peak periods.

Cumulative conditions do not assume completion of the South Linden and Scott Street grade separations since these Projects are not yet fully funded or included in the regional transportation plan. As of September 2020, both South San Francisco and San Bruno have provided direction to proceed with studying a hybrid approach for the South Linden Avenue grade crossing that involves partially raising the railway and lowering the roadway, along with closing Scott Street to vehicles and maintaining a crossing for pedestrians and bicyclists.

[5] The total land use approvals for employment Projects in the City of South San Francisco exceeds Plan Bay Area forecasts, so the difference in employment growth has been added to Plan Bay Area forecasts. Projects included in this cumulative analysis include major developments such as the Cove, Gateway of the Pacific, the Oyster Point Development, and other projects in the East of 101 Area.

3.3.5 Cumulative 2040 Plus Project Conditions

Cumulative plus Project conditions represent the cumulative condition with the addition of the complete Project buildout to determine the extent to which the proposed Project would contribute to long-term cumulative transportation impacts.

3.4 Travel Demand Model Methodology

The *City/County Association of Governments of San Mateo County Travel Demand Model* (C/CAG Model) was used as a basis for analyzing travel behavior, including trip distribution and vehicle miles traveled (discussed in Section 4.2). The C/CAG Model is a trip-based regional travel demand model that considers regional land use patterns, approximated highway congestion, and connecting transit service within the nine-county Bay Area region. As part of the ongoing City of South San Francisco General Plan Update study, the C/CAG model was reviewed, and updated through a series of diagnostic tests to assess the model's performance and reasonableness, and a series of refinements were made to the model inputs for land use, roadway network and transit service within South San Francisco.[6] These updates improve the C/CAG model's effectiveness in reasonably estimating current travel patterns and changes in travel patterns in response to Project land use and transportation network changes.

To further enhance the reasonableness of trip assignment from the C/CAG Model, the City of South San Francisco's sub-area model was applied using Project trip generation and trip distribution from the C/CAG Model. The sub-area model, developed for the City of South San Francisco General Plan Update, reflects origin-destination patterns consistent with the C/CAG Model and incorporates refinements to the level of detail in the local street network. The sub-area model, developed in the Visum software platform, provides a more detailed representation of traffic circulation and operational performance of the roadway network in the vicinity of the Project and within the San Francisco and San Bruno areas. The roadway network in the sub-area model was refined to include most streets and major driveways in South San Francisco. The traffic assignment process in the sub-area model incorporates details such as signal timings, intersection lane geometries, and turning movement delays, allowing for a more realistic representation of existing traffic patterns and those associated with the Project land use and proposed street extension.

3.5 Trip Generation, Distribution, and Assignment

The amount of traffic added to the roadway system by the proposed Project was estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. The first step, trip generation, estimates the amount of traffic that would be generated once the proposed Project was built and fully occupied. The second step, trip distribution, estimates the direction of travel to and from the Project. The

[6] The updates to model were based on relevant national guidance including *the 2017 Regional Transportation Plan Guidelines for Metropolitan Transportation Planning Organizations, CTC, 2017* and *Travel Model Validation and Reasonableness Checking Manual, Second Edition, TMIP, FHWA, 2010.*

third step, trip assignment, assigns the proposed Project trips to specific street segments and intersection turning movements. The results are described below.

3.5.1 Trip Generation

Project person trip and vehicle trip forecasts were developed to capture the multimodal nature of Project travel as a transit-oriented development. Person trip generation represents trips by one person in any mode of transportation, whereas vehicle trip generation represents trips by one vehicle. Vehicle trip estimates include trips associated with single occupancy vehicles, taxis, ride-hailing companies (like Uber and Lyft), carpools, and shuttles.

The Project includes two land use alternatives – an office use and a life science use. For purposes of this analysis, the office use was analyzed to reflect a land use condition with an employee density – typically offices have one employee per 250 square feet, compared to one employee per 450 square feet for life science uses.[7] Therefore, the Office Alternative would have a larger effect on the surrounding environment when compared to the Life Sciences Alternative. As such, this section analyzes the Office Alternative when considering project impacts under the buildout scenario.

Trip generation estimates were prepared for the Phase 1 Project (701,000 square feet), inclusive of the approximately 16,400 square foot publicly-accessible ground floor uses in the amenities buildings, in addition to the Project Buildout (up to 2,800,000 square feet). The higher parking scenario was analyzed (2.2 spaces per 1,000 square feet).

As described in Section 1.1, the Project is subject to the City's Transportation Demand Management ordinance. The Project will be required to comply with a maximum drive alone mode share of 55 percent. Under the Transportation Demand Management ordinance, the Project must comply with standard monitoring practices to enforce these mode share requirements. A Preliminary TDM Plan has been prepared for the Project, which is applicable to the entire Project site.

3.5.1.1 Office Trip Generation

Office trip generation was calculated using local data from comparable sites, as further described below, based on the ITE *Trip Generation Manual, 10th Edition* recommendation for using local data for similar atypical developments like the proposed Project, which is very large in scale, adjacent to high frequency transit service, has a reduced parking supply, and is subject to stringent transportation demand management requirements. Based on the ITE recommendation, this analysis estimates person trip and vehicle trip rates based on observed counts and mode share surveys for comparable high intensity technology office uses in Downtown Redwood City near the Redwood City Caltrain Station, as analyzed in the *Redwood City Moves Transportation Plan*. Based on a review of comparable trip generation and mode share data for other transit-oriented office sites located in San Francisco, Oakland, and San Mateo, the

[7] San Jose Market Overview and Employment Lands Analysis, City of San Jose, 2016.

Downtown Redwood City location was selected based on land use, transit, and TDM characteristics that most closely resemble the Project. These person trip and vehicle trip rates from the Downtown Redwood City data were adjusted to reflect the Project's mode share requirements consistent with the City of South San Francisco's TDM ordinance – a maximum peak period drive alone rate of 55 percent including single-occupancy vehicles and single-passenger trips via ride-hailing companies or taxis, as compared to an observed peak period drive-alone rate of 50 percent in the downtown Redwood City surveys.[8]

Person trip generation for non-auto modes was based on transit, carpool, and active transportation data from South San Francisco TDM surveys and the proximity of the Project to transit services and active transportation facilities. An estimated 23 percent of peak hour trips would occur via BART, 10 percent via Caltrain, eight percent via Carpool, two percent via SamTrans buses, and two percent via bicycling. Trips via BART and SamTrans would require walking from the Project to the San Bruno BART Station or SamTrans bus transit center, while trips via Caltrain would connect via first/last mile shuttles or via biking.

3.5.1.2 Amenity Uses

Trip generation for the Project's publicly accessible restaurant/retail uses were estimated using the High Turnover Restaurant classification from the *Trip Generation Manual, 10th Edition*. Since the publicly accessible amenities are generally expected to draw pedestrian trips from elsewhere within the Project site and adjacent areas, the High Turnover Restaurant classification provides a conservative assessment of vehicle trips that is typically more reflective of a more automobile-oriented use.

Amenity uses accessible only to tenants of the Project such as an employee cafeteria, fitness center, basketball court, auditorium would not generate external vehicle trips, but would generate employee-related person trips for individuals employed at these services. Trip generation for these internal private amenities was estimated at about one quarter of office rates based on anticipated employee densities and mix of staffed and unstaffed uses[9]. Trip generation for the public and private amenity uses were included in both the Phase 1 Project and Project Buildout.

3.5.1.3 Trip Internalization

In mixed use developments, some trips between different land uses are "internalized" onsite – occurring by walking rather than driving elsewhere. The project proposes to include a mix of office and amenity uses that would facilitate some internalization (such as an office employee walking to a fitness center, cafeteria, and café or retail space). Internalization rates of 3 percent (AM peak hour) and 2 percent (PM peak hour) were

[8] City of South San Francisco's TDM ordinance establishes required alternative mode share of 45 percent based on Project floor area ratio.

[9] Based on the San Mateo County Linkage Fee Nexus Study, restaurant and service uses typically have half of the employee density of office uses. About half of the Project amenity spaces were identified to be actively staffed restaurant and service uses; therefore, the employee density and trip generation was assumed to be one-quarter of office uses. Office trip generation typically reflect mostly trips by employees, so the ratio of amenity density to office density was applied to trip generation to determine amenity trip generation rates.

applied to all vehicle trips during the respective peak hours, based on the Mixed-Use Trip Generation Model (MXD) + Model, a weighted average of the U.S. Environmental Protection Agency's MXD and the National Cooperative Highway Research Program's 684 methodology.

3.5.1.4 Credit for Existing Trip Generation

The project's net change in the number of vehicle trips was calculated to reflect the estimated number of vehicle trips occurring at the Specific Plan area under existing conditions. Because of the atypical travel patterns associated with the COVID-19 shelter-in-place order, driveway counts at existing uses were not conducted. Instead, trip generation for existing uses within the Specific Plan area was estimated based on land use characteristics and Trip Generation Manual recommendations. Existing land uses include approximately 344,000 square feet of light industrial and office uses, about 85 percent of which is occupied. All of the existing land uses would be demolished as part of Phase 1; therefore, both Phase 1 and project buildout trip generation include the full trip credit associated with existing land uses. In total, existing uses generate an estimated 1,504 daily vehicle trips, including 171 AM peak-hour vehicle trips and 150 PM peak-hour vehicle trips.

3.5.1.5 Trip Generation Results

Phase 1 of the Project would generate approximately 7,930 daily person trips and 3,954 daily vehicle trips. These totals include 1,043 AM peak hour person trips, 485 net new AM peak hour vehicle trips, 950 PM peak hour person trips, and 455 net new PM peak hour vehicle trips. Table 3-1 and Table 3-2 show person trip and vehicle trip generation estimates for Phase 1, respectively.

Table 3-1. Person Trip Generation | Phase 1

Mode	Mode Share	AM Peak Hour	PM Peak Hour	Daily
Drive Alone	55%	499	447	3,837
Carpool	8%	73	65	550
BART	23%	209	187	1,281
Caltrain[1]	10%	91	81	557
SamTrans	2%	18	16	111
Walk/Bike[2]	2%	18	16	111
Total Person Trips Monitored by TDM Ordinance	**100%**	**908**	**812**	**6,448**
Person Trips, Public Amenity Visitors	-	135	138	1,482
Total Person Trips	**-**	**1,043**	**950**	**7,930**

Notes:
1. Based on travel demand data from high intensity tech office mode share and person trip generation surveys from Downtown Redwood City near the Redwood City Caltrain Station as well as requirements from City of South San Francisco TDM Ordinance.
2. Mode share estimates based on City of South San Francisco TDM Surveys and analysis based on local context.

Source: Fehr & Peers, 2020.

Table 3-2. Vehicle Trip Generation | Phase 1

Land Use	Size (KSF)	AM Peak Hour				PM Peak Hour				Daily	
		Rate (per KSF)	In	Out	Total	Rate (per KSF)	In	Out	Total	Rate (per KSF)	Total
Office[1]	613	0.81	464	35	499	0.73	58	387	445	6.16	3,774
Private Amenities[2]	72	0.23	15	1	16	0.20	2	13	15	1.72	124
Public Amenities[3]	16	9.94	87	72	159	9.77	97	59	156	115	1,840
Internalization Adjustment (3% AM / 2% PM)			*-15*	*-3*	*-18*		*-3*	*-8*	*-11*		*-280*
Project Trips			**551**	**105**	**656**		**154**	**451**	**605**		**5,458**
Existing Office[4]	*11*	*ITE Equation*	-10	-2	-12	*ITE Equation*	-2	-12	-14	9.74	-125
Existing Light Industrial[5]	*278*	*ITE Equation*	-140	-19	-159	*ITE Equation*	-18	-118	-136	4.96	-1,379
Net New Project Trips			**401**	**84**	**485**		**134**	**321**	**455**		**3,954**

Notes:

1. Based on travel demand data from high intensity tech office mode share and vehicle trip generation surveys from Downtown Redwood City near the Redwood City Caltrain Station as well as requirements from City of South San Francisco TDM Ordinance. Values rounded in table.
2. Includes external trips associated with employee commutes and deliveries only, assumed to be 72 percent less than the office trip generation rate based upon expected uses and employee densities.
3. Source: ITE 932 High Turnover Restaurant, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Values rounded in table.
4. Source: ITE 710, General Office Building, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Fitted curve equation used for individual land uses. Includes occupied spaces only as of March 2020. Values rounded in table. All existing uses are assumed to be removed with the Phase 1 Project.
5. Source: ITE 110, General Light Industrial, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Fitted curve equation used for individual land uses. Includes occupied spaces only as of March 2020. Values rounded in table. All existing uses are assumed to be removed with the Phase 1 Project.

Source: Fehr & Peers, 2020.

The Project Buildout would generate approximately 28,461 daily person trips and 16,876 vehicle trips. These totals include 3,918 AM peak hour person trips, 2,150 net new AM peak hour vehicle trips, 3,528 PM peak hour person trips, and 1,952 PM peak hour vehicle trips. Table 3-3 and Table 3-4 show person trip and vehicle trip generation estimates for the Project Buildout respectively.

Table 3-3. Person Trip Generation | Project Buildout

Mode	Mode Share	AM Peak Hour	PM Peak Hour	Daily
Drive Alone	55%	2,105	1,879	15,984
Carpool	8%	306	273	2,317
BART	23%	880	786	5,394
Caltrain[1]	10%	383	342	2,345
SamTrans	2%	77	68	469
Walk/Bike[2]	2%	77	68	469
Total Person Trips Monitored by TDM Ordinance	**100%**	**3,828**	**3,416**	**26,978**
Person Trips, Public Amenity Visitors	-	90	112	1,483
Total Person Trips	**-**	**3,918**	**3,528**	**28,461**

Notes:

1. Based on travel demand data from high intensity tech office mode share and person trip generation surveys from Downtown Redwood City near the Redwood City Caltrain Station as well as requirements from City of South San Francisco TDM Ordinance.
2. Mode share estimates based on City of South San Francisco TDM Surveys and assignment to transit providers based on local context and expected travel patterns.

Source: Fehr & Peers, 2020.

Table 3-4. Vehicle Trip Generation | Project Buildout

Land Use	Size (KSF)	AM Peak Hour				PM Peak Hour				Daily	
		Rate (per KSF)	In	Out	Total	Rate (per KSF)	In	Out	Total	Rate (per KSF)	Total
Office[1]	2,712	0.81	2,053	155	2,208	0.73	256	1,713	1,969	6.16	16,696
Private Amenities[2]	72	0.23	15	1	16	0.20	2	13	15	1.72	124
Public Amenities[3]	16	9.94	87	72	159	9.77	97	59	156	115	1,840
Internalization Adjustment (3% AM / 2% PM)			-56	-6	-62		*-6*	*-32*	*-38*		*-280*
Project Trips			**2,099**	**222**	**2,321**		**349**	**1,753**	**2,102**		**18,380**
Existing Office[4]	*11*	*ITE Equation*	-10	-2	-12	*ITE Equation*	-2	-12	-14	9.74	-125
Existing Light Industrial[5]	*278*	*ITE Equation*	-140	-19	-159	*ITE Equation*	-18	-118	-136	4.96	-1,379
Net New Project Trips			**1,949**	**201**	**2,150**		**329**	**1,623**	**1,952**		**16,876**

Notes:

1. Based on travel demand data from high intensity tech office mode share and vehicle trip generation surveys from Downtown Redwood City near the Redwood City Caltrain Station as well as requirements from City of South San Francisco TDM Ordinance. Values rounded in table.
2. Includes external trips associated with employee commutes and deliveries only, assumed to be 72 percent less than the office trip generation rate based upon expected uses and employee densities.
3. Source: ITE 932 High Turnover Restaurant, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Values rounded in table.
4. Source: ITE 710, General Office Building, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Fitted curve equation used for individual land uses. Includes occupied spaces only as of March 2020. Values rounded in table.
5. Source: ITE 110, General Light Industrial, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Fitted curve equation used for individual land uses. Includes occupied spaces only as of March 2020. Values rounded in table.

Source: Fehr & Peers, 2020.

3.5.2 Project Vehicle Trip Distribution, and Project Vehicle Trip Assignment

Figure 3-1 displays vehicle trip distribution by county based on the C/CAG Model. Approximately 65 percent of vehicle trips would travel between the Project and other locations in San Mateo County. About 21 percent of trips would travel between the Project and San Francisco County. The remainder of trips would be split between Alameda County, Santa Clara County, and elsewhere in the East Bay and North Bay. This summary does not include trip distribution associated with non-auto trips.

Figure 3-1. Vehicle Trip Distribution – Summary by County

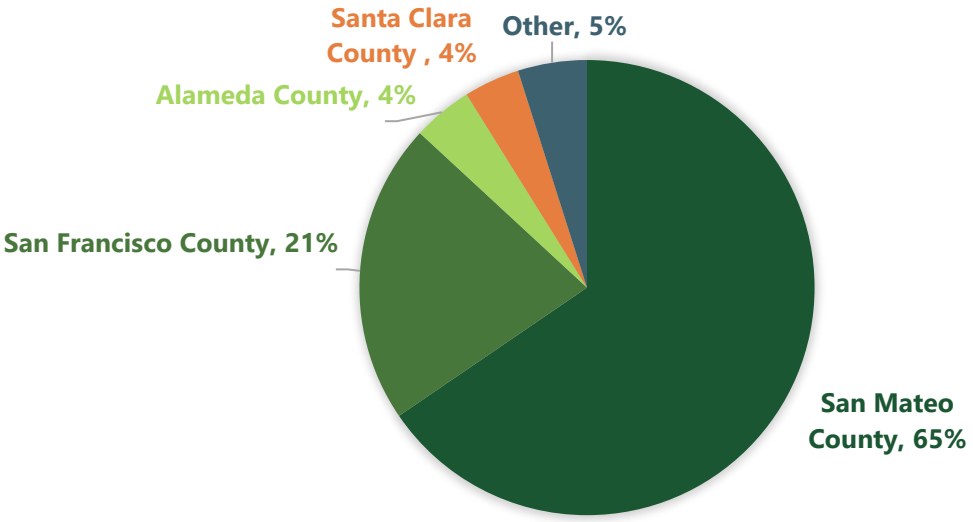
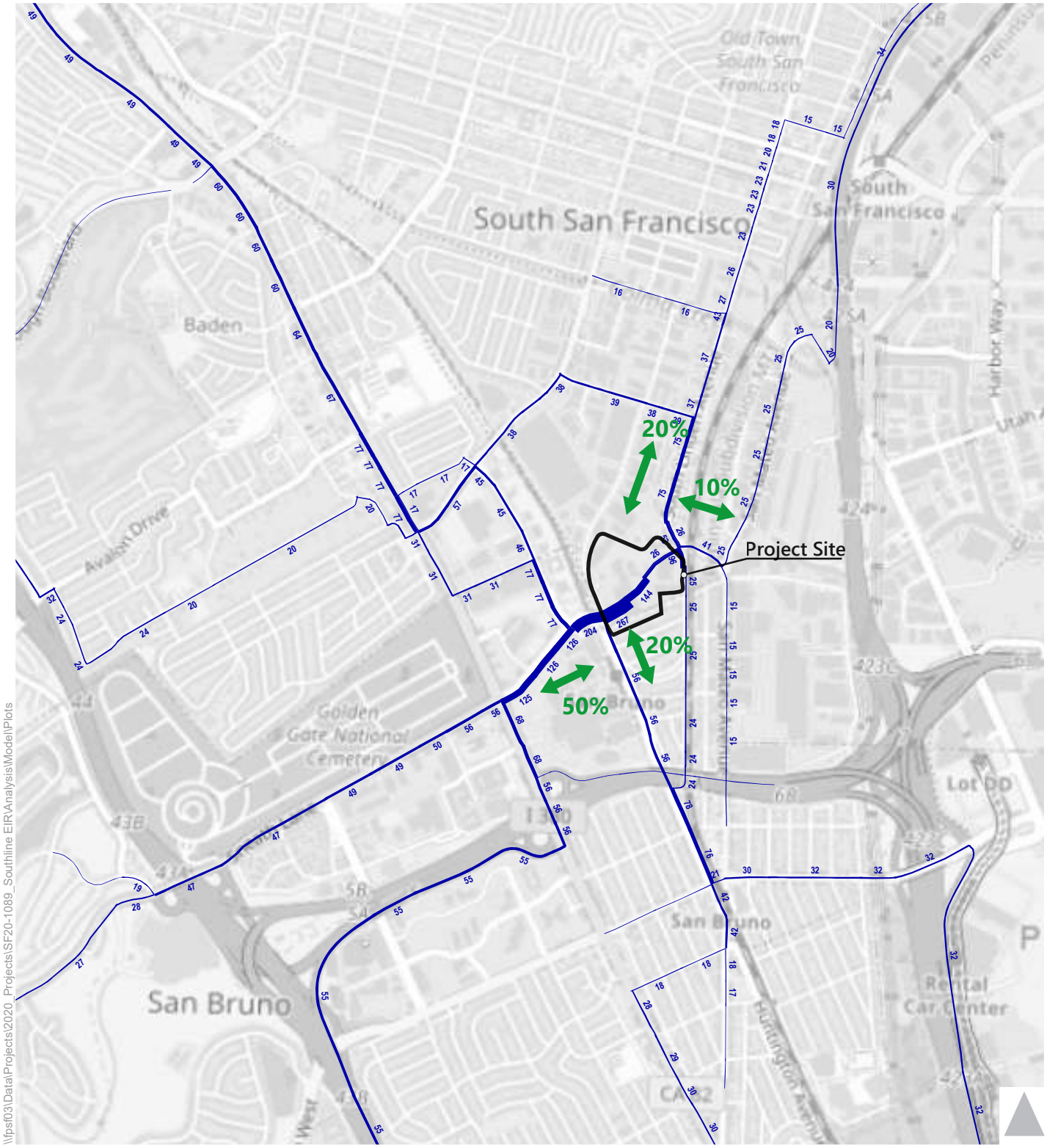


Figure 3-2 through Figure 3-5 illustrate Phase 1 and Project Buildout trip distribution and assignment based on the City's sub-area model, depicting street segments with greater than 25 Project-generated trips. Vehicle trip distribution from the Project is shown in green, while volumes assigned to individual streets are illustrated proportionally in blue. The Project's location and access to multiple freeway ramps would result in drivers using several different routes to access US-101, I-380, and I-280. Because 2040 freeway conditions are projected to be highly congested, some Project trips may travel somewhat longer distances via parallel corridors such as El Camino Real or Junipero Serra Boulevard. Approximately 56 percent of Project-generated trips would travel via San Bruno, and 44 percent via South San Francisco.

Figure 3-6 through Figure 3-9 illustrate the total difference in volumes associated with the Phase 1 Project and Project Buildout (the Phase 1 and Project Buildout trip assignment plus the rerouting of trips associated with the new street connection). Change in trips is illustrated proportionally with increases shown in red and decreases shown in green. By adding the Southline Avenue connection between Sneath Lane/Huntington Avenue and South Linden Avenue, the Project would shift vehicle trips from other routes, resulting in a net decrease in traffic volumes on parallel routes like Spruce Avenue and Scott Street. 2024 conditions generally mirror those shown in 2040 with lower traffic volumes associated with Phase 1.

The vehicle trip assignment served as the basis for selecting study locations for freeway ramps (Figure 3-10) as well as simulation of local transportation conditions, described in the following section.



\\fps03\Data\Projects\2020_Projects\SF20-1089_Southline EIR\Analysis\Model\Plots

Figure 3-2

Southline - Phase 1
Trip Distribution - AM Peak Hour

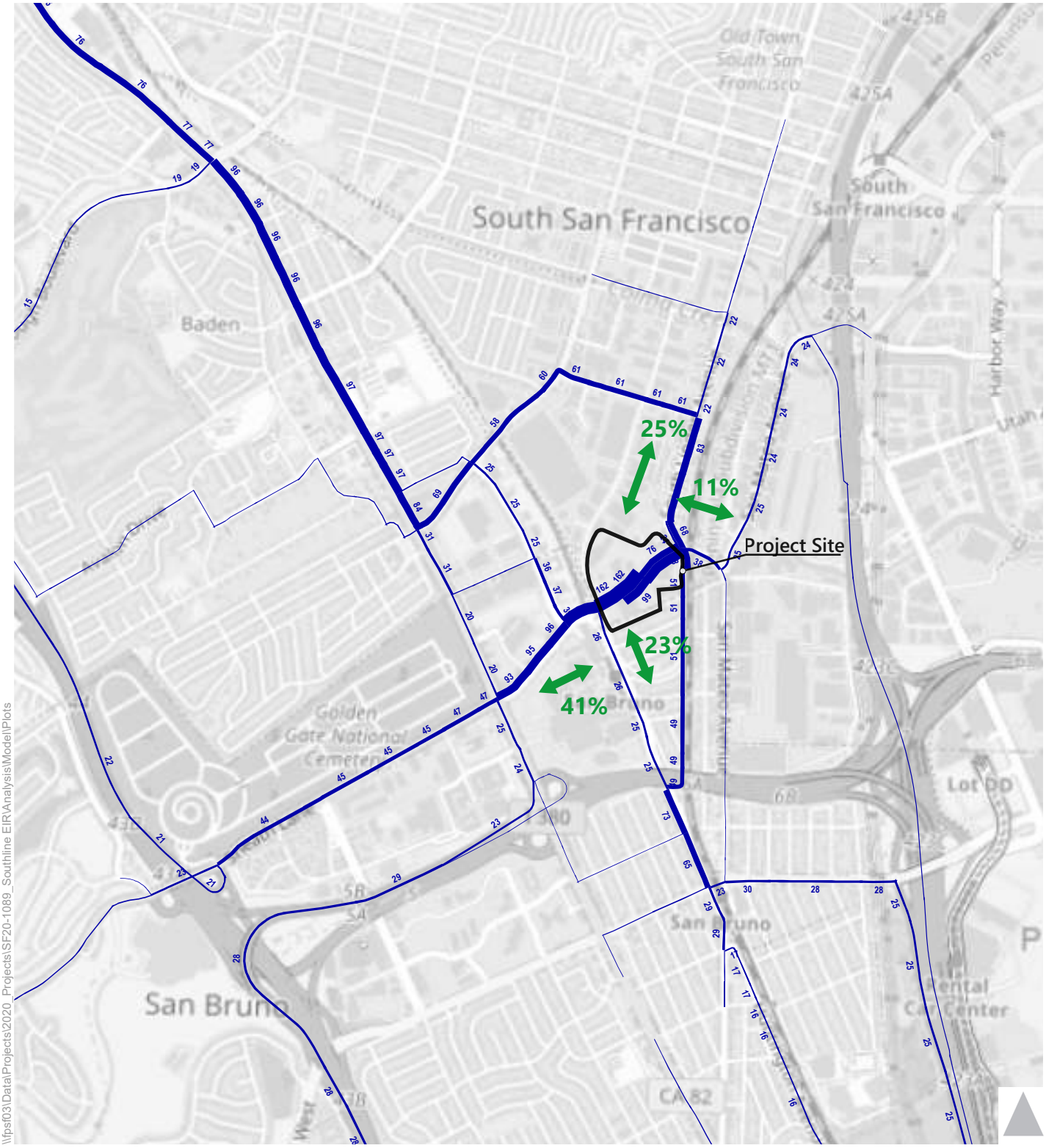


Figure 3-3

Southline - Phase 1
Trip Distribution - PM Peak Hour

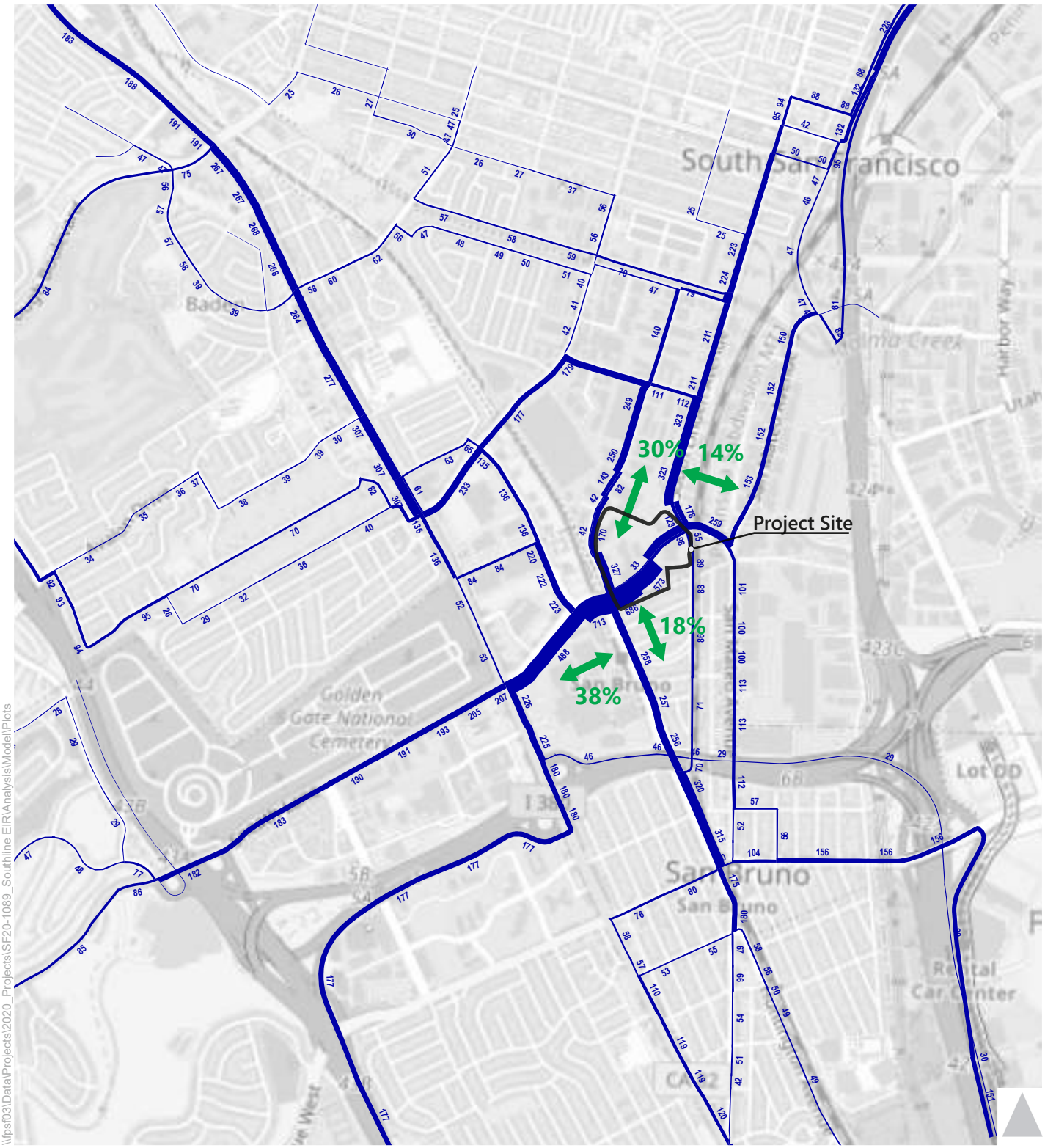


Figure 3-4

Project Trip Distribution & Assignment - AM Peak Hour

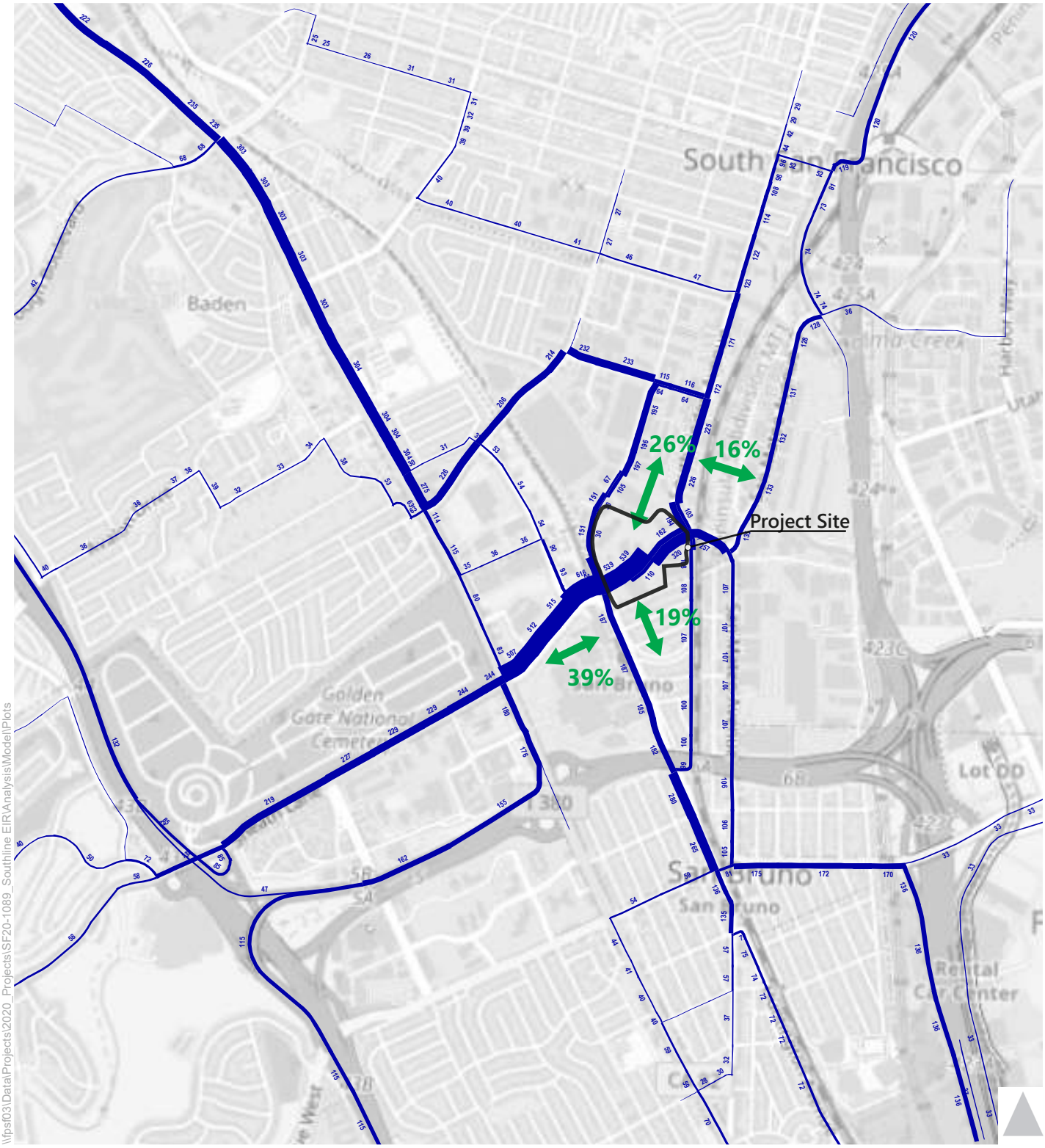


Figure 3-5

Project Trip Distribution & Assignment - PM Peak Hour

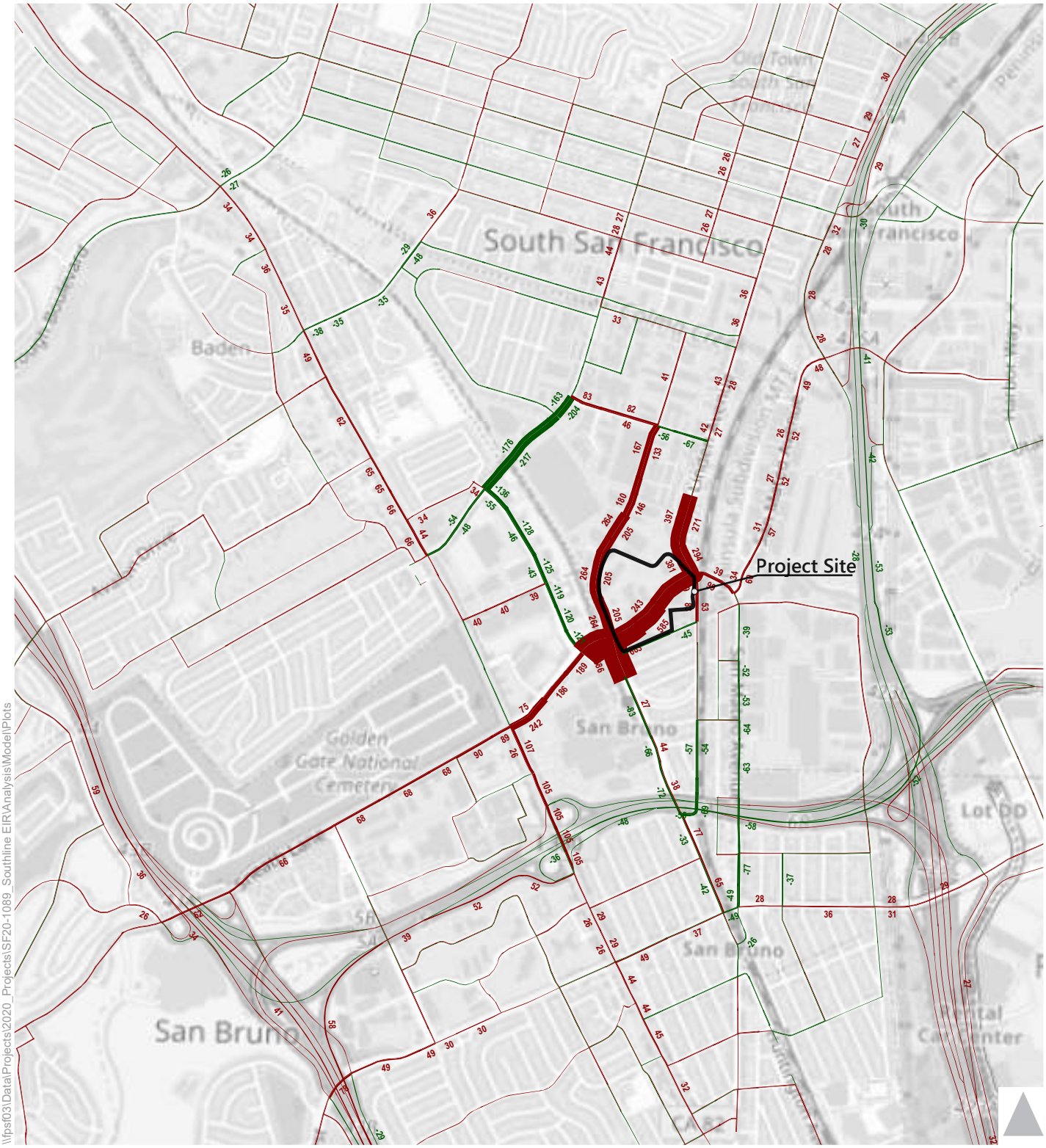
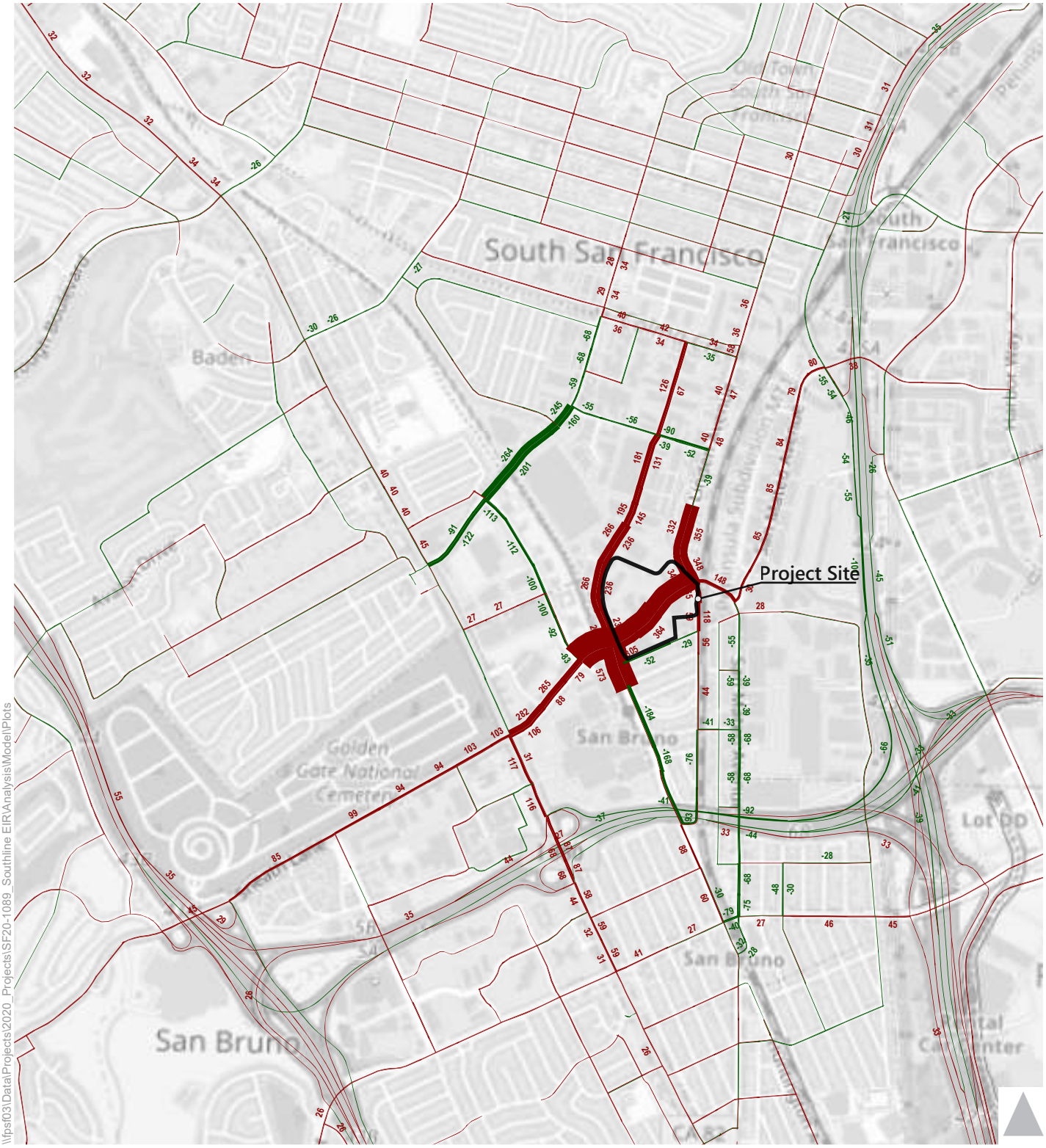


Figure 3-6

Southline - Existing Plus Phase 1
Volume Difference - AM Peak Hour



Change in Volume

Decrease

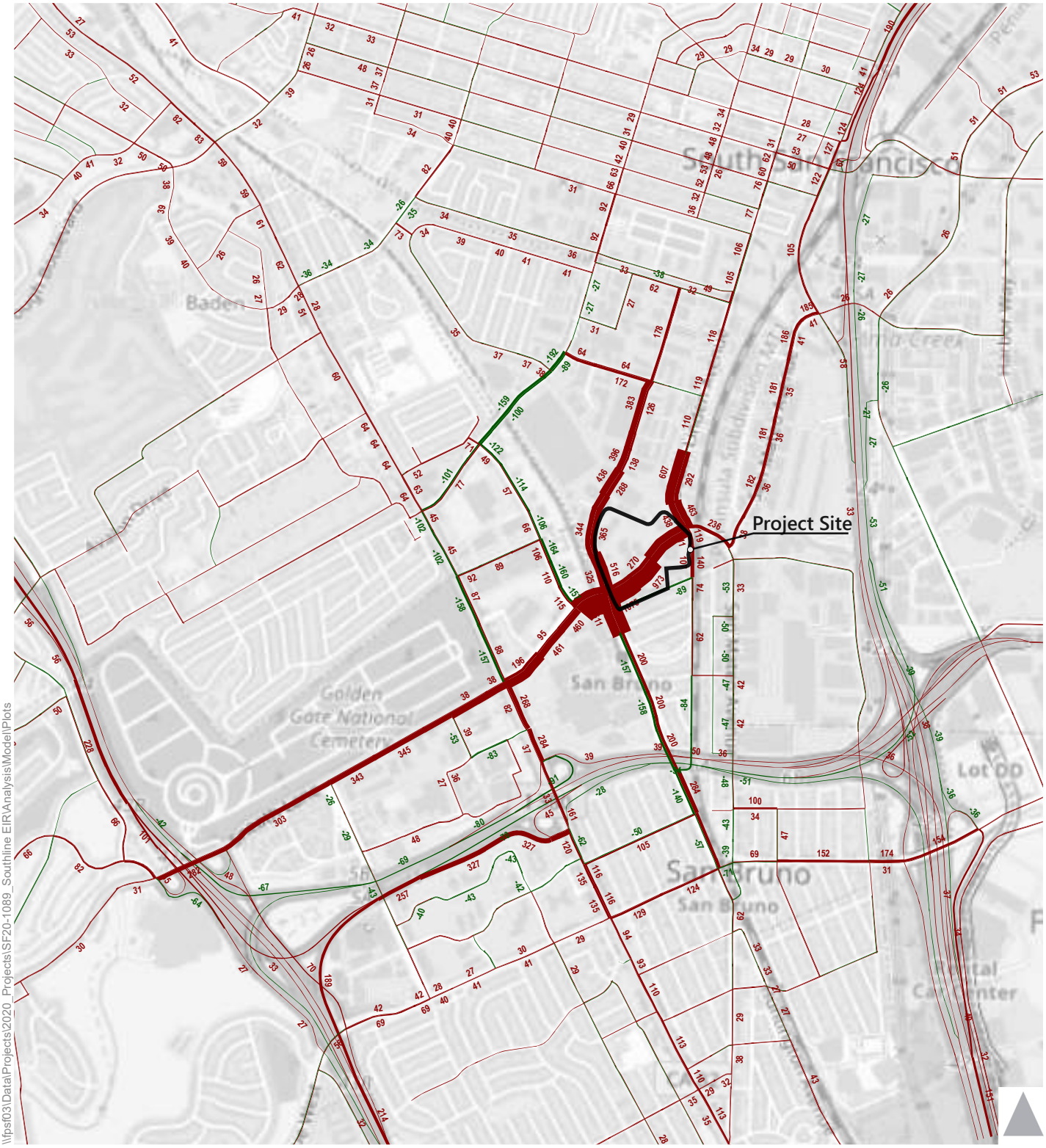
Increase

Volume - *veh/hr*

100 250 500 1000

Figure 3-7

Southline - Existing Plus Phase 1 Volume Difference - PM Peak Hour



Change in Volume

Decrease

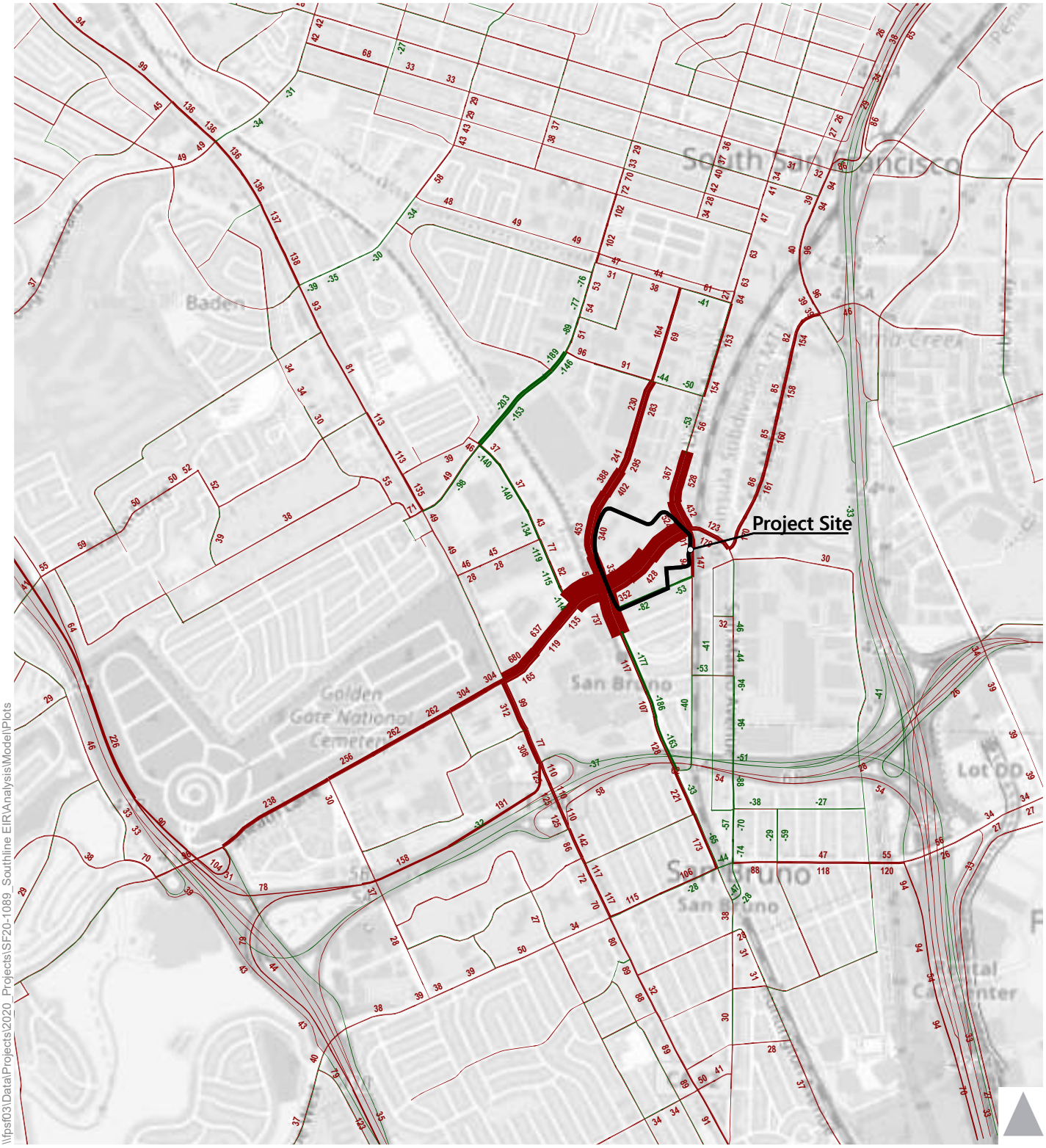
Increase

Volume - *veh/hr*

350 700 1400

Figure 3-8

Southline
Project Volume Difference - AM Peak Hour



Change in Volume

Decrease

Increase

Volume - *veh/hr*

350 700 1400

Figure 3-9

Southline
Project Volume Difference - PM Peak Hour

Project Site
New Street - Southline Avenue
Microsimulation Network
Freeway Intersections
City Boundary
BART Station
Caltrain Station

Figure 3-10
Study Locations

3.6 Multimodal Analysis Methodology

The Vissim software program was used as the basis for evaluating the congestion and multimodal traffic conditions around the Project. Vissim analyzes traffic by simulating and capturing the interactions between individual cars, trucks, buses, pedestrians and bicycles. In addition to vehicular LOS, Vissim enables evaluation of vehicle queuing, transit and emergency vehicle delays, pedestrian and bicycle delays, and pedestrian density (via the Viswalk module). When analyzing new and modified traffic signals in the Project, traffic signal timing was optimized to balance minimizing conflicts between pedestrians and vehicles and reducing delay for all users.

Synchro and SimTraffic software were used to evaluate vehicle queueing at freeway ramps. Synchro was used as the primary analysis tool to identify potentially congested locations, while SimTraffic was used to refine the queueing analysis at congested locations.

4. Transportation Analysis

This section includes analysis and findings of the Project's environmental effects on transportation services and facilities related to walking, biking, driving, and riding transit. Topics covered include:

- Plan & Policy Consistency Review
- VMT Analysis
- Trip Generation, Distribution, and Assignment
- Site Plan Analysis
- Offsite Analysis

4.1 Plan & Policy Consistency Review

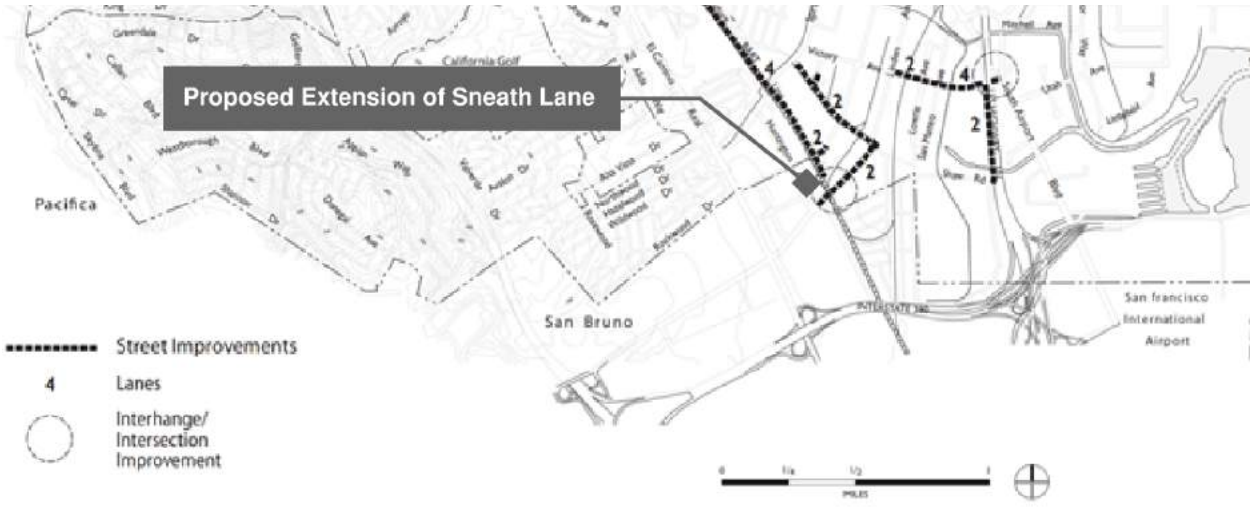
This section reviews the Project's consistency with adopted plans and policies by local and regional jurisdictions.

4.1.1 City of South San Francisco Plans and Policies

4.1.1.1 General Plan Policies

The Project site is located within the Lindenville Planning Sub-Area under the General Plan. The General Plan includes a number of policies that encourage redevelopment and infrastructure improvements in the Lindenville Planning Sub-Area, such as providing better connectivity to San Bruno BART station, including via an extension of Sneath Lane through the Project site. The General Plan contemplates that a new east-west street that would bisect the Project site and create a connection between Sneath Lane and South Linden Avenue to serve as the gateway between Downtown and San Bruno BART Station, as shown in Figure 4-1.

Figure 4-1. South San Francisco General Plan (1999) – Proposed Streets



The following City of South San Francisco General Plan policies relate to the Project and walking, biking, and transit.[10] A new 2040 General Plan (Shape SSF) is currently being prepared by the City, but the City has not yet adopted new policies.

- 3.2-G-2 Develop new streets and through connections to facilitate truck movement; improve access to U.S. 101, and provide better connectivity between the proposed San Bruno BART station and Downtown.
- 3.2-G-3 Enhance the appearance of the area by undertaking streetscape and other improvements.
- 3.2-I-14 Provide new street extensions in Lindenville as outlined in Chapter 4: Transportation.. including extension of South Linden Avenue to the San Bruno BART station
- 4.2-G-2 Improve connections between different parts of the city.
- 4.2-G-8 Use the Bicycle Master Plan to identify, schedule, and implement roadway improvements that enhance bicycle access.
- 4.2-G-9 Use the Pedestrian Master Plan to identify, schedule, and implement roadway improvements that enhance pedestrian access.
- 4.2-G-10 Make efficient use of existing transportation facilities and, through the arrangement of land uses, improved alternate modes, and enhanced integration of various transportation systems serving South San Francisco, strive to reduce the total vehicle-miles traveled.
- 4.2-G-13 Integrate Complete Streets infrastructure and design features into street design and construction to create safe and inviting environments for people to walk, bicycle, and use public transportation.
- 4.2-I-2 Undertake street improvements [including the] South Linden Avenue extension to Sneath Lane.
- 4.2-I-10 In planning, designing, and constructing Complete Streets:
    - Include infrastructure that promotes a safe means of travel for all users along the right of way, such as sidewalks, shared use paths, bicycle lanes, and paved shoulders.
    - Include infrastructure that facilitates safe crossing of the right of way, such as accessible curb ramps, crosswalks, refuge islands, and pedestrian signals; such infrastructure must meet the needs of people with different types of disabilities and people of different ages.
    - Ensure that sidewalks, crosswalks, public transportation stops and facilities, and other aspects of the transportation right of way are compliant with the Americans with Disabilities Act and meet the needs of people with different types of disabilities, including mobility impairments, vision impairments, hearing impairments, and others. Ensure that the South San Francisco ADA Transition Plan includes a prioritization method for enhancements and revise if necessary.

[10] The City of South San Francisco General Plan includes policies related to automobile LOS for certain locations, however, General Plan Policy 4.2-G-17 exempts development within one-quarter mile of a Caltrain or BART station, or a City-designated ferry terminal, from LOS standards, which applies to the Project. Moreover, under SB 743, LOS or similar measures of traffic congestion are no longer considered a significant impact under CEQA,

- Prioritize incorporation of street design features and techniques that promote safe and comfortable travel by pedestrians, bicyclists, and users of public transportation, such as traffic calming circles, additional traffic calming mechanisms, narrow vehicle lanes, raised medians, dedicated transit lanes, transit priority signalization, transit bulb outs, road diets, high street connectivity, and physical buffers and separations between vehicular traffic and other users.
- Ensure use of additional features that improve the comfort and safety of users: Provide pedestrian-oriented signs, pedestrian-scale lighting, benches and other street furniture, bicycle parking facilities, and comfortable and attractive public transportation stops and facilities. Encourage street trees, landscaping, and planting strips, including native plants where possible, in order to buffer traffic noise and protect and shade pedestrians and bicyclists. Reduce surface water runoff by reducing the amount of impervious surfaces on the streets.

- 4.2-I-11 In all street projects, include infrastructure that improves transportation options for pedestrians, bicyclists, and users of public transportation of all ages and abilities.
  - Ensure that this infrastructure is included in planning, design, approval, construction, operations, and maintenance phases of street projects.
  - Incorporate this infrastructure into all construction, reconstruction, retrofit, maintenance, alteration, and repair of streets, bridges, and other portions of the transportation network.

- 4.3-I-14 Undertake a program to improve pedestrian connections between the rail stations—South San Francisco and San Bruno BART stations and the Caltrain Station—and the surroundings. Components of the program should include:
  - Installing handicapped ramps at all intersections as street improvements are being installed;
  - Constructing wide sidewalks where feasible to accommodate increased pedestrian use; • Providing intersection "bulbing" to reduce walking distances across streets in Downtown, across El Camino Real and Mission Road, and other high use areas;
  - Continuing with the City's current policy of providing pedestrian facilities at all signalized intersections;
  - Providing landscaping that encourages pedestrian use

4.1.1.2 Bicycle and Pedestrian Master Plans

The City of South San Francisco's Bicycle Master Plan and Pedestrian Master Plan identify improvements to provide safer walking and biking to make active transportation an integral part of the City's transportation system. Near the Project site, the Bicycle Master Plan identifies Class III bicycle routes on South Linden Avenue and Dollar Avenue. Both plans are currently being updated in the Active South City Bicycle and Pedestrian Master Plan in connection with the City's General Plan Update in progress (Shape SSF), which has not yet been adopted.

4.1.1.3 South San Francisco Transportation Demand Management Ordinance

The City's Transportation Demand Management (TDM) Ordinance, which is specified in Title 20 of the City's Municipal Code in Chapter 20.400, *Transportation Demand Management*, seeks to reduce the amount of traffic generated by nonresidential development and minimize drive-alone commute trips. The TDM ordinance establishes a performance target for minimum alternative mode share for all nonresidential projects resulting in more than 100 average daily trips and identifies higher thresholds for projects that will be developed at increased intensity. For the Project, the minimum alternative mode share is 45 percent, based on the requested FAR.

Per the TDM ordinance, all projects are required to submit annual mode share surveys. Projects seeking a FAR bonus are also required to submit triennial reports assessing project compliance with the required alternative mode share target. Where targets are not achieved, the report must include program modification recommendations and City officials may impose administrative penalties should subsequent triennial reports indicate mode share targets remain unachieved.

4.1.2 City of San Bruno Plans and Policies

This section summarizes City of San Bruno policies as they relate to the portion of the Project's proposed infrastructure improvements within its jurisdiction. The Project EIR is intended to provide CEQA clearance for subsequent discretionary approvals required by other agencies, including the City of San Bruno, for proposed offsite improvements located outside of the City of South San Francisco's jurisdiction. Analysis regarding these City of San Bruno policies is included here for that purpose; however, these policies do not apply to the Project overall.

4.1.2.1 General Plan Policies

The following City of San Bruno General Plan policies are relevant to the Project's proposed offsite improvements within San Bruno.[11]

- T-A Provide for efficient, safe, and pleasant movement for all transportation modes—vehicles, bicycles, transit, and pedestrians.
- T-E Focus San Bruno's efforts on improvements to the non-motorized transportation system (i.e., bicycles, pedestrians, strollers, etc.) adjacent to transit corridors and stations, and their connections to those systems.
- T-F Provide efficient local transit—such as a shuttle system—to the BART and Caltrain stations to avoid dependence on individual motor vehicles.

[11] The City of San Bruno General Plan includes policies related to automobile LOS, including Policy T-B stating that acceptable levels of service for vehicular movement along the city's street network should be maintained, and that "[a]cceptable level of service could vary based on characteristics of the area under consideration." Under SB 743, LOS or similar measures of traffic congestion are no longer considered a significant impact under CEQA.

- T-I Develop and maintain a comprehensive bicycle network within San Bruno, providing connections to BART and Caltrain, surrounding cities, employment and shopping areas, and natural areas.
- T-J Develop a safe, convenient, and continuous network of sidewalks and pedestrian paths within the city.
- T-2 Ensure that all transportation improvements— roadway, transit, bicycle, and pedestrian—are designed and constructed according to Americans with Disabilities Act standards. Improve existing facilities so they are compliant with American Disability Act standards.
- T-43 Create a "pedestrian-friendly" environment surrounding the BART and Caltrain stations by installing additional street trees, lighting, signage, and widening sidewalks along streets adjacent to these stations.
- T-47 Improve multi-modal access—specifically for pedestrians, cyclists, and transit passengers—to the BART and Caltrain stations through improvements along Huntington Avenue.
- T-70 Identify funding for and implement as a priority bicycle/pedestrian paths along the BART and Caltrain track alignments (Huntington Avenue and Herman Avenue) within the city limits. Coordinate with the Linear Park planned in South San Francisco and Millbrae.

4.1.2.2 Transit Corridors Plan Policies

The City of San Bruno Transit Corridors Plan articulates the community's vision for revitalized commercial corridors in proximity to the San Bruno Avenue Caltrain Station. The following policies are relevant to the Project's proposed offsite improvements within San Bruno:

- TRANS-B Ensure increased transit connectivity within and to/from the Transit Corridors Area and provide for transit amenities at stops and stations that increase the visibility of stops/stations and improve the comfort and convenience for transit riders.
- TRANS-C Encourage improved bicycle connectivity and enhanced bicycle parking opportunities within the Transit Corridors Area linking the surrounding land uses and future Caltrain station.
    - TRANS-C.1 Provide Class II bicycle lanes on Huntington Avenue north of San Bruno Avenue.
- TRANS-D Facilitate pedestrian access and safety through pedestrian enhancements, including the provision of enhanced crosswalks at all intersections and wider sidewalks and pedestrian amenities along the transit corridors.
    - TRANS-D.1 Provide enhanced crosswalks at all crossings in Transit Corridors Area. As appropriate, enhanced crosswalks should include pedestrian bulbouts, median refuge islands or special paving treatments.
- TRANS-E Develop and implement a parking management strategy for the Plan area that makes efficient use of the City's parking supply through shared parking strategies and that provides the lowest number of parking spaces while still maintaining the viability of the Plan through efficient use of the parking supply within the Plan Area.

- TRANS-F Develop and implement a Transportation Demand Management (TDM) Program that reduces the amount of peak period motor vehicle traffic and encourages the use of modes other than the single-occupant vehicle.

4.1.2.3 Walk 'n Bike Plan

The City of San Bruno Walk 'n Bike Plan identifies improvements to support safe, comfortable, and convenient walking and biking within the City. The Plan identifies specific improvements including streetscape enhancements and a Class IV separated bikeway along Huntington Avenue, gap closures of Class II bicycle lanes along Sneath Lane, and a Class III bicycle route along Herman Street.

4.1.3 Regional Plans and Policies

This section summarizes regional policies that relate to the Project.

4.1.3.1 MTC/ABAG Plan Bay Area 2040

Plan Bay Area is the Bay Area's Regional Transportation Plan and Sustainable Communities Strategy. Plan Bay Area 2040 is a state-mandated, integrated long-range transportation and land use plan intended to meet greenhouse gas reduction targets. Plan Bay Area 2040 identifies various action items related to achieving these targets. The following action items relate to the Project:

- Increase transportation access to growing and potential job centers;
- Support regional growth by balancing housing, transit-oriented jobs, and industrial uses.

4.1.3.2 San Mateo City/County Association of Governments Congestion Management Program

The San Mateo City/County Association of Governments (C/CAG) is the Congestion Management Agency (CMA) for San Mateo County and is authorized to set State and federal funding priorities for improvements affecting the San Mateo County Congestion Management Program (CMP) roadway system. The C/CAG-designated CMP roadway system in South San Francisco includes State Route (SR) 82 (El Camino Real), U.S. 101, Interstate I-380, and I-280.[12]

C/CAG has adopted guidelines to reduce the number of net new vehicle trips generated by new land development. These guidelines apply to all developments that generate 100 or more net new peak hour vehicular trips on the CMP network and are subject to CEQA review. C/CAG calls for projects that meet the criteria to determine if a combination of acceptable measures is possible that has the capacity to "fully reduce," through the use of a trip credit system, the demand for net new trips that a project is anticipated to generate on the CMP roadway network (including the first 100 trips). C/CAG has published a list of

[12] C/CAG sets LOS standards for the CMP network, but these LOS standards do not apply to CEQA per SB-743.

mitigation options in a memorandum that also outlines a process for obtaining C/CAG approval of the Transportation Demand Management (TDM) Plan.

4.1.3.3 BART Transit-Oriented Development Policy

BART's Transit Oriented Development (TOD)[13] Policy informs BART's internal and external approach to development near BART stations. The following goals and strategies are relevant to the Project:

- Goal B Sustainable Communities Strategy. Lead in the delivery of the region's land use and transportation vision to achieve quality of life, economic, and greenhouse gas reduction goals.
- Goal E Transportation Choice. Leverage land use and urban design to encourage non-auto transportation choices both on and off BART property, through enhanced walkability and bikeability, and seamless transit connectivity.
- Strategy B1 Support Transit-Oriented Districts: Proactively support local jurisdictions in creating station area plans and land use policies that: a) encourage transit-supportive, mixed-use development on and around station properties, b) enhance the value of BART land, and c) enhance the performance of the BART system as a whole.
- Strategy B2 Form partnerships with public agencies, developers and landowners, community development organizations, finance entities, and consider strategic land acquisition to help build TOD both on and off BART property.
- Strategy C1 Utilize BART's TOD Guidelines to ensure future development and investments seamlessly connect BART stations with surrounding communities
- Strategy C3 Utilize strategies including mixed-use development, transportation demand management, and pedestrian-friendly urban design to encourage reverse-commute, off-peak, and non-work trips on BART and other modes of non-auto transportation, thereby reducing greenhouse gas emissions.

4.1.4 Policy Consistency Analysis

The Project, including the associated proposed offsite improvements, is consistent with applicable adopted transit, bicycling, and walking policies within the Cities of South San Francisco and San Bruno. The Project and associated proposed offsite improvements would improve connectivity between the San Bruno BART Station and the Lindenville neighborhood; provide more direct pedestrian routes; add Class II bike lanes on Southline Avenue, in addition to Class I and Class III bike facilities within the Project area; extend the Centennial Way Trail; and provide a range of amenities and features within the Project site, including bicycle parking, showers, and changing facilities, among other features. The new Southline Avenue/Sneath Lane/Huntington Avenue/Maple Avenue intersection would include a signalized trail and pedestrian crossings with high-visibility crosswalks. Near the San Bruno BART Station, the Project includes circulation

[13] BART Transit-Oriented Development Policy, Amended April 23 2020
https://www.bart.gov/sites/default/files/docs/BART%20Transit-Oriented%20Development%20Policy_Amended2020-04-23.pdf

enhancements to Huntington Avenue, including widening sidewalks, upgrading curb ramps, providing high-visibility crosswalks, adding bulbouts, and extending the Centennial Way Trail. The Project supports public transit ridership by providing enhanced connectivity to BART and SamTrans, a dedicated signalized bus entrance to the SamTrans transit center, and offering a shuttle service to Caltrain. The Project includes a TDM program to meet a 45 percent mode share target required by the City.

The Project is also consistent with regional plans including Plan Bay Area, C/CAG's Congestion Management Program, and BART's TOD Policy. While the Project site was not specifically identified as a Priority Development Area in Plan Bay Area (adjacent sites in the City of San Bruno were identified), its location in a Transit Priority Area near the San Bruno BART Station is consistent with Plan Bay Area's goals to better integrate land use and transportation planning as well as BART's goals to encourage reverse-commute trips to employment centers near stations. The Project's Preliminary TDM program and associated circulation improvements are intended to fulfill C/CAG trip reduction requirements and is consistent with the above described goals by BART and C/CAG to encourage transit ridership and reduce vehicle trips.

4.2 VMT Analysis

This section analyzes VMT for the Project in relation to the criteria in section 3.2.1. The Project would affect VMT in two ways: the addition of Project-related travel from land use changes, and the effect of the Southline Avenue extension on travel patterns within the surrounding area. These topics are analyzed below.

4.2.1.1 VMT Screening – Land Use Project

SB 743 applies to the Project, which is a qualifying employment center Project located on an infill site within a transit priority area, as those terms are defined under Section 21099 of the Public Resources Code. As discussed in Sections 3.1 and 3.2.1, CEQA Guidelines Section 15064.3(b)(1), implementing SB 743, establishes a presumption of less than significance for VMT impacts related to qualifying land use Projects.

The Project is located within a qualifying transit priority area, as it is located within one-half mile of a major transit stop, including the San Bruno BART station and a frequent bus route (the SamTrans ECR route, which operates every 15 minutes), as shown in Figure 2-1. Both the San Bruno BART station and ECR route stops are considered major transit stops per Section 21099 of the Public Resources Code.

A project qualifies for a presumption of a less than significant impact provided that project-specific and location-specific information supports this presumption. The following Project-specific and location-specific information supports a presumption of less than significant impact:

- The Project's proximity to BART provides a high-frequency regional transit connection to San Francisco, the East Bay, and northern San Mateo County, and its proximity to the SamTrans ECR route provides a frequent local transit connection within San Mateo County. Employee access to Caltrain via a shuttle service may further enable a regional transit connection to San Francisco, the Peninsula, and the South Bay.

- The Project includes infrastructure improvements to support direct connections to transit and active transportation, including widening sidewalks and extending the Centennial Way Trail to the San Bruno BART Station, adding pedestrian bulbouts and high-visibility crosswalks, and providing a shuttle service to connect to Caltrain.
- The Project would allow for development of up to 2,800,000 SF (a maximum FAR of 2.4), which is substantially more dense than surrounding land uses as well as the existing land use at the Project site. The Project density is consistent with transit supportive development for station areas as defined in BART *TOD Guidelines*, which calls for medium to high density development that is greater than the community average within a 5 to 10-minute walk of stations.
- The Project's parking supply is below the City of South San Francisco requirements applicable to the existing zoning district and comparable office/R&D uses. The project, inclusive of Phase 1, would include vehicle parking up to a maximum of 2.2 parking spaces per 1,000 square feet of office space, which is less than the City's standard requirement of 2.9 spaces per 1,000 square feet for similar business/professional office and R&D developments. The Project includes a TDM program to require that at least 45 percent of trips occur via transit, active transportation, and carpooling.
- The Project is consistent with the goals of Plan Bay Area to provide transit-oriented employment growth.

Based on these features in combination with its transit-oriented location, both Phase 1 of the Project as well as the Project Buildout meet OPR's criteria for a presumption of less than significant VMT impact.

4.2.1.2 VMT Analysis – Southline Avenue Extension

The addition of Southline Avenue connecting Sneath Lane/Huntington Avenue and South Linden Avenue, a new street extension of approximately one quarter mile in length, would provide additional capacity for east-west travel in the Project area. Under existing conditions, there is no direct access between South Linden Avenue and Sneath Lane; this connection requires detouring about 1.3 miles either to the south on Huntington Avenue to Herman Avenue/Dollar Avenue, or detouring north on Huntington Avenue to South Spruce Avenue and Victory Avenue.

To assess the effect of the new connection on local VMT, the City of South San Francisco Travel Model was used. The City's model provides greater detail in the local transportation network compared to the C/CAG Model and allows for dynamic assignment of vehicles to the most efficient route, therefore accounting for changes in travel behavior due to new connections and roadways.

Overall, the Southline Avenue extension is expected to result in a modest reduction in VMT produced by vehicles traversing the Project area, specifically affecting local traffic patterns by shifting east-west trips from South Spruce Avenue, San Bruno Avenue, and Scott Street toward the new shorter and more direct route. This modified circulation results in a slight reduction in VMT. Results are shown in Table 4-1.

Table 4-1. VMT Effects of Southline Avenue Extension within South San Francisco and San Bruno

Area	Existing Daily Roadway Network VMT	Daily Roadway Network VMT with Southline Avenue Extension	Difference
VMT in South San Francisco and San Bruno	5,077,500	5,072,600	-4,900

Source: Fehr & Peers, 2020

4.3 Site Plan Analysis

This section analyzes the Project Buildout's effects on local circulation within the extents of the Project site and related offsite improvement areas. Similarities and differences between the Project Buildout and Phase 1 Project are noted where applicable. Project Buildout conditions are analyzed in the Cumulative 2040 context, while Phase 1 Project conditions are analyzed in the 2024 context, reflecting anticipated construction timing.

The Project's site plan provides a preliminary design of building layouts and transportation infrastructure. Project-related infrastructure changes include the Southline Avenue extension, driveways, sidewalks, traffic signals, the Centennial Way Trail extension, reconfiguration of bus and pedestrian access to the San Bruno BART Station, and the realignment of the at-grade rail crossing of Caltrain. These components would be finalized over the course of the Phase 1 and Project Buildout design processes and designed to applicable standards.

4.3.1 Multimodal Analysis

The following sections evaluate the Project's proposed changes to existing circulation and transportation infrastructure, as shown in Figure 4-2. As detailed in this analysis, the proposed circulation and transportation improvements associated with the Phase 1 Project and Project Buildout would sufficiently accommodate the change in land use associated with an office/R&D campus in a manner consistent with applicable Caltrans and Highway Design Manual design standards, and would not introduce any design hazards.

4.3.1.1 Phase 1 Centennial Way Trail Extension and BART Station Access

The Project would extend the Centennial Way Trail to the San Bruno BART Station, providing a 15- to 17-foot-wide multi-use path along the west side of Huntington Avenue. The path intends to serve both pedestrians and bicyclists in a shared use condition similar to the Centennial Way Trail to the north while retaining the bioswale area adjacent to the SamTrans Transit Center.

Viswalk was used to analyze potential conflicts between pedestrians and bicyclists along the Centennial Way trail extension during AM and PM peak hours. The analysis simulates pedestrian and bicycle behavior, interactions, and usage of space. Pedestrian and bicycle trips were distributed to reflect the proposed

Project's travel demand, particularly the trips between the Project and BART and SamTrans. During peak hours, the path would serve about 550 to 650 pedestrians per hour traveling to and from the BART Station as well as about 100 to 150 bicyclists. Pedestrian and bicycle flows exiting the BART station were metered to reflect the BART train schedule during the AM and PM peak hours.

The Viswalk analysis evaluated "pedestrian space," described as the average amount of area available for a pedestrian walking along a trail, sidewalk or crosswalk. Pedestrian space can also be expressed as the inverse of pedestrian density. The *Highway Capacity Manual* (HCM) 6th Edition provides a qualitative description of the pedestrian space that can be used to evaluate the performance of pedestrian facilities. Since pedestrians will comprise the vast majority of users on the Centennial Way Trail during peak hours, analyzing pedestrian space helps illustrate how much room remains for bicyclists to pass pedestrians as well as the potential for conflicts between modes. This scale is summarized in Table 4-2 shows a worst-case condition for pedestrian space experienced by users of the Centennial Way Trail during the AM and PM peak hours.

Table 4-2: Pedestrian Space Crowding Scale

Pedestrian Space (square feet per pedestrian)	Description
> 60	Ability to move in desired path, no need to alter movements
> 40-60	Occasional need to adjust path to avoid conflicts
> 24-40	Frequent need to adjust path to avoid conflicts
> 15-24	Speed and ability to pass slower pedestrians restricted
> 8-15	Speed restricted, very limited ability to pass slower pedestrians
<= 8	Speed severely restricted, frequent contact with other users

Notes: Based on the *Highway Capacity Manual* 6th Edition
Source: Fehr & Peers, 2020.

The Viswalk results indicate that the proposed 15 to 17-foot-wide trail extension is sufficiently sized to accommodate forecasted pedestrian and bicycle volumes. The analysis identified hot spots for pedestrian space at the corners of the Huntington/BART and Huntington/Southline Avenue intersections, particularly the southwest corner of the Huntington/BART intersection during the AM peak hour due to the heavy pedestrian and bicycle flows existing the BART station. A visual inspection of the Viswalk simulation showed that while substantial crowding would occur at this corner as pedestrians wait for the 'walk' signal, the duration of the 'walk' signal and the lack of conflicts with vehicular movements would allow all pedestrians to cross in the same signal cycle. In essence, a high volume of pedestrians after a train arrival would control the speed of travel on the trail adjacent to the station, then spacing between pedestrians would increase walking farther from the station allowing bicyclists to comfortably pass. Therefore, the proposed design is unlikely to pose a hazardous condition.

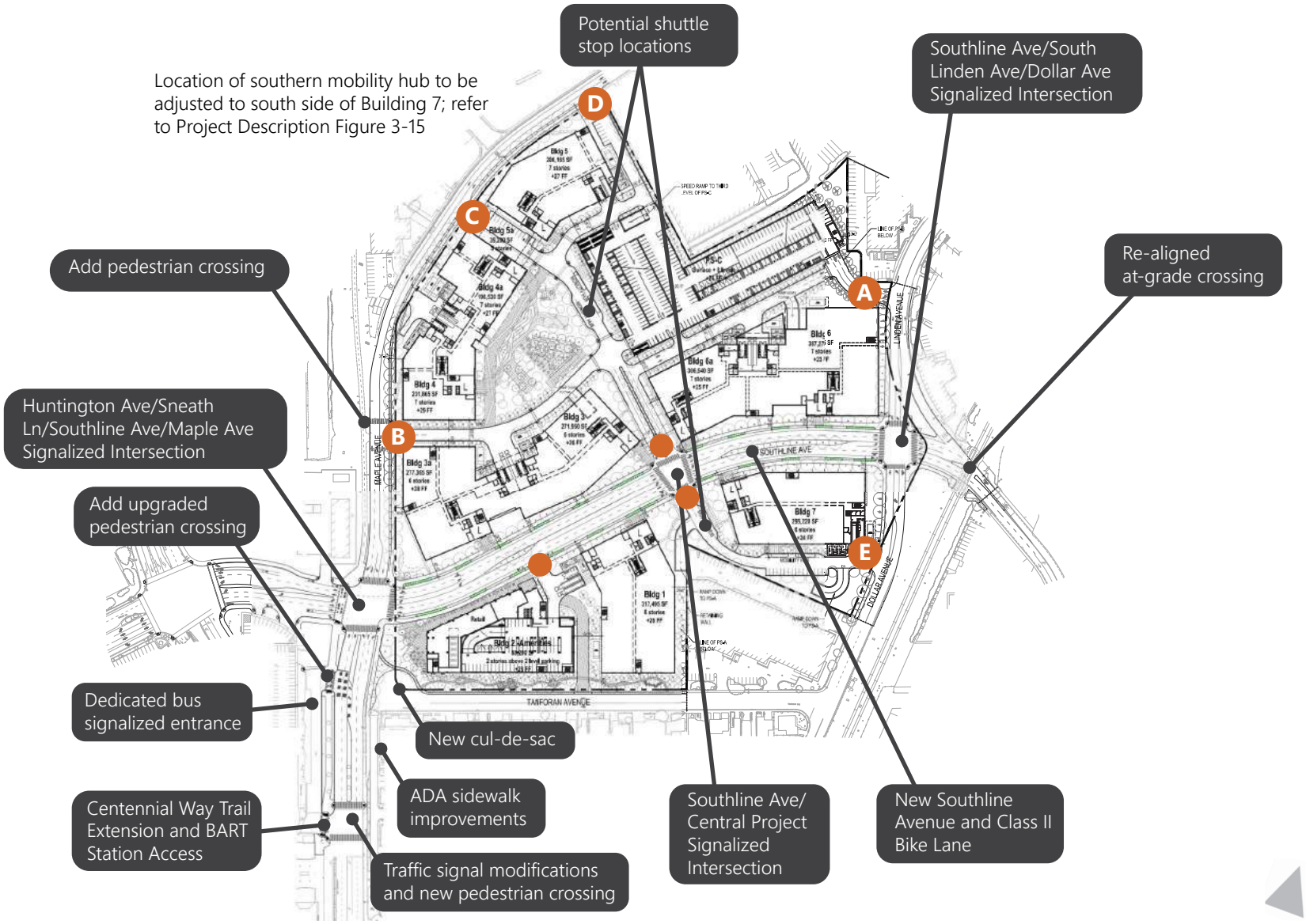


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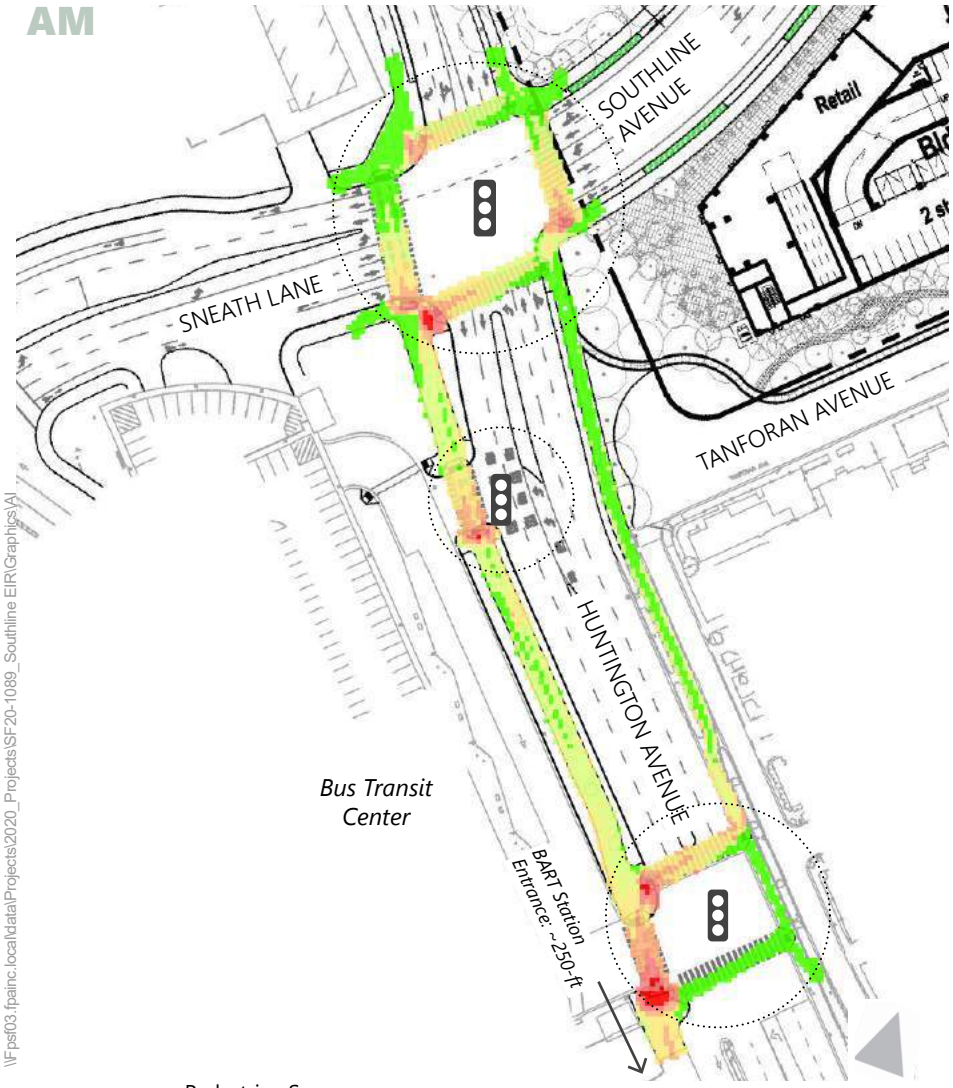
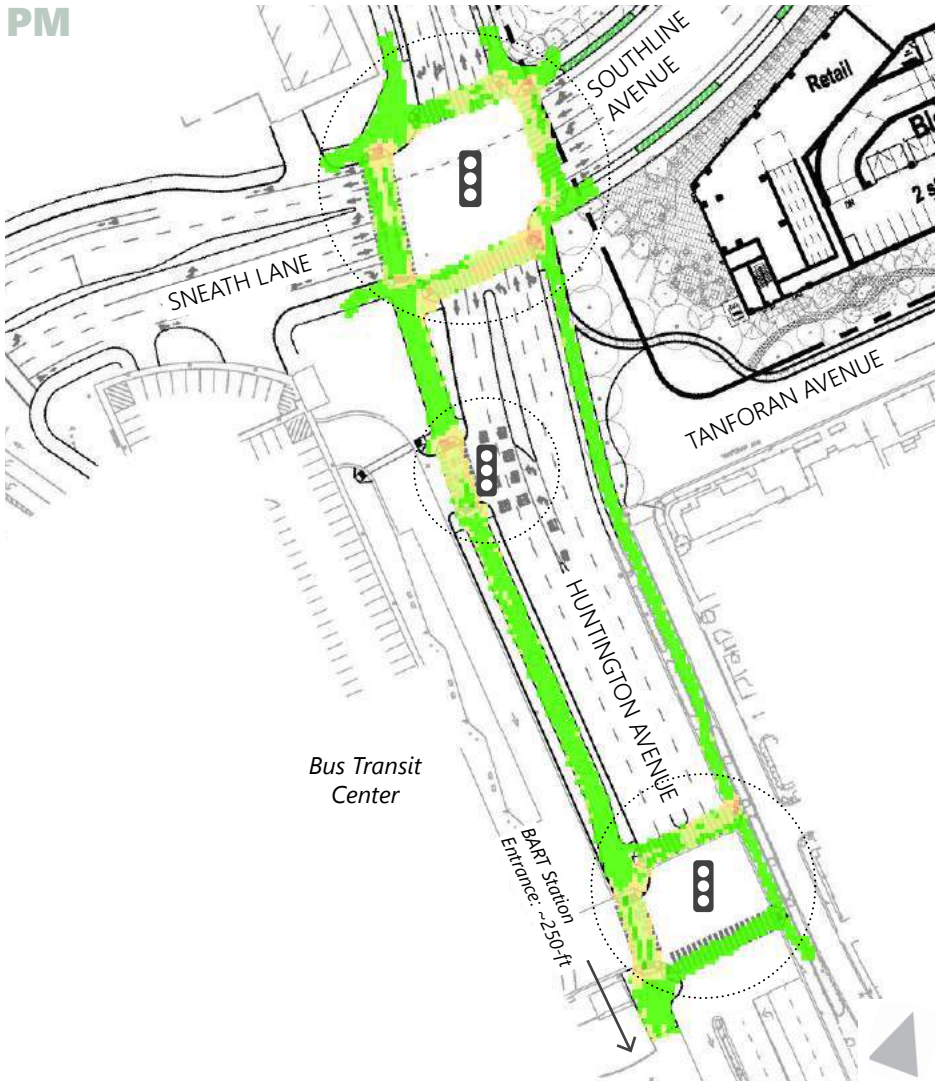
Figure 1-3

Project Improvement Locations





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Pedestrian Space
(square feet per pedestrian)

>60	Ability to move in desired path, no need to alter movements
>40-60	Occasional need to adjust path to avoid conflicts
>24-40	Frequent need to adjust path to avoid conflicts
>15-24	Speed and ability to pass slower pedestrians restricted
>8-15	Speed restricted, very limited ability to pass slower pedestrians
<=8	Speed severely restricted, frequent contact with other users
	Undefined

Signalized Intersection

Figure 4-3

Pedestrian Spacing
AM + PM Peak Hours

The Project would add a new crosswalk and pedestrian bulbout on the south side of the SamTrans Transit Center driveway to provide a more direct connection between the BART Station to the eastern sidewalk along Huntington Avenue. The eastern sidewalk would be rebuilt to achieve ADA compliance. Walking trips to and from the Project are likely to use both the eastern sidewalk and western trail along Huntington Avenue.

4.3.1.2 Huntington Avenue/Sneath Lane/Southline Avenue/Maple Avenue Intersection

The Project would create a new signalized intersection between Huntington Avenue/Sneath Lane/Southline Avenue/Maple Avenue at the Project entrance. Huntington Avenue would be aligned with Maple Avenue, while Sneath Lane would be aligned with Southline Avenue. The western leg of the intersection would include a crossing for the Centennial Way Trail, while high visibility crosswalks would be provided on the remaining northern, southern, and eastern legs of the intersection. This trail crossing was analyzed as a protected phase without conflicting right-turn-on-red movements by southbound and eastbound vehicles.

The intersection would change access to several adjacent driveways. Access to the BART maintenance facility driveway on the north side of Huntington Avenue would remain in the westbound direction but would be restricted in the eastbound direction. Northbound bus access from Huntington Avenue to the SamTrans Transit Center would be relocated to a signalized bus-only left turn (serving about five buses per hour throughout the day). Eastbound access to the SamTrans Transit Center would remain.

Adding this intersection would also affect Tanforan Avenue. Tanforan Avenue would be separated from Maple Avenue while maintaining a connection with Huntington Avenue East. No vehicular Project access would occur on Tanforan Avenue. Consequently, traffic volumes would decline on Tanforan Avenue, particularly vehicle and truck traffic associated with industrial sites in Lindenville.

4.3.1.3 Southline Avenue/Central Project Driveway

The Southline Avenue/Central Project Driveway intersection (at Buildings 1, 3, 6, and 7) would experience very high pedestrian volumes during peak hours as a result of its location between Project buildings, parking facilities, shuttle stops, and amenities. Crosswalk volumes are expected to be in excess of 500 pedestrians per crosswalk leg. Consequently, a pedestrian scramble phase (in which pedestrians cross all legs of the intersection at the same time) was analyzed as the optimized condition to separate pedestrian and vehicle movements. With a pedestrian scramble phase, conflicts between modes are expected to be minimal.

4.3.1.4 Southline Avenue/South Linden Avenue/Dollar Avenue Intersection

Southline Avenue would connect to a realigned intersection of South Linden Avenue/Dollar Avenue on the east side of the Project. The northern leg of South Linden Avenue would align with Dollar Avenue, while Southline Avenue would connect across a realigned at-grade rail crossing of Caltrain to San Mateo Avenue. Eventually, it is anticipated that this crossing would be grade separated through a multi-agency planning and implementation process; both the cities of South San Francisco and San Bruno have recommended that planning efforts proceed under the "Alternative 1" design, which would partially lower South Linden Avenue and partially raise the railway. The Project's design is compatible with the preferred Alternative 1 design.

The proposed grade separation project will be subject to a separate CEQA review and approval process not related to the Project; the grade separation project also requires public financing for implementation, which has not yet been obtained.

4.3.2 Signal Warrant Analysis

A signal warrant analysis to determine the potential need for traffic signals at unsignalized intersections was conducted for unsignalized Project intersections to assess potential hazards associated with Project-related vehicle and pedestrian volumes in accordance with criteria in the *California Manual on Uniform Traffic Control Devices* (CA-MUTCD). Signal warrants were tested for the five new full-access driveways, shown on Figure 4-2**,** on the Project based on the Peak Hour and Pedestrian Volume methodologies described in the CA-MUTCD, Section 4C.04 and 4C.05. As shown in Table 4-3, no driveways meet peak hour signal warrants under either Phase 1 or Project Buildout conditions. One driveway intersection at Maple Avenue (south of Building 4) would potentially meet pedestrian volume warrants; however, the Project's proposed Rapid-Rectangular Flashing Beacon is expected to provide sufficient prioritization for pedestrians crossing at this location to fulfill the anticipated need. Therefore, no signal warrants are met under Phase 1 Project and Project Buildout conditions.

Table 4-3: Signal Warrant Analysis

Driveway	Driveway Location	Project Buildout Conditions	
		Peak Hour Signal Warrant Met	Pedestrian Volume Warrant Met
A	South Linden Avenue	No	No
B	Maple Avenue, south of Building 4	No	No[1]
C	Maple Avenue, west of Building 4	No	No
D	Maple Avenue, east of Building 5	No	No
E	Dollar Avenue	No	No

Notes:
Based on the CA-MUTCD
[1]Project would provide a Rapid-Rectangular Flashing Beacon to accommodate crossing needs
Source: Fehr & Peers, 2020.

4.3.3 Phase 1 At-Grade Rail Crossing Analysis

The Project is located adjacent to the active rail corridor used by both Caltrain and limited evening freight activity. Under existing conditions, Caltrain operates five trains per hour, per direction during peak periods and one to two trains per hour, per direction during off-peak periods, while one to two trains per day operate during late evening hours. In 2022, the Peninsula Corridor Electrification Project will increase Caltrain service to six trains per hour, per direction during peak periods. By 2040, Caltrain plans to operate

eight trains per hour, per direction, while California High Speed Rail would operate four trains per hour, per direction, for a total of 12 trains per hour, per direction.

Vehicle traffic associated with the Project would increase the traffic volumes at the existing at-grade rail crossings at South Linden Avenue and at Scott Street; however, the Project (Phase 1 and Buildout) would not exacerbate potential safety hazards at these locations. as further described in Section 3.7.3.1 below. While a grade separation is planned, the at-grade crossing condition was analyzed to reflect a worst-case scenario given that the grade separation currently is unfunded and not yet approved. The Project's design of Southline Avenue maintains flexibility for a future grade separation; in the interim, it includes a reconfigured at-grade rail crossing to connect Southline Avenue with South Linden Avenue. No changes to the Scott Street at-grade rail crossing would occur with the Project.

4.3.3.1 South Linden Avenue At-Grade Rail Crossing

The rail crossing most directly affected by the Project is located on South Linden Avenue, immediately east of Dollar Avenue. The number of vehicles using this at-grade crossing increases due to both Project trips and the construction of Southline Avenue, which provides new east-west access connecting to Sneath Lane. Operations affecting this railroad crossing and nearby intersections were modeled using the *VISSIM* traffic operations analysis software. Vissim analyzes traffic by simulating and capturing the interactions between individual cars, trucks, buses, trains, pedestrians, and bicycles and can provide detailed queuing information and indication of potential for vehicles to not clear an at-grade crossing.

Table 4-4 shows the storage space and simulated queuing activity under 2040 Plus Project Buildout conditions. With the Project Buildout, there is potential for queues exceeding available storage for the westbound movements at Southline Avenue and Dollar Avenue. However, by synchronizing the traffic signal with the at-grade crossing, the Project would minimize potential risk of conflicts since vehicles would be flushed out of the rail crossing prior to a train approaching. The inclusion of medians would also enhance safety by inhibiting vehicles from traveling around crossing gates. Consequentially, the risk of conflicts under either the Phase 1 Project or Project Buildout would not change substantially relative to the existing condition.

4.3.3.2 Scott Street At-Grade Rail Crossing

The second rail crossing potentially affected by the Project is located at Scott Street, located about 1,200 feet to the south of the Project. By adding Southline Avenue as a more direct connection between Huntington Avenue and San Mateo Avenue, the Project would decrease traffic volumes on Scott Street compared to No Project conditions. Because the total number of vehicles crossing the corridor at this location would decrease, the Phase 1 Project and Project Buildout would not exacerbate potential safety hazards at this location.

Table 4-4. Queuing at Linden Avenue At-Grade Rail Crossing – 2040 Project Buildout

Intersection	Movement	Storage Space	Average Queue Length (ft)	95th Percentile Queue Length (ft)	Queue exceeds storage?
AM Peak Hour					
Southline Avenue / Dollar Avenue	WBT	80	**170**	**300**	**Yes**
Southline Avenue / Dollar Avenue	WBL	60	**160**	**290**	**Yes**
Linden Avenue/ San Mateo Avenue	SBT	450	100	140	No
Linden Avenue/ San Mateo Avenue	SBL	450	190	250	No
PM Peak Hour					
Southline Avenue / Dollar Avenue	WBT	80	**530**	**600**	**Yes**
Southline Avenue / Dollar Avenue	WBL	60	**530**	**600**	**Yes**
Linden Avenue/ San Mateo Avenue	SBT	450	190	250	No
Linden Avenue/San Mateo Avenue	SBL	450	320	390	No

Source: Fehr & Peers, 2020

4.4 Offsite Transportation Analysis

4.4.1 Signal Warrant Analysis

A signal warrant analysis was conducted for the intersection of Huntington Avenue/Herman Street/Forest Lane to assess potential hazards associate with Project-related vehicle volumes. This intersection, which is presently all-way stop controlled, was selected based on the volume of Project-related vehicle traffic added along multiple approaches (Huntington Avenue and Herman Street). Signal warrants were tested based on the Peak Hour methodology described in the CA-MUTCD Section 4C.04. There are no other unsignalized intersections in the study area where the Project is expected to add substantial volume on unsignalized approaches.

The Huntington Avenue/Herman Street/Forest Lane intersection meets the peak hour signal warrant under all analysis scenarios during the PM peak hour, including existing, 2024 No Project, 2024 plus Phase 1, 2040 No Project, and 2040 Plus Project Buildout conditions. The intersection experienced six injury collisions between 2015 and 2019. Phase 1 of the Project would add approximately 11 PM peak hour trips to the intersection during the PM peak hour, which is unlikely to materially change the intersection's operations. The Project Buildout would add approximately 301 PM peak hour trips, which would more substantially affect intersection operations. The addition of Project Buildout-related trips may exacerbate risk of collisions

at this multi-lane stop-controlled intersection, which experienced eight reported injury collisions between 2014 and 2019 (five vehicle-vehicle collisions, two vehicle-pedestrian collisions, and one-vehicle-bicycle collision).[14]

4.4.2 Freeway Ramp Queuing Analysis

Ten freeway off-ramps were analyzed based on Project trip assignment patterns to assess conditions where the addition of Project trips may result in hazards to road users. The study locations are listed below and shown in Figure 3-10.

1. I-280 Southbound Off-Ramp at Rollingwood Drive & Sneath Lane
2. I-280 Southbound Off-Ramp at San Bruno Avenue
3. I-280 Northbound Off-Ramp at San Bruno Avenue
4. US-101 Southbound Off-Ramp at San Bruno Avenue
5. US 101 Northbound Off-Ramp at San Bruno Avenue
6. I-380 Westbound Off-Ramp at El Camino Real
7. I-380 Eastbound Off-Ramp at El Camino Real
8. US-101 Southbound Off-Ramp at Airport Boulevard
9. US-101 Southbound Off-Ramp at Produce Avenue
10. US-101 Northbound Off-Ramp at South Airport Boulevard

Traffic counts were collected at the approaches and departures to the ten freeway on- and off-ramps during the morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) peak periods in 2017 and 2019 prior to the onset of the COVID-19 pandemic, as further described above. During all counts, weather conditions were generally dry, no unusual traffic patterns were observed, and local school districts were in regular session. Table 4-5 and Table 4-6. present weekday AM and PM peak hour vehicle queues at the ten US-101 off-ramp study locations under existing, 2024 (Phase 1), and 2040 (Project Buildout) conditions.

Due to the Project's access to these ten freeway ramps for US-101, I-280, and I-380 via several roadways and driveways, Project-related traffic would distribute across a number of potential routes including arterials and other roadways. Consequently, Project-related traffic volumes would not result in queues exceeding the total ramp storage distance to the freeway mainline at any of the study locations under any scenarios. As such, the Project is not expected to create or contribute to hazards resulting from speed differentials at off-ramp diverges on Caltrans facilities.

[14] California Statewide Integrated Traffic Records System (SWITRS), 2014-2019, retrieved via the Transportation Injury Mapping System (TIMS)

Table 4-5. Existing and 2024 Weekday AM and PM Peak Hour 95th Percentile Queues

Approach Lanes	Storage Distance (ft)	Existing		2024 No Project		2024 Plus Project (Phase 1)	
		Queue Length		Queue Length		Queue Length	
		AM	PM	AM	PM	AM	PM
1. I-280 Southbound Off-Ramp at Rollingwood Drive & Sneath Lane							
Left/Through	1,200	65	190	68	197	77	203
Right	150	65	72	67	62	68	66
2. I-280 Southbound Off-Ramp at San Bruno Avenue*							
Left	120	197	153	205	158	209	161
Left/Through	840	183	90	190	92	197	96
Through/Right	3,615						
Right	80	54	51	58	51	62	57
3. I-280 Northbound Off-Ramp at San Bruno Avenue*							
Left	230	405	225	415	426	230	405
Through/Left/Right	1,335	1,015	1,372	959	1,391	1,335	1,015
4. US-101 Southbound Off-Ramp at San Bruno Avenue*							
Left	280	112	81	112	84	56	86
Left/Through	960	112	82	112	84	56	86
Right	280	24	130	24	136	24	140
5. US 101 Northbound Off-Ramp at San Bruno Avenue*							
Left/Through	2,600	201	424	305	478	2,600	277 201
6. I-380 Westbound Off-Ramp at El Camino Real*							
Left	980	246	303	248	303	248	303
Right	980	252	834	280	838	296	799
7. I-380 Eastbound Off-Ramp at El Camino Real*							
Left	520	131	340	135	352	157	355
Through/Left/Right	1,760	96	263	105	287	151	306
Right	330	88	245	96	267	118	277
8. US 101 Southbound Off-Ramp at Airport Boulevard							
Left	430	208	143	213	166	230	174
Through	720	209	224	220	240	230	254
9. US 101 Southbound Off-Ramp at Produce Avenue							
Left	620	220	162	182	168	221	202
Right	100	69	40	58	40	59	42
10. US 101 Northbound Off-Ramp at South Airport Boulevard							
Left/Through	740	473	176	492	188	492	182

Table 4-5. Existing and 2024 Weekday AM and PM Peak Hour 95th Percentile Queues

Approach Lanes	Storage Distance (ft)	Existing		2024 No Project		2024 Plus Project (Phase 1)	
		Queue Length		Queue Length		Queue Length	
		AM	PM	AM	PM	AM	PM
Right	740	45	33	46	34	46	34

Notes: Ramps analyzed using Synchro software; * indicates additional analysis with SimTraffic software. Bold type indicates conditions where queue length exceeds storage capacity due to project volumes (none applicable). Queues do not take into account downstream spillover from adjacent intersections. Storage distance and queues in feet per lane.
Source: Fehr & Peers, 2020

Table 4-6. 2040 Weekday AM and PM Peak Hour 95th Percentile Queues

Approach Lanes	Storage Distance (ft)	2040 No Project		2040 Plus Project (Buildout)	
		Queue Length		Queue Length	
		AM	PM	AM	PM
1. I-280 Southbound Off-Ramp at Rollingwood Drive & Sneath Lane					
Left/Through	1200	105	215	118	230
Right	150	74	91	104	103
2. I-280 Southbound Off-Ramp at San Bruno Avenue*					
Left	120	232	179	243	195
Left/Through	840	221	102	227	120
Through/Right	3615				
Right	80	68	68	74	79
3. I-280 Northbound Off-Ramp at San Bruno Avenue*					
Left	230	405	225	415	426
Through/Left/Right	1,335	1,015	1,372	959	1,391
4. US-101 Southbound Off-Ramp at San Bruno Avenue*					
Left	280	115	87	65	88
Left/Through	960	116	87	65	89
Right	280	26	138	26	138
5. US 101 Northbound Off-Ramp at San Bruno Avenue*					
Left/Through	2,600	201	424	305	478
6. I-380 Westbound Off-Ramp at El Camino Real*					
Left	980	253	212	250	217
Right	980	331	668	359	637
7. I-380 Eastbound Off-Ramp at El Camino Real*					
Left	520	157	294	234	378
Through/Left/Right	1,760	170	271	271	312

Table 4-6. 2040 Weekday AM and PM Peak Hour 95th Percentile Queues

Approach Lanes	Storage Distance (ft)	2040 No Project		2040 Plus Project (Buildout)	
		Queue Length		Queue Length	
		AM	PM	AM	PM
Right	330	160	252	242	273
8. US 101 Southbound Off-Ramp at Airport Boulevard					
Left	430	278	253	360	270
Through	720	282	307	368	318
9. US 101 Southbound Off-Ramp at Produce Avenue					
Left	620	208	182	272	226
Right	100	63	43	63	45
10. US 101 Northbound Off-Ramp at South Airport Boulevard					
Left/Through	740	526	283	514	274
Right	740	46	39	47	39

Notes: Ramps analyzed using Synchro software; * indicates additional analysis with SimTraffic software . Bold type indicates conditions where queue length exceeds storage capacity due to project volumes (none applicable). Storage distance and queues in feet per lane.
Source: Fehr & Peers, 2020

4.4.3 Transit Performance Analysis

This section analyzes the Project's effects on the performance of transit services, including delay to transit vehicles and effects on transit capacity.

4.4.3.1 Transit Delay

The Phase 1 Project and Project Buildout would generate vehicle trips in the vicinity of existing transit services, which could potentially contribute toward delays for transit operations. To assess the Project's potential effects on transit travel times and delay to transit riders, the VISSIM traffic analysis software was used to report total travel times for the ECR SamTrans bus route, which diverts via Sneath Lane from El Camino Real to serve the San Bruno BART Station. This route was analyzed because it provides the most frequent service and would be most heavily exposed to Project-related delays; findings would also apply for portions of the 140 and 141 SamTrans bus routes that overlap with the ECR route. Table 4-7 shows travel times along these transit routes under 2040 No Project and 2040 Plus Project Buildout conditions. Travel times are taken for the portion of each route that travels from El Camino Real along Sneath Lane to the BART Station, then returning to El Camino Real; this represents around one mile worth of travel.

Table 4-7. Average ECR Travel Times between El Camino Real and the San Bruno BART Station

Study Period	Round Trip Transit Travel Time (Minutes)			
	Existing	2040 No Project	2040 Plus Project	Project Effect (2040)
AM Peak Hour (ECR NB)	6	6	7	+1
AM Peak Hour (ECR SB)	7	7	8	+1
PM Peak Hour (ECR NB)	6	6	9	+3
PM Peak Hour (ECR SB)	8	8	11	+3

Notes: Travel times measured include the time needed to travel through the El Camino Real/Sneath Lane intersection via the route diversion through the San Bruno BART Station Transit Center. Values rounded to nearest minute. Based on Vissim simulation.
Source: Fehr & Peers, 2020

The Project Buildout would result in a change of transit travel times for the ECR route totaling about one minute each way in the AM peak hour and three minutes each way in the PM peak hour. During the PM peak hour, congestion associated with added vehicle trips at the split phase signal at the El Camino Real/Sneath Lane intersection represents the primary source of delay. Given the route operates every 15 minutes during the AM and PM peak periods, and has a one-way travel time of about 110 minutes, this change in travel time is unlikely to affect the route's performance overall or require additional buses to maintain comparable headways. Since traffic volumes will be lower under Phase 1 Project conditions, the Phase 1 Project is also unlikely to affect the performance of bus services.

4.4.3.2 Transit Capacity and Crowding

The Phase 1 Project and Project Buildout are anticipated to add net new transit trips to both BART, Caltrain, and SamTrans during the AM and PM peak commute periods. BART and Caltrain currently experience peak period crowding along certain segments of key routes. A majority of transit trips would occur via BART (up to about 800 to 900 Project-related peak hour trips under Project Buildout conditions), while trips would also occur on Caltrain (300 to 400 peak hour trips) and SamTrans (70 to 80 peak hour trips). Phase 1 of the Project would add slightly less than one quarter of these Project Buildout totals.

Project-related BART trips would largely travel in the reverse-commute direction in which BART has ample capacity. Under existing conditions, about 60 to 65 percent of BART passengers riding between San Bruno and South San Francisco are traveling northbound during the AM peak hour and Southbound during the PM peak hour. San Bruno Station mirrors these patterns, with most passengers entering the station during the AM peak hour and exiting during the PM peak hour. The Project would shift these patterns to nearly balance segment volumes between South San Francisco and San Bruno, and would shift station access patterns at San Bruno Station such that a majority of passengers would exit the station during the AM peak hour and enter the station during the PM peak hour. However, the total number of passengers entering/exiting the station or waiting on the platform would be similar to existing conditions but would occur in a reverse commute direction. As an example, under Project Buildout conditions, the total number of PM station entries would be 926, around 200 more entries than the existing 718 station entries in the AM

peak hour. In both the AM and PM peak periods, BART trains and platforms at San Bruno Station maintain sufficient capacity to handle these increases in passenger volumes.

BART capacity is highly constrained on service segments through the Transbay Tube between Oakland and San Francisco. Based on existing ridership data, around 13 percent of BART riders entering or exiting the system at San Bruno, South San Francisco, and Millbrae Stations have an origin or destination in the East Bay and travel through the Transbay Tube (most stations in the East Bay are greater than 40 minutes away). The Project Buildout is expected to have similar travel patterns, adding approximately 100 to 120 trips to the Transbay Tube during the peak hours. While capacity is highly constrained in these periods, this represents a less than one percent contribution to total ridership on this segment of the system under existing conditions and by extension under cumulative conditions as well. In addition, trips would be spread across multiple trains during each peak hour, with an expected increase of only 15 to 20 riders per train, representing one to two additional passengers in each BART car. Therefore, the Project Buildout and Phase 1 Project would not materially affect BART performance or crowding.

Table 4-8 summarizes the Project Buildout's effect on total activity at San Bruno station, ridership on the segment nearest the Project, and ridership in the Transbay Tube.

Table 4-8. Project Buildout Effect on Total Activity at San Bruno BART Station

Study Period	Direction	Project Buildout BART Trip Generation	2019 Passenger Count	2019 + Project Buildout
San Bruno BART Station Passenger Volumes				
AM	Entries (Peak)	65	718	783
AM	Exits (Reverse Peak)	816	187	1,003
PM	Exits (Peak)	105	679	784
PM	Entries (Reverse Peak)	678	248	926
San Bruno – South San Francisco Segment				
AM	Northbound (Peak)	65	2,102	2,167
AM	Southbound (Reverse Peak)	816	1,267	2,083
PM	Southbound (Peak)	105	2,013	2,118
PM	Northbound (Reverse Peak)	678	1,073	1,751
Transbay Tube (Embarcadero – West Oakland Segment)				
AM	Westbound (Peak)	122	17,395	17,517
PM	Eastbound (Peak)	102	15,839	15,941

Notes: In/out split for BART passengers assumed to be similar to vehicle trip generation. Source: BART, 2019, Fehr & Peers, 2020

Caltrain riders would access the Project via South San Francisco or San Bruno stations, depending on service schedules after completion of the Peninsula Corridor Electrification Project. Trip distribution via Caltrain is expected to roughly mirror existing conditions, with about two-thirds of Project-related travel traveling northbound in the AM peak period and southbound in the PM peak period. This distribution would result

in approximately 233 northbound passengers during the AM peak period and 195 southbound passengers during the PM peak period. Spread across six trains per hour, per direction, the Project would add an average of about 30 to 40 passengers per train, or about five to six passengers per train car. Upon electrification, Caltrain would have capacity for 5,400 passengers per hour, per direction – about 900 passengers per train operating six trains per hour, per direction. Given the Project Buildout's contribution to Caltrain capacity would be about four percent or less, it is anticipated that the Project Buildout and Phase 1 Project would have a relatively minor effect on Caltrain capacity.

A relatively small share of Project travel is expected to occur via SamTrans – about 70 to 80 peak hour trips, which would roughly translate to five to ten passengers per bus. SamTrans presently has sufficient capacity to handle this demand and is likely to be able to accommodate Project trips in the future.

4.4.4 Bicycle and Pedestrian Analysis

The project would add approximately 1,000 to 1,100 pedestrian and bicycle trips to and from the site during the AM and PM peak hours (of which 90 percent would be walking or biking to or from transit). In particular, the Project is likely to add bicycle trips along the Centennial Way Trail, Huntington Avenue, South Linden Avenue, and Sneath Lane, which are designated bicycle routes by the cities of South San Francisco and San Bruno.

The Project Buildout would also add vehicle trips along designated bicycle routes and in areas with high levels of pedestrian activity. Such areas would include Huntington Avenue, South Linden Avenue, Sneath Lane, San Bruno Avenue, and the edges of downtown San Bruno and downtown South San Francisco. However, since Project traffic would be distributed across several routes accessing freeway ramps, walking and biking conditions are not expected to be adversely affected by Project Buildout or Phase 1 traffic volumes relative to No Project conditions.

4.4.5 Emergency Vehicle Analysis

The Project's primary potential to affect emergency vehicle access would be through design features that do not fully accommodate emergency vehicles, or through Project-generated vehicle traffic that would cause emergency vehicles to be slowed or unable to access the site or surrounding areas. The Phase 1 Project and Project Buildout would increase vehicular delay on several roadways and at several nearby intersections; however, this delay is not bidirectional, and emergency vehicles retain the ability to utilize other traffic lanes to circumvent traffic congestion. In particular, the San Bruno Police Station at 1177 Huntington Avenue would retain the ability to travel both with and against the flow of vehicle traffic should an emergency response be necessary directly from the station (emergency responses from police vehicles usually occur from the field). In addition, the Project provides an additional route for emergency vehicles to access the Project vicinity through construction of the new intersection at Sneath Lane, Huntington Avenue, and Southline Avenue. Consequently, the Phase 1 Project and Project Buildout are not anticipated to adversely affect emergency vehicle operations.

5. Impacts and Mitigations

5.1 Vehicular Traffic

5.1.1 Vehicle Miles Traveled

Impact TRANS-1A: Development of the proposed Phase 1 Project would have a less-than-significant impact on vehicle miles traveled due to the Project's location, transit-oriented nature, and other characteristics. ***(Less-than-Significant)***

Impact TRANS-1B: Development of the proposed Project Buildout would have a less-than-significant impact on vehicle miles traveled due to the Project's location, transit-oriented nature, and other characteristics. ***(Less-than-Significant)***

As documented in Section 4.2, the proposed Project meets the criteria set by the California Governor's Office of Planning and Research and CEQA statute to establish the presumption of a less-than-significant impact on VMT. Specifically, the Project is an employment center located within ½ mile of a major transit station and high quality transit corridor, with a parking ratio below what would otherwise be required by the City for projects of this type, and Project elements designed to encourage transit use and reduce the number of automobile trips to and from the site. As such, the Phase 1 Project and Project Buildout would have a less-than-significant impact on VMT, and no mitigation is required.

Mitigation Measures: None required.

Impact TRANS-2A: Development of the proposed Southline Avenue extension under Phase 1 would have a less-than-significant impact on vehicle miles traveled due to its short distance, and nature as a connector rather than a regional roadway facility. ***(Less-than-Significant)***

Impact TRANS-2B: Development of the proposed Southline Avenue extension under Project Buildout would have a less-than-significant impact on vehicle miles traveled due to its short distance, and nature as a connector rather than a regional roadway facility. ***(Less-than-Significant)***

As documented in Section 4.2, the proposed Southline Avenue extension is not expected to increase VMT as a street extension one quarter mile in length with mostly local circulation effects. Therefore, the Southline Avenue extension associated with the Phase 1 Project and Project Buildout would have a less-than-significant impact on VMT, and no mitigation is required.

Mitigation Measures: None required.

5.2 Design Hazards

5.2.1 Geometric Design Hazards

Impact TRANS-3A: Development of the proposed Phase 1 Project would not increase hazards to street users due to a design feature or land uses incompatible with the surrounding street network. ***(Less-than-Significant)***

Impact TRANS-3B: Development of the proposed Project Buildout would not increase hazards to street users due to a design feature or land uses incompatible with the surrounding street network. ***(Less-than-Significant)***

As documented in Section 4.3.1, the Phase 1 Project and Project Buildout include a range of improvements to vehicle, pedestrian, bicycle, and transit infrastructure that would be consistent with design standards and compatible with the intensity of proposed employment uses. Therefore, the Phase 1 Project and Project Buildout would have a less-than-significant impact on design hazards, and no mitigation is required.

Mitigation Measure: None required.

5.2.2 Freeway Ramp Queuing

Impact TRANS-4A: Development of the proposed Phase 1 Project would not add vehicle trips to existing freeway off-ramp vehicle queues that exceed storage capacity resulting in a potentially hazardous condition, and as such would have a less than significant impact on freeway ramp queuing. ***(Less-than-Significant)***

Impact TRANS-4B: Development of the proposed Project Buildout would not add vehicle trips to existing freeway off-ramp vehicle queues that exceed storage capacity resulting in a potentially hazardous condition, and as such would have a less than significant impact on freeway ramp queuing. ***(Less-than-Significant)***

As documented in Section 4.4.2, neither the Phase 1 Project vehicle trips nor the Project Buildout vehicle trips would exceed ramp storage capacities at any of the intersections studied, and would not lead to potential hazardous interference with the freeway mainline. Therefore, the Phase 1 Project and Project Buildout would have a less-than-significant impact on freeway ramp queuing, and no mitigation is required.

Mitigation Measures: None required

5.2.3 At-Grade Rail Crossings

Impact TRANS-5A: Development of the proposed Phase 1 Project would increase vehicle queues beyond available storage at the South Linden Avenue grade crossing but would not exacerbate risk of collisions; therefore, it would have a less than significant impact on at-grade rail crossing hazards. ***(Less-than-Significant)***

Impact TRANS-5B: Development of the proposed Project Buildout would increase vehicle queues beyond available storage at the South Linden Avenue grade crossing but would not exacerbate risk of collisions; therefore, it would have a less than significant impact on at-grade rail crossing hazards. ***(Less-than-Significant)***

The Project would result in substantial increased traffic volumes at the realigned at-grade rail crossing at South Linden Avenue. As discussed in section 4.3.3 this increase in traffic volumes would lengthen vehicle queues across available storage area. However, the synchronization of traffic signals and presence of medians would limit the risk of collisions associated with Project-related traffic. Synchronized traffic signals included in the Project would minimize potential risk of conflicts since vehicles would be flushed out of the rail crossing prior to a train approaching. The inclusion of medians enhances safety by inhibiting vehicles from traveling around crossing gates through provision of a physical barrier to doing so. Therefore, the Project would have a less-than-significant impact on the South Linden Avenue at-grade rail crossing, and no mitigation is required.

Mitigation Measure: None required.

Impact TRANS-6A: Development of the proposed Phase 1 Project would decrease vehicle volumes, and therefore vehicle queues, at the Scott Street at-grade rail crossing and would not exacerbate risk of collisions, resulting in no impact to the at-grade rail crossing. ***(Less-than-Significant)***

Impact TRANS-6B: Development of the proposed Project Buildout would decrease vehicle volumes, and therefore vehicle queues, at the Scott Street at-grade rail crossing and would not exacerbate risk of collisions, resulting in no impact to the at-grade rail crossing. ***(Less-than-Significant)***

The Project would result in a net decrease in traffic volumes crossing the Caltrain corridor along Scott Street. As discussed in Section 4.3.3, some vehicle traffic crossing the Caltrain corridor at Scott Street would shift to Southline Avenue, resulting in a net decrease in vehicle volumes and queues on Scott Street. As a result, the Phase 1 Project and Project Buildout would have a less-than-significant impact on the Scott Street at-grade rail crossing, and no mitigation is required.

Mitigation Measure: None required.

5.2.4 Traffic Signal Warrant

Impact TRANS-7A: Development of the proposed Phase 1 Project would not meet any traffic signal warrants within the Specific Plan area, and as such the Phase 1 Project results in a less than significant impact. ***(Less-than-Significant)***

Impact TRANS-7B: Development of the proposed Project Buildout would not meet any traffic signal warrants within the Specific Plan area, and as such the Project Buildout results in a less than significant impact. **(Less-than-*Significant)***

As discussed in Section 4.3.2, none of the Project's five unsignalized driveways meet peak hour signal warrants, and the Project provides appropriate pedestrian crossing treatments at unsignalized crossings. As a result, the Phase 1 Project and Project Buildout would have a less-than-significant impact on traffic signal warrants, and no mitigation is required.

Mitigation Measure: None required.

Impact TRANS-8A: Development of the proposed Phase 1 Project would meet Peak Hour Signal Warrant at the City of San Bruno's Huntington Avenue/Herman Street/Forest Avenue Intersection; however, conditions would not change materially from existing conditions, and as such the Phase 1 Project results in a less than significant impact at this location. ***(Less-than-Significant)***

Impact TRANS-8B: Development of the proposed Project Buildout would meet Peak Hour Signal Warrant at the Huntington Avenue/Herman Street/Forest Avenue Intersection, resulting in a significant impact. ***(Significant)***

As documented in Section 4.4.1, the Project would result in a net increase of about 11 PM vehicle trips under Phase 1 conditions and 301 PM peak hour trips under Project Buildout conditions at the intersection of Huntington Avenue/Herman Street/Forest Avenue. This intersection meets CA-MUTCD peak hour signal warrant during the PM peak hour under Existing, 2024 No Project, and 2040 No Project conditions. The addition of Project Buildout traffic would substantially contribute to the need for a signal at this intersection; Phase 1 traffic would not materially change conditions relative to no Project conditions. As such, the Project Buildout would have a significant impact at this location, while Phase 1 would have a less than significant impact.

Mitigation Measures: The Project Sponsor should provide a fair share contribution towards implementation of a traffic signal at the intersection of Huntington Avenue/Herman Street/Forest Avenue to alleviate potential conflicts associated with Project Buildout-related traffic. However, the traffic signal is not presently included in a capital improvement or fee program adopted by the City of San Bruno, therefore, the City of San Bruno does not have a plan or mechanism for funding this mitigation and cannot ensure this mitigation occurs will be implemented. Therefore, while the proposed mitigation could reduce the Project Buildout impact on this intersection to a less-than-significant level, because a funding mechanism does not exist, the impact would be remain significant and unavoidable. ***(Significant and Unavoidable)***

5.3 Emergency Vehicle Access

Impact TRANS-9A: Development of the proposed Phase 1 Project would not produce a detrimental impact to emergency vehicle access in the study area. ***(Less-than-Significant)***

Impact TRANS-9B: Development of the proposed Project Buildout would not produce a detrimental impact to emergency vehicle access in the study area. ***(Less-than-Significant)***

As documented in Section 4.4.5, the Project would not include design elements that would hinder emergency access, and all roadways and facilities will be designed to accommodate emergency vehicles including fire trucks and fire engines. The Project would result in increased travel times and vehicular delay on Huntington Avenue and Sneath Lane near the Project, particularly for the portion of Sneath Lane between the Project and El Camino Real during the PM peak hour. While this increase in vehicular delay is expected to also affect emergency vehicles, Sneath Lane includes additional right of way in the form of the Class II Bicycle Lane that allows for vehicles to yield to emergency vehicles that have engaged sirens and flashers. Thus, while there may be some delay to emergency vehicles with the Project, it is not expected to adversely affect emergency vehicle access or response times. Therefore, the Phase 1 Project and Project Buildout would have a less than significant impact on emergency vehicle access and no mitigation is required.

Mitigation Measures: None required.

5.4 Bicycle, Pedestrian, and Transit

Impact TRANS-10A: Development of the proposed Phase 1 Project would not conflict with adopted policies, plans, or programs regarding transit, bicycle, or pedestrian facilities and results in a less than significant impact based on compliance with such plans and policies. ***(Less-than-Significant)***

Impact TRANS-10B: Development of the proposed Project Buildout would not conflict with adopted policies, plans, or programs regarding transit, bicycle, or pedestrian facilities and results in a less than significant impact based on compliance with such plans and policies. ***(Less-than-Significant)***

As documented in Section 4.1, the Project exhibits consistency with plans, policies, and programs adopted by the City of South San Francisco, City of San Bruno, C/CAG, BART, and MTC. The Project would provide employment near regional transit, would enhance bicycle and pedestrian facilities to support transit access, would connect local street networks, and would include a TDM program that meets City requirements. Therefore, the Phase 1 Project and Project Buildout would not conflict with adopted policies, plans, or programs and would have a less than significant impact.

Impact TRANS-11A: Development of the proposed Phase 1 Project would increase travel times for some bus routes, but would not decrease the overall performance of transit service, and as such results in a less than significant impact on transit. ***(Less-than-Significant)***

Impact TRANS-11B: Development of the proposed Project Buildout would increase travel times for some bus routes, but would not decrease the overall performance of transit service, and as such results in a less than significant impact on transit. ***(Less-than-Significant)***

As documented in Section 4.4.3, the Project would increase average transit travel times on SamTrans ECR bus route (and portions of SamTrans routes 140 and 141) by one to three minutes, but is unlikely to affect the route's performance overall or require additional buses to maintain comparable headways. No other routes operating in the Project vicinity would have increased average transit times due to the Project. The Project would also add transit ridership to BART, SamTrans, and Caltrain, but would not materially contribute to overcrowding. In addition, the Project delivers pedestrian infrastructure designed to enhance access to the SamTrans transit center and BART station. Therefore, the Phase 1 Project and Project Buildout would have a less than significant impact on transit performance and no mitigation is required.

Mitigation Measure: None required.

Impact TRANS-12A: Development of the proposed Phase 1 Project would not detrimentally affect the performance or safety of bicycle or pedestrian facilities, resulting in a less than significant impact. ***(Less-than-Significant)***

Impact TRANS-12B: Development of the proposed Project Buildout would not detrimentally affect the performance or safety of bicycle or pedestrian facilities, resulting in a less than significant impact. ***(Less-than-Significant)***

As documented in Section 4.4.4, the Project would not degrade the performance or safety of bicycle or pedestrian facilities. The Project would extend the Centennial Way Trail, enhance bicycle and pedestrian access to the San Bruno BART Station, and provide new bike lane and sidewalk facilities. Therefore, the Phase 1 Project and Project Buildout would have a less than significant impact on bicycle and pedestrian facilities, and no mitigation is required.

Mitigation Measure: None required.

6. Partial Circulation Network Alternative

The Partial Circulation Network Alternative considers the same Phase 1 and Project Buildout land use and TDM program but with fewer infrastructure changes associated with the Project. Specifically, the Partial Circulation Network Alternative would include a partial buildout of Southline Avenue but omit the new street connection between Huntington Avenue/Sneath Lane and Southline Avenue/Maple Avenue as well as pedestrian and bicycle improvements to enhance access to BART and SamTrans facilities and extend the Centennial Way Trail (referred to as the "Partial Circulation Network Alternative"; see Figure 6-1). This section analyzes the transportation and circulation effects of the Partial Circulation Network Alternative under both the Phase 1 Project and Project Buildout conditions.

6.1 Plan and Policy Consistency Analysis

The Partial Circulation Network Alternative would remain consistent with local and regional plans and policies. The Partial Circulation Network Alternative would not implement the connection of Sneath Lane and Southline Avenue, the extension of the Centennial Way Trail, and access improvements to the San Bruno BART Station consistent with adopted plans and policies by the Cities of South San Francisco and San Bruno, C/CAG, BART and MTC. However, the Partial Circulation Network Alternative would not necessarily preclude these changes in the future, and is therefore consistent with applicable plans and policies. The Partial Circulation Network Alternative would remain consistent with regional plans and policies given the Project's proximity to transit (see Section 4.1).

6.2 VMT Analysis

The Partial Circulation Network Alternative would meet OPR's criteria for a presumption of less than significant VMT impact based on the Project's proximity to the San Bruno BART Station and the SamTrans ECR route (see Section 4.2). Transit access conditions would be more challenging under the Partial Circulation Network Alternative, although the Partial Circulation Network Alternative would implement a high-density land use in proximity to a high quality transit corridor, include a parking supply below City requirements for comparable projects, and implement a TDM program to achieve a 45 percent alternative mode share.

Without the Southline Avenue extension to Sneath Lane, the Partial Circulation Network Alternative would not realize the slight decrease in VMT associated with more direct trips between San Bruno and the Lindenville District in South San Francisco. However, this would not affect the presumption of less than significant VMT impact for the Project as a whole.

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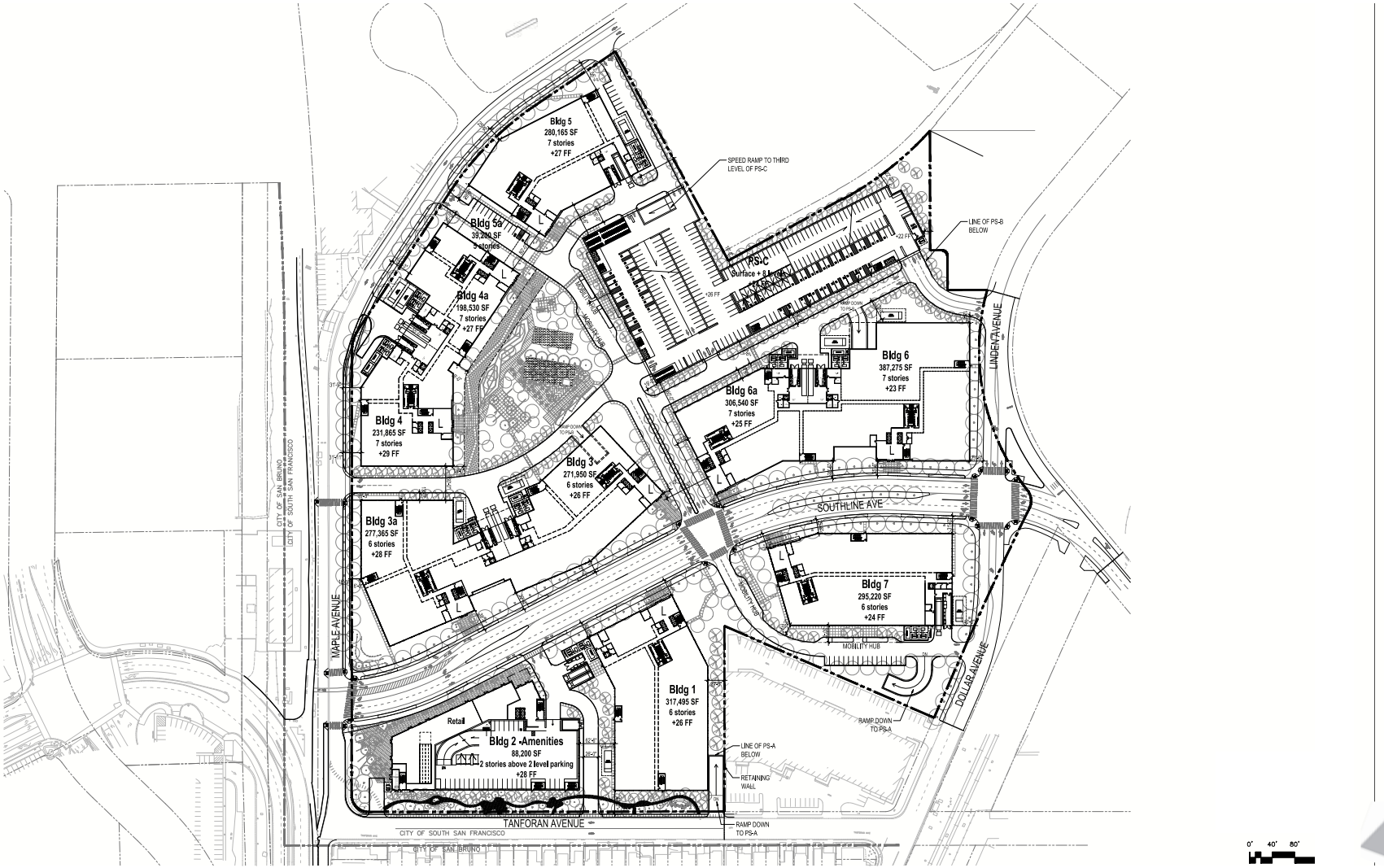


Figure 6-1

Project Buildout Partial Circulation Network Site Plan

Table 6-1. Queuing at Linden Avenue At-Grade Rail Crossing – Partial Circulation Network Alternative (2040 Project Buildout)

Intersection	Movement	Storage Space	Average Queue Length (ft)	95th Percentile Queue Length (ft)	Queue exceeds storage?
AM Peak Hour					
Southline Avenue / Dollar Avenue	WBT	80	**570**	**590**	**Yes**
Southline Avenue / Dollar Avenue	WBL	60	**560**	**580**	**Yes**
Linden Avenue/ San Mateo Avenue	SBT	450	100	130	No
Linden Avenue/ San Mateo Avenue	SBL	450	200	240	No
PM Peak Hour					
Southline Avenue / Dollar Avenue	WBT	80	**230**	**470**	**Yes**
Southline Avenue / Dollar Avenue	WBL	60	**220**	**460**	**Yes**
Linden Avenue/ San Mateo Avenue	SBT	450	190	420	No
Linden Avenue/San Mateo Avenue	SBL	450	320	390	No

6.3.3.2 Scott Street At-Grade Rail Crossing

Without the connection between Sneath Lane and Southline Avenue, the Partial Circulation Network Alternative would increase traffic volumes on the Scott Street at-grade rail crossing. However, queues are not expected to exceed available storage on Scott Street as shown in Table 6-2. Therefore, the Partial Circulation Network Alternative would have a less than significant impact on the Scott Street at-grade rail crossing.

Table 6-2. Queuing at Scott Street At-Grade Rail Crossing – Partial Circulation Network Alternative (2040 Project Buildout)

Intersection	Movement	Storage Space	Average Queue Length (ft)	95th Percentile Queue Length (ft)	Queue exceeds storage?
AM Peak Hour					
Scott Street / Herman Street	WB	360	60	120	No
Scott Street / San Mateo Avenue	EB	360	60	80	No
PM Peak Hour					
Scott Street / Herman Street	WB	360	130	240	No
Scott Street / San Mateo Avenue	EB	360	40	90	No

6.4 Offsite Transportation Analysis

6.4.1 Signal Warrant Analysis

The Partial Circulation Network Alternative would result in the Huntington Avenue/Herman Street/Forest Lane intersection meeting the peak hour signal warrant during the PM peak hour for both the Phase 1 and Project Buildout conditions such that a Significant Impact would occur. Phase 1 would add 133 PM peak hour trips to this intersection, while Project Buildout would add approximately 571 PM peak hour trips. Under the Partial Circulation Network Alternative, the addition of Phase 1 and Project Buildout-related trips may exacerbate the risk of collisions at this multi-lane stop-controlled intersection, which experienced eight reported injury collisions between 2014 and 2019 (five vehicle-vehicle collisions, two vehicle-pedestrian collisions, and one-vehicle-bicycle collision).[15]

6.4.2 Freeway Ramp Queueing Analysis

The Partial Circulation Network Alternative would result in queues exceeding the total ramp storage distance to the freeway mainline at one study location (I-280 Northbound Off-Ramp at San Bruno Avenue) under Project Buildout conditions such that a Significant Impact would occur. Under both the Phase 1 and Project Buildout conditions, the Partial Circulation Network Alternative would distribute Project-related vehicle trips across ten freeway ramps for US-101, I-280, and I-380, with slightly more trips using US-101 ramps and slightly fewer trips using ramps to I-380 and I-280. Phase 1 results are shown in Table 6-3, while Project Buildout results are shown in Table 6-4. In addition to the I-280 Northbound Off-Ramp at San Bruno

[15] California Statewide Integrated Traffic Records System (SWITRS), 2014-2019, retrieved via the Transportation Injury Mapping System (TIMS)

Avenue, queues may exceed storage distance at several other ramp approaches under Phase 1 and Project Buildout conditions, but there are no Phase 1- or Project-related trips added to these ramps.

Table 6-3. Weekday AM and PM Peak Hour 95th Percentile Queues – Partial Circulation Network Alternative (Phase 1)

Approach Lanes	Storage Distance (ft)	Existing		2024 No Project		2024 Plus Phase 1 (Partial Circulation)	
		Queue Length		Queue Length		Queue Length	
		AM	PM	AM	PM	AM	PM
1. I-280 Southbound Off-Ramp at Rollingwood Drive & Sneath Lane							
Left/Through	1,200	65	190	68	197	77	203
Right	150	65	72	67	62	68	66
2. I-280 Southbound Off-Ramp at San Bruno Avenue*							
Left	120	197	153	205	158	209	161
Left/Through	840	183	90	190	92	197	96
Through/Right	3,615						
Right	80	54	51	58	51	62	57
3. I-280 Northbound Off-Ramp at San Bruno Avenue*							
Left	230	85	202	89	211	91	207
Through/Left/Right	1,280	334	660	365	701	325	701
4. US-101 Southbound Off-Ramp at San Bruno Avenue*							
Left	280	112	81	112	84	56	86
Left/Through	960	112	82	112	84	56	86
Right	280	24	130	24	136	24	140
5. US 101 Northbound Off-Ramp at San Bruno Avenue*							
Left	560	256	345	260	391	295	419
Right (through)	2,400	69	68	93	86	102	103
6. I-380 Westbound Off-Ramp at El Camino Real*							
Left	980	246	303	248	303	248	303
Right	980	252	834	280	838	296	799
7. I-380 Eastbound Off-Ramp at El Camino Real*							
Left	520	131	340	135	352	157	355
Through/Left/Right	1,760	96	263	105	287	151	306
Right	330	88	245	96	267	118	277
8. US 101 Southbound Off-Ramp at Airport Boulevard							
Left	430	208	143	213	166	230	174
Through	720	209	224	220	240	230	254
9. US 101 Southbound Off-Ramp at Produce Avenue							

Approach Lanes	Storage Distance (ft)	Existing		2024 No Project		2024 Plus Phase 1 (Partial Circulation)	
		Queue Length		Queue Length		Queue Length	
		AM	PM	AM	PM	AM	PM
Left	620	220	162	182	168	221	202
Right	100	69	40	58	40	59	42
10. US 101 Northbound Off-Ramp at South Airport Boulevard							
Left/Through	740	473	176	492	188	492	182
Right	740	45	33	46	34	46	34

Notes: Ramps analyzed using Synchro software; * indicates additional analysis with Simtraffic software. **Bold** type indicates conditions where queue length exceeds storage capacity due to Project-related trips (none applicable). Queues do not take into account downstream spillover from adjacent intersections. Storage distance and queues in feet per lane.
Source: Fehr & Peers, 2020

Table 6-4. Cumulative Weekday AM and PM Peak Hour 95th Percentile Queues - Partial Circulation Network Alternative (Project Buildout)

Approach Lanes	Storage Distance (ft)	2040 No Project		2040 Plus Project (Buildout)		2040 Plus Project Buildout (Partial Circulation)	
		Queue Length		Queue Length		Queue Length	
		AM	PM	AM	PM	AM	PM
1. I-280 Southbound Off-Ramp at Rollingwood Drive & Sneath Lane							
Left/Through	1,200	105	215	118	230	198	254
Right	150	74	91	104	103	356	74
2. I-280 Southbound Off-Ramp at San Bruno Avenue*							
Left	120	232	179	243	195	239	200
Left/Through	840	221	102	227	120	224	123
Through/Right	3,615						
Right	80	68	68	74	79	73	76
3. I-280 Northbound Off-Ramp at San Bruno Avenue*							
Left	230	93	225	419	240	418	240
Through/Left/Right	1,335	394	818	1,171	778	**1,633**	801
4. US-101 Southbound Off-Ramp at San Bruno Avenue*							
Left	280	115	87	65	88	130	91
Left/Through	960	116	87	65	89	130	91
Right	280	26	138	26	138	64	140
5. US 101 Northbound Off-Ramp at San Bruno Avenue*							
Left/Through	2,600	277	603	2,299	1,040	1,723	1,074
Right	560	324	335	961	498	818	505

Approach Lanes	Storage Distance (ft)	2040 No Project		2040 Plus Project (Buildout)		2040 Plus Project Buildout (Partial Circulation)	
		Queue Length		Queue Length		Queue Length	
		AM	PM	AM	PM	AM	PM
6. I-380 Westbound Off-Ramp at El Camino Real*							
Left	980	253	212	250	217	257	265
Right	980	331	668	359	637	338	851
7. I-380 Eastbound Off-Ramp at El Camino Real*							
Left	520	157	294	234	378	178	360
Through/Left/Right	1,760	170	271	271	312	227	328
Right	330	160	252	242	273	207	305
8. US 101 Southbound Off-Ramp at Airport Boulevard							
Left	430	278	253	360	270	384	245
Through	720	282	307	368	318	392	311
9. US 101 Southbound Off-Ramp at Produce Avenue							
Left	620	208	182	272	226	280	255
Right	100	63	43	63	45	62	44
10. US 101 Northbound Off-Ramp at South Airport Boulevard							
Left/Through	740	526	283	514	274	577	302
Right	740	46	39	47	39	591	344

Notes: Ramps analyzed using Synchro software; * indicates additional analysis with Simtraffic software. **Bold** type indicates conditions where queue length exceeds storage capacity due to Project-related trips. Storage distance and queues in feet per lane.
Source: Fehr & Peers, 2020

6.4.3 Transit Performance Analysis

Without any changes to transit center access, traffic signals, or added vehicle traffic on Sneath Lane, the Partial Circulation Network Alternative would not substantially affect SamTrans operations at the San Bruno BART transit center compared to Project and No Project conditions. No changes to transit capacity and crowding would occur relative to the Project condition. Therefore, the Partial Circulation Network Alternative would have a less than significant impact on transit performance.

6.4.4 Bicycle and Pedestrian Analysis

6.4.4.1 Effects on BART Station Access

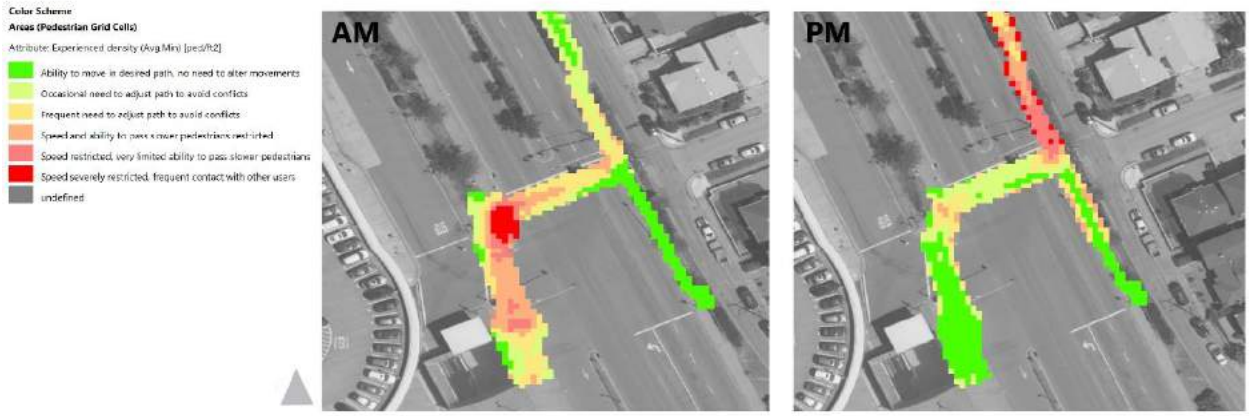
The Partial Circulation Network Alternative would not address bicycle and pedestrian connections between the Specific Plan Area and San Bruno BART Station. Instead, bicycle and pedestrian access to BART would occur via existing sidewalks and crosswalks. While these facilities could accommodate the roughly 200 peak hour BART passengers generated by the Phase 1 Project, crowding is expected to occur at existing

pedestrian facilities with the 800 to 900 peak hour passengers under Project Buildout conditions. Figure 3-1 illustrates a VisWalk simulation of pedestrian crowding at the BART Station entrance under Project Buildout conditions. Specifically, the northwestern curb ramp at the BART Station entrance would be substantially crowded during the AM peak hour, while the northeastern curb ramp would be substantially crowded during the PM peak hour. This crowding may result in a hazardous condition if not all pedestrians are accommodated on the sidewalk, and for interactions between pedestrians and bicyclists traveling to or from the Centennial Way Trail.

The design and operations of the traffic signal and crosswalks contribute to crowding due to the relatively long wait times for pedestrians crossing the street and single marked crosswalk across Huntington Avenue. This configuration may prompt some pedestrians to cross in the unmarked crosswalk on the southern side of the intersection rather than waiting to cross to the marked northern crosswalk. The unmarked southern crosswalk has a longer crossing distance that is less likely to be accomplished in the allocated walk time and may leave some pedestrians crossing against traffic on Huntington Avenue or waiting in the median.

The combination of limited sidewalk capacity, auto-oriented signal operations, and crosswalk design poses a potentially hazardous condition with the addition of trips by pedestrians and bicyclists traveling to and from the San Bruno BART Station under Project Buildout conditions with the Partial Circulation Network Alternative such that a Significant Impact would occur.

Figure 6-2. Pedestrian Space during AM and PM Peak Hours, Project Buildout with Partial Circulation Network Alternative



6.4.4.2 Other Effects

Under both the Phase 1 and Project Buildout conditions, the Partial Circulation Network Alternative would increase vehicle trips along designated bicycle routes and in areas with high levels of pedestrian activity. Such areas would include Herman Avenue, South Linden Avenue, Sneath Lane, San Bruno Avenue, Spruce Avenue, and the edges of downtown San Bruno and downtown South San Francisco. However, since Project traffic would be distributed across several routes accessing freeway ramps, walking and biking conditions

are not expected to be adversely affected by the Partial Circulation Network Alternative relative to No Project conditions.

6.4.5 Emergency Vehicle Analysis

Neither the Phase 1 nor Project Buildout conditions under the Partial Circulation Network Alternative are anticipated to substantially affect emergency vehicle operations relative to the No Project conditions. The proposed site plan fully accommodates emergency vehicles and would not include design features that would cause emergency vehicle to be slowed or unable to access the site or surrounding areas.

6.5 Impacts and Mitigations

6.5.1 Vehicular Traffic

6.5.1.1 Vehicle Miles Traveled

Impact TRANS-13A: Development of the proposed Partial Circulation Network Alternative would have a less-than-significant impact on vehicle miles traveled, under Phase 1 conditions, due to the Project's location, transit-oriented nature, and other characteristics. ***(Less-than-Significant)***

Impact TRANS-13B: Development of the proposed Partial Circulation Network Alternative would have a less-than-significant impact on vehicle miles traveled, under Project Buildout conditions, due to the Project's location, transit-oriented nature, and other characteristics. ***(Less-than-Significant)***

As documented in Section 6.2, the Partial Circulation Network Alternative would not change the Project's proximity to transit and presumption of less than significant impact to VMT. While the Partial Circulation Network Alternative would not realize the slight decrease in VMT associated with more direct trips between San Bruno and the Lindenville District in South San Francisco, the Phase 1 Project and Project Buildout under the Partial Circulation Network Alternative would have a less-than-significant impact on VMT, and no mitigation is required.

Mitigation Measures: None required.

6.5.2 Design Hazards

6.5.2.1 Geometric Design Hazards

Impact TRANS-14A: Development of the proposed Partial Circulation Network Alternative would not increase hazards to street users, under Phase 1 conditions, due to a design feature or land uses incompatible with the surrounding street network. ***(Less-than-Significant)***

Impact TRANS-14B: Development of the proposed Partial Circulation Network Alternative would not increase hazards to street users, under Project Buildout conditions, due to a design

feature or land uses incompatible with the surrounding street network. ***(Less-than-Significant)***

The Partial Circulation Network Alternative would provide onsite circulation changes consistent with design standards, but would not provide access improvements to the San Bruno BART Station under the Phase 1 Project or Project Buildout. Therefore, the Partial Circulation Network Alternative under both Phase 1 Project and Project Buildout conditions would have a less-than-significant impact on design hazards, and no mitigation is required.

Mitigation Measure: None required.

6.5.2.2 Freeway Ramp Queuing

Impact TRANS-15A: Development of the proposed Partial Circulation Network Alternative would not add vehicle trips to existing freeway off-ramp vehicle queues, under Phase 1 conditions, that exceed storage capacity resulting in a potentially hazardous condition, and as such would have a less than significant impact on freeway ramp queuing. ***(Less-than-Significant)***

Impact TRANS-15B: Development of the proposed Partial Circulation Network Alternative would cause vehicle queues, under Project Buildout conditions, to exceed storage capacity at one freeway ramp (I-280 Northbound Off-Ramp at San Bruno Avenue) resulting in a significant impact. ***(Significant)***

As documented in Section 6.4.2, the Partial Circulation Network Alternative does not cause vehicle trips associated with the Phase 1 Project to exceed ramp storage capacities at any ramps studied; however, queues would exceed ramp storage capacity due to Project-related travel at one study location (I-280 Northbound Off-Ramp at San Bruno Avenue) under Project Buildout conditions (shown in Table 6-4). As such, the Partial Circulation Network Alternative would have a significant impact at this location at Project Buildout, while Phase 1 would have a less than significant impact.

Mitigation Measures: Although the purpose of the Partial Circulation Network Alternative is to evaluate a condition where the extension of Southline Avenue to Sneath Lane does not occur, this street extension as included in the Proposed Project would mitigate ramp queueing conflicts associated with Project Buildout-related traffic. However, without the direct implementation by the Project Sponsor, no plan or funding mechanism exists to implement this mitigation since it is not presently included in a capital improvement or fee program adopted by the City of South San Francisco or the City of San Bruno where the mitigation is jointly located. Therefore, while the proposed mitigation could reduce the Partial Circulation Network Alternative impact to a less-than-significant level, because a funding mechanism does not exist, the impact would remain significant and unavoidable. There are no other feasible mitigation measures. **(Significant and Unavoidable)**

6.5.2.3 At-Grade Rail Crossings

Impact TRANS-16A: Development of the proposed Partial Circulation Network Alternative would increase vehicle queues beyond available storage at the South Linden Avenue grade crossing, under Phase 1 conditions, but would not exacerbate risk of collisions; therefore, it would have a less than significant impact on at-grade rail crossing hazards. ***(Less-than-Significant)***

Impact TRANS-16B: Development of the proposed Partial Circulation Network Alternative would increase vehicle queues beyond available storage at the South Linden Avenue grade crossing, under Project Buildout conditions, but would not exacerbate risk of collisions; therefore, it would have a less than significant impact on at-grade rail crossing hazards. ***(Less-than-Significant)***

The Partial Circulation Network Alternative would result in increased traffic volumes at the realigned at-grade rail crossing at South Linden Avenue under Phase 1 Project and Project Buildout conditions. However, Project-related crossing improvements would limit the risk of collisions associated with increased traffic, consistent with the Phase 1 and Project site plans. Therefore, the Partial Circulation Network Alternative under the Phase 1 Project and Project Buildout conditions would have a less-than-significant impact on the South Linden Avenue at-grade rail crossing, and no mitigation is required.

Mitigation Measure: None required.

Impact TRANS-17A: Development of the proposed Partial Circulation Network Alternative would not increase vehicle queues, under Phase 1 conditions, beyond available storage at the Scott Street at-grade rail crossing and would not exacerbate risk of collisions, resulting in no impact to the at-grade rail crossing. ***(Less-than-Significant)***

Impact TRANS-17B: Development of the proposed Partial Circulation Network Alternative would not increase vehicle queues, under Project Buildout conditions, beyond available storage at the Scott Street at-grade rail crossing and would not exacerbate risk of collisions, resulting in no impact to the at-grade rail crossing. ***(Less-than-Significant)***

The Partial Circulation Network Alternative would result in an increase in vehicle traffic across the at-grade rail crossing at Scott Street, but would not increase vehicle queues beyond available storage under the Phase 1 or Project Buildout conditions. As a result, the Partial Circulation Network Alternative, under Phase 1 Project and Project Buildout conditions, would have a less-than-significant impact on the Scott Street at-grade rail crossing, and no mitigation is required.

Mitigation Measure: None required.

6.5.2.4 Traffic Signal Warrant

Impact TRANS-18A: Development of the proposed Partial Circulation Network Alternative would not meet any traffic signal warrants within the Specific Plan area, under Phase 1 conditions, and as such the Phase 1 Project results in a less than significant impact. ***(Less-than-Significant)***

Impact TRANS-18B: Development of the proposed Partial Circulation Network Alternative would not meet any traffic signal warrants within the Specific Plan area, under Project Buildout conditions, and as such the Project Buildout results in a less than significant impact. ***(Less-than-Significant)***

None of the Project's five unsignalized driveways meet peak hour signal warrants under Phase 1 or Project Buildout conditions with the Partial Circulation Network Alternative as described in Sections 6.3.2 and 6.4.1. The Project would provide appropriate pedestrian crossing treatments at these unsignalized crossings. As a result, the Partial Circulation Network Alternative under both Phase 1 Project and Project Buildout conditions would have a less-than-significant impact on traffic signal warrants, and no mitigation is required.

Mitigation Measure: None required.

Impact TRANS-19A: Development of the proposed Partial Circulation Network Alternative would meet Peak Hour Signal Warrant at the Huntington Avenue/Herman Street/Forest Avenue Intersection, under Phase 1 conditions, resulting in a significant impact. ***(Significant)***

Impact TRANS-19B: Development of the proposed Partial Circulation Network Alternative would meet Peak Hour Signal Warrant at the Huntington Avenue/Herman Street/Forest Avenue Intersection, under Project Buildout conditions, resulting in a significant impact. ***(Significant)***

As documented in Section 6.4.1, the Partial Circulation Network Alternative would result in a net increase of about 133 PM vehicle trips under Phase 1 conditions and 571 PM peak hour trips under Project Buildout conditions at the intersection of Huntington Avenue/Herman Street/Forest Avenue. This intersection meets CA-MUTCD peak hour signal warrant during the PM peak hour under Existing, 2024 No Project, and 2040 No Project conditions. The addition of Phase 1 and Project Buildout traffic would substantially contribute to the need for a signal at this intersection. As such, the Partial Circulation Network Alternative under both the Phase 1 and Project Buildout conditions would have a significant impact at this location.

Mitigation Measures: The Project Sponsor should provide a fair share contribution towards implementation of a traffic signal at the intersection of Huntington Avenue/Herman Street/Forest Avenue to alleviate potential conflicts associated with Project Buildout-related traffic. However, the traffic signal is not presently included in a capital improvement or fee program adopted by the City of San Bruno, therefore, the City of San Bruno does not have a mechanism for funding this mitigation and cannot ensure this

mitigation occurs will be implemented. Therefore, while the proposed mitigation could reduce the Project Buildout impact on this intersection to a less-than-significant level, because a funding mechanism does not exist, the impact would be remain significant and unavoidable. ***(Significant and Unavoidable)***

Emergency Vehicle Access

Impact TRANS-20A: Development of the proposed Partial Circulation Network Alternative would not produce a detrimental impact to emergency vehicle access in the study area, under Phase 1 conditions. ***(Less-than-Significant)***

Impact TRANS-20B: Development of the proposed Partial Circulation Network Alternative would not produce a detrimental impact to emergency vehicle access in the study area, under Project Buildout conditions. ***(Less-than-Significant)***

As documented in Section 6.4.5, the Partial Circulation Network Alternative would not include design elements that would hinder emergency access, and all roadways and facilities will be designed to accommodate emergency vehicles. Therefore, the Partial Circulation Network Alternative under the Phase 1 and Project Buildout conditions would have a less than significant impact on emergency vehicle access and no mitigation is required.

Mitigation Measures: None required

6.5.3 Bicycle, Pedestrian, and Transit

Impact TRANS-21A: Development of the proposed Partial Circulation Network Alternative would not conflict with adopted policies, plans, or programs regarding transit, bicycle, or pedestrian facilities, under Phase 1 conditions, and results in a less than significant impact based on compliance with such plans and policies. ***(Less-than-Significant)***

Impact TRANS-21B: Development of the proposed Partial Circulation Network Alternative would not conflict with adopted policies, plans, or programs regarding transit, bicycle, or pedestrian facilities, under Project Buildout conditions, and results in a less than significant impact based on compliance with such plans and policies. ***(Less-than-Significant)***

As documented in Section 6.1, the Partial Circulation Network Alternative would not implement the connection of Sneath Lane and Southline Avenue, the extension of the Centennial Way Trail, and access improvements to the San Bruno BART Station consistent with adopted plans and policies by the Cities of South San Francisco and San Bruno, C/CAG, BART and MTC. However, the Alternative would not necessarily preclude these changes in the future, and therefore the Partial Circulation Network Alternative under the Phase 1 Project and Project Buildout conditions would not conflict with adopted policies, plans, or programs and would have a less than significant impact.

Impact TRANS-22A: Development of the proposed Partial Circulation Network Alternative would increase travel times for some bus routes, under Phase 1 conditions, but would not decrease the overall performance of transit service, and as such results in a less than significant impact on transit. ***(Less-than-Significant)***

Impact TRANS-22B: Development of the proposed Partial Circulation Network Alternative would increase travel times for some bus routes, under Project Buildout conditions, but would not decrease the overall performance of transit service, and as such results in a less than significant impact on transit. ***(Less-than-Significant)***

As documented in Section 6.4.3, the Partial Circulation Network Alternative would not substantially affect transit operations or contribute to transit overcrowding. Therefore, the Partial Circulation Network Alternative under both Phase 1 and Project Buildout conditions would have a less than significant impact on transit performance and no mitigation is required.

Mitigation Measure: None required.

Impact TRANS-23A: Development of the proposed Project Buildout Partial Circulation Network Alternative would not decrease the performance and safety of bicycle and pedestrian facilities near the Project under Phase 1 conditions, resulting in a less-than-significant impact. ***(Less-than-Significant)***

Impact TRANS-23B: Development of the proposed Project Buildout Partial Circulation Network Alternative would decrease the performance and safety of bicycle and pedestrian facilities near the Project under Project Buildout conditions, resulting in a significant impact. ***(Significant)***

As documented in Section 4.4.4, the Project Buildout Partial Circulation Network Alternative would result in substantial crowding to pedestrian and bicycle facilities near the San Bruno BART Station entrance. While existing facilities could accommodate Phase 1 pedestrian volumes, existing sidewalk, crosswalk, and signal facilities are insufficient to accommodate Project Buildout pedestrian volumes, and may pose a hazardous condition due to crowding. Therefore, the Partial Circulation Network Alternative would have a less than significant impact under Phase 1 conditions, while the Partial Circulation Network Alternative would have a significant impact under Project Buildout conditions.

Mitigation Measure: Although the purpose of the Partial Circulation Network Alternative is to evaluate a condition where the extension of Southline Avenue to Sneath Lane and associated changes to pedestrian and bicycle infrastructure do not occur, the implementation of pedestrian improvements at the San Bruno BART Station entrance as included in the Proposed Project would alleviate this potentially significant impact under Project Buildout conditions. Pedestrian improvements would include adding a bulbout, curb ramps, and marked high-visibility crosswalk on the southern leg of the intersection, a high-visibility crosswalk on the northern leg of the intersection, and retiming the signal to include pedestrian recall. However, without the direct implementation by the Project Sponsor, no funding mechanism exists to implement this

mitigation since it is not presently included in a capital improvement or fee program adopted by the City of South San Francisco or City of San Bruno where the mitigation is jointly located. Therefore, while the proposed mitigation could reduce the Partial Circulation Network Alternative impact to a less-than-significant level, because a funding mechanism does not exist, the impact would remain significant and unavoidable. There are no other feasible mitigation measures. ***(Significant and Unavoidable)***

7. Reduced Underground Parking Alternative

The Reduced Underground Parking Alternative considers a similar Phase 1 Project with a modified parking layout that places all parking at- or above-grade instead of below-grade. The Phase 1 Project footprint would expand to cover 80 Tanforan, where a parking garage would be constructed. The Reduced Underground Parking Alternative would provide a total of 1,095 parking spaces for approximately 684,700 square feet (1.6 per 1,000 square feet) in Phase 1. Table 7-1 compares the Phase 1 Project with the Reduced Underground Parking Alternative. The remaining Project Buildout projections, except as modified for Phase 1, remain the same as the Project.

Table 7-1. Phase 1 Project vs. Reduced Underground Parking Alternative

Scenario		Phase 1		
		Project	Reduced Underground Parking Alternative	Project Buildout
Office / R&D		612,700	615,000	2,730,300
Public Restaurant/Retail		*16,400*	*11,800*	*11,800*
Other Amenities		*71,800*	*57,900*	*57,900*
Total Active Land Use		**700,900**	**684,700**	**2,800,000**
Vehicle Parking Stalls (# south of Southline Avenue)		1,103 to 1,379 (1,103 to 1,194)	1,095 (1,095)	4,594 to 5,395 (1,194)
Vehicle Trip Generation	AM	656	617	2,293
	PM	605	565	2,073
	Daily	5,458	4,986	18,007
Net New Vehicle Trip Generation	AM	485	446	2,122
	PM	455	415	1,923
	Daily	3,954	3,482	16,503

As illustrated in Table 7-1, the Reduced Underground Parking Alternative includes reductions in building area and parking compared to the Project, which would result in fewer vehicle trips. The Reduced Underground Parking Alternative includes a 2,300 square foot increase in office space, a 4,600 square foot decrease in public restaurant/retail space, and a 13,900 square foot decrease in amenity space. Based on the trip generation methodology described in Section 3.5, these changes would result in a net decrease in vehicle trips under Phase 1 conditions. The total Project Buildout square footage would remain unchanged, although total office space may increase by up to 18,500 square feet. Moreover, the Reduced Underground Parking Alternative includes 284 fewer parking spaces than the Phase 1 Project's higher parking option that

was analyzed in Sections 1-5 (1,379 spaces, of which 1,194 were south of Southline Avenue). Because there is no increase to building square footage or parking supply and driveway locations would not change, it is presumed that Phase 1 and Project Buildout trip generation and driveway volumes would not increase under the Reduced Underground Parking Alternative, and trip distribution and assignment would remain unchanged. Consequently, the trip generation estimates provided in Table 7-1, likely overestimate the actual trip generation associated with Phase 1 and Project Buildout conditions.

This section analyzes the transportation and circulation effects of the Reduced Underground Parking Alternative under both the Phase 1 Project and Project Buildout conditions.

7.1 Plan and Policy Consistency Analysis

The Reduced Underground Parking Alternative would remain consistent with local and regional plans and policies. The Reduced Underground Parking Alternative would implement all transportation infrastructure changes identified in the Phase 1 Project, including the connection of Sneath Lane and Southline Avenue, the extension of the Centennial Way Trail, and access improvements to the San Bruno BART Station consistent with adopted plans and policies by the Cities of South San Francisco and San Bruno, C/CAG, BART and MTC. The Reduced Underground Parking Alternative would remain consistent with regional plans and policies given the Project's proximity to transit (described in Section 4.1).

7.2 VMT Analysis

The Reduced Underground Parking Alternative would meet OPR's criteria for a presumption of less than significant VMT impact based on the Project's proximity to the San Bruno BART Station and the SamTrans ECR route (see Section 4.2). The Reduced Underground Parking Alternative would implement a high-density land use in proximity to a high-quality transit corridor, include a parking supply below City requirements for comparable projects, and implement a TDM program to achieve a 45 percent alternative mode share.

7.3 Site Plan Analysis

As shown in Figure 7-1, the Reduced Underground Parking Alternative would not substantively change circulation within the Specific Plan area, and therefore would not pose any design hazards. The primary circulation change associated with the Reduced Underground Parking Alternative would be extending the park walkway along Tanforan Avenue to Dollar Avenue. Otherwise, Project driveways would remain in the same locations under the Reduced Underground Parking Alternative, including a single right in/right out driveway for the amenity building, a signalized driveway connecting to Southline Avenue for the primary garage entrance, and an unsignalized driveway connecting to Dollar Avenue as the secondary garage entrance. Access to the shuttle and ride-hailing mobility hubs would occur at the Southline Avenue and Dollar Avenue driveways, along with pedestrian connections to adjacent buildings. No other new driveways or changes to circulation patterns would occur.

The site plan would retain all other circulation elements, including adding Southline Avenue as an east-west connection between Maple Avenue and South Linden Avenue, the realignment of the South Linden Avenue

at-grade rail crossing, and driveways connecting to Southline Avenue, Dollar Avenue, Maple Avenue, South Linden Avenue, and Tanforan Avenue. Southline Avenue would include bike lanes connecting to the Centennial Way Trail, and all new or modified streets would include new sidewalks and curb ramps. Proposed infrastructure within the Specific Plan area would be consistent with design standards and compatible with the intensity of proposed employment uses.

The Reduced Underground Parking Alternative would not include changes to streets, sidewalks, crosswalks, bicycle facilities, or transit circulation outside of the Specific Plan area other than the changes listed above. The effects of the Reduced Underground Parking Alternative are consistent with discussion provided in Section 4.4.4.

7.3.1 Signal Warrant Analysis

Driveway volumes would not materially change relative to Phase 1 or Project Buildout conditions; therefore, no driveways would meet peak hour vehicle or pedestrian volume signal warrants under the Reduced Underground Parking Alternative.

7.3.2 At-Grade Rail Crossing Analysis

The Reduced Underground Parking Alternative would not affect traffic volumes crossing the at-grade rail crossing of Caltrain relative to the Phase 1 Project. Like the Phase 1 Project, the synchronization of traffic signals and presence of medians in the Reduced Underground Parking Alternative would limit the risk of collisions associated with Project-related traffic. Consequently, the Reduced Underground Parking Alternative would have a less than significant impact on the South Linden Avenue at-grade rail crossing.

7.4 Offsite Transportation Analysis

7.4.1 Signal Warrant Analysis

The Reduced Underground Parking Alternative would result in the Huntington Avenue/Herman Street/Forest Lane intersection meeting the peak hour signal warrant during PM peak hour for both the Phase 1 and Project Buildout conditions consistent with the analysis in Section 4.4.1. Phase 1 would add 11 PM peak hour trips to this intersection, while Project Buildout would add approximately 301 PM peak hour trips. As with the Project, although Phase 1 is unlikely to materially change the intersection's operations, the addition of Project Buildout-related trips may exacerbate the risk of collisions at this multi-lane stop-controlled intersection, which experienced eight reported injury collisions between 2014 and 2019.[16]

[16] California Statewide Integrated Traffic Records System (SWITRS), 2014-2019, retrieved via the Transportation Injury Mapping System (TIMS)

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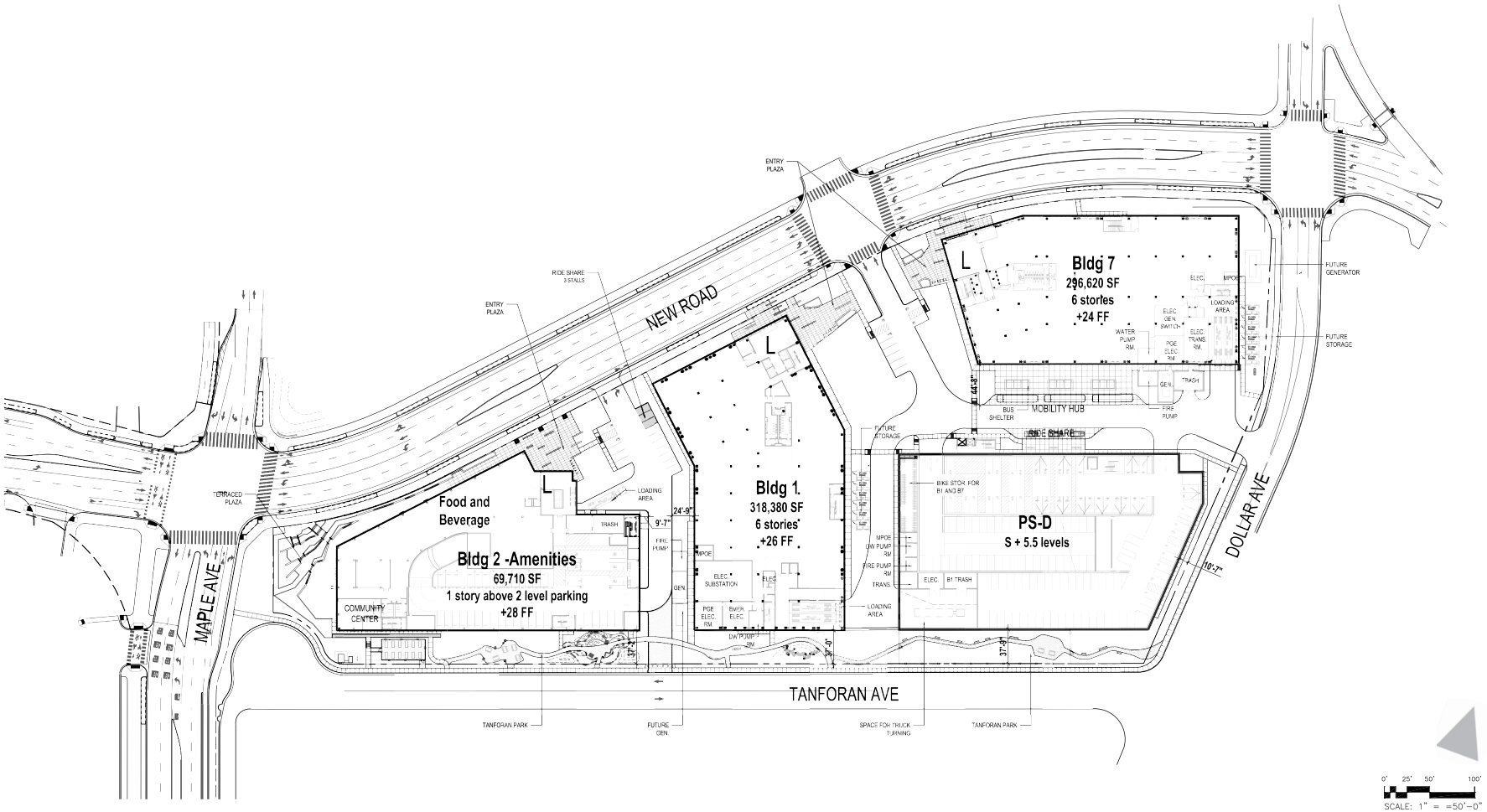


Figure 7-1

Revised Specific Plan Alternative Site Plan

7.4.2 Freeway Ramp Queueing Analysis

The Reduced Underground Parking Alternative would not change the trip generation, distribution, or assignment relative to the Phase 1 Project and Project Buildout; therefore, the effects on freeway ramp queueing would remain consistent with the analysis provided in Section 4.4.2. No offramps would experience queues exceeding storage capacities under Phase 1 or Project Buildout conditions with the Reduced Underground Parking Alternative.

7.4.3 Transit Performance Analysis

The Reduced Underground Parking Alternative would not change transit performance relative to the Phase 1 Project and Project Buildout; consequently, the effects on transit delay and crowding would remain consistent with the analysis provided in Section 4.4.3.

7.4.4 Bicycle and Pedestrian Analysis

Under both the Phase 1 and Project Buildout conditions, the Reduced Underground Parking Alternative would increase vehicle trips along designated bicycle routes and in areas with high levels of pedestrian activity consistent with the analysis provided in Section 4.4.4. Such areas would include Herman Avenue, South Linden Avenue, Sneath Lane, San Bruno Avenue, Spruce Avenue, and the edges of downtown San Bruno and downtown South San Francisco. However, since traffic would be distributed across several routes accessing freeway ramps, walking and biking conditions are not expected to be adversely affected by the Reduced Underground Parking Alternative relative. By extending the greenway along Tanforan Avenue, the Reduced Underground Parking Alternative would enhance east-west pedestrian and bicycle connectivity between the BART Station and Tanforan Avenue.

7.4.5 Emergency Vehicle Analysis

The Reduced Underground Parking Alternative is not anticipated to substantially affect emergency vehicle operations relative to the No Project conditions. The proposed site plan fully accommodates emergency vehicles and would not include design features that would cause emergency vehicle to be slowed or unable to access the site or surrounding areas.

7.5 Impacts and Mitigations

7.5.1 Vehicular Traffic

7.5.1.1 Vehicle Miles Traveled

Impact TRANS-24A: Development of the proposed Reduced Underground Parking Alternative would have a less-than-significant impact on vehicle miles traveled, under Phase 1 conditions, due to the Project's location, transit-oriented nature, and other characteristics. ***(Less-than-Significant)***

Impact TRANS-24B: Development of the proposed Reduced Underground Parking Alternative would have a less-than-significant impact on vehicle miles traveled, under Project

Buildout conditions, due to the Project's location, transit-oriented nature, and other characteristics. ***(Less-than-Significant)***

As documented in Sections 4.2 and 7.2, the Reduced Underground Parking Alternative would not change the Project's proximity to transit and presumption of less than significant impact to VMT. The Reduced Underground Parking Alternative is an employment center located within ½ mile of a major transit station and high quality transit corridor, with a parking ratio below what would otherwise be required by the City for projects of this type, and Project elements designed to encourage transit use and reduce the number of automobile trips to and from the site. As such, the Reduced Underground Parking Alternative Phase 1 Project and Project Buildout would have a less-than-significant impact on VMT, and no mitigation is required.

Mitigation Measures: None required.

7.5.2 Design Hazards

7.5.2.1 Geometric Design Hazards

Impact TRANS-25A: Development of the proposed Reduced Underground Parking Alternative would not increase hazards to street users, under Phase 1 conditions, due to a design feature or land uses incompatible with the surrounding street network. ***(Less-than-Significant)***

Impact TRANS-25B: Development of the proposed Reduced Underground Parking Alternative would not increase hazards to street users, under Project Buildout conditions, due to a design feature or land uses incompatible with the surrounding street network. ***(Less-than-Significant)***

As documented in Sections 4.3 and 7.3, the Reduced Underground Parking Alternative includes a range of improvements to vehicle, pedestrian, bicycle, and transit infrastructure that would be consistent with design standards and compatible with the intensity of proposed employment uses. Therefore, the Reduced Underground Parking Alternative would have a less-than-significant impact on design hazards under Phase 1 Project and Project Buildout conditions, and no mitigation is required.

Mitigation Measure: None required.

7.5.2.2 Freeway Ramp Queuing

Impact TRANS-26A: Development of the proposed Reduced Underground Parking Alternative would not add vehicle trips to existing freeway off-ramp vehicle queues, under Phase 1 conditions, that exceed storage capacity resulting in a potentially hazardous condition, and as such would have a less than significant impact on freeway ramp queuing. ***(Less-than-Significant)***

Impact TRANS-26B: Development of the proposed Reduced Underground Parking Alternative would not add vehicle trips to existing freeway off-ramp vehicle queues, under Project Buildout conditions, that exceed storage capacity resulting in a potentially hazardous condition, and as such would have a less than significant impact on freeway ramp queuing. ***(Less-than-Significant)***

As documented in Sections 4.4.2 and 7.4.2, vehicle trips associated with the Reduced Underground Parking Alternative would not exceed ramp storage capacities at any of the intersections studied, and would not lead to potential hazardous interference with the freeway mainline. Therefore, the Reduced Underground Parking Alternative would have a less-than-significant impact on freeway ramp queuing under Phase 1 Project and Project Buildout conditions, and no mitigation is required.

Mitigation Measures: None Required

7.5.2.3 At-Grade Rail Crossings

Impact TRANS-27A: Development of the proposed Reduced Underground Parking Alternative would increase vehicle queues beyond available storage at the South Linden Avenue grade crossing, under Phase 1 conditions, but would not exacerbate risk of collisions; therefore, it would have a less than significant impact on at-grade rail crossing hazards. ***(Less-than-Significant)***

Impact TRANS-27B: Development of the proposed Reduced Underground Parking Alternative would increase vehicle queues beyond available storage at the South Linden Avenue grade crossing, under Project Buildout conditions, but would not exacerbate risk of collisions; therefore, it would have a less than significant impact on at-grade rail crossing hazards. ***(Less-than-Significant)***

The Reduced Underground Parking Alternative would result in increased traffic volumes at the realigned at-grade rail crossing at South Linden Avenue under Phase 1 Project and Project Buildout conditions as documented in Sections 4.3.3 and 7.3.2. However, Project-related crossing improvements would limit the risk of collisions associated with increased traffic, consistent with the Phase 1 and Project Buildout site plans. Therefore, the Reduced Underground Parking Alternative under the Phase 1 Project and Project Buildout conditions would have a less-than-significant impact on the South Linden Avenue at-grade rail crossing, and no mitigation is required.

Mitigation Measure: None required.

Impact TRANS-28A: Development of the proposed Reduced Underground Parking Alternative would not increase vehicle queues, under Phase 1 conditions, beyond available storage at the Scott Street at-grade rail crossing and would not exacerbate risk of collisions, resulting in no impact to the at-grade rail crossing. ***(Less-than-Significant)***

Impact TRANS-28B: Development of the proposed Reduced Underground Parking Alternative would not increase vehicle queues, under Project Buildout conditions, beyond available storage at the Scott Street at-grade rail crossing and would not exacerbate risk of collisions, resulting in no impact to the at-grade rail crossing. ***(Less-than-Significant)***

The Reduced Underground Parking Alternative would result in a net decrease in traffic volumes crossing the Caltrain corridor along Scott Street, as some vehicle traffic crossing the Caltrain corridor at Scott Street would shift to Southline Avenue (documented in Sections 4.3.3 and 7.3.2). As a result, the Reduced Underground Parking Alternative would have a less-than-significant impact on the Scott Street at-grade rail crossing under Phase 1 and Project Buildout conditions, and no mitigation is required.

Mitigation Measure: None required.

7.5.2.4 Traffic Signal Warrant

Impact TRANS-29A: Development of the proposed Reduced Underground Parking Alternative would not meet any traffic signal warrants within the Specific Plan area, under Phase 1 conditions, and as such the Phase 1 Project results in a less than significant impact. ***(Less-than-Significant)***

Impact TRANS-29B: Development of the proposed Reduced Underground Parking Alternative would not meet any traffic signal warrants within the Specific Plan area, under Project Buildout conditions, and as such the Project Buildout results in a less than significant impact. ***(Less-than-Significant)***

None of the Project's five unsignalized driveways meet peak hour signal warrants under Phase 1 or Project Buildout conditions with the Reduced Underground Parking Alternative as described in Sections 4.3.2 and 7.4.1. The Reduced Underground Parking Alternative would provide appropriate pedestrian crossing treatments at these unsignalized crossings. As a result, the Reduced Underground Parking Alternative under both Phase 1 Project and Project Buildout conditions would have a less-than-significant impact on traffic signal warrants, and no mitigation is required.

Mitigation Measure: None required.

Impact TRANS-30A: Development of the proposed Reduced Underground Parking Alternative would meet Peak Hour Signal Warrant at the Huntington Avenue/Herman Street/Forest Avenue Intersection, under Phase 1 conditions, resulting in a significant impact. ***(Significant)***

Impact TRANS-30B: Development of the proposed Reduced Underground Parking Alternative would meet Peak Hour Signal Warrant at the Huntington Avenue/Herman Street/Forest Avenue Intersection, under Project Buildout conditions, resulting in a significant impact. ***(Significant)***

As documented in Sections 4.4.1 and 7.4.1, the Reduced Underground Parking Alternative would result in a net increase of about 11 PM vehicle trips under Phase 1 conditions and 301 PM peak hour trips under Project Buildout conditions at the intersection of Huntington Avenue/Herman Street/Forest Avenue. This intersection meets CA-MUTCD peak hour signal warrant during the PM peak hour under Existing, 2024 No Project, and 2040 No Project conditions. The addition of Phase 1 and Project Buildout traffic would substantially contribute to the need for a signal at this intersection. As such, the Reduced Underground Parking Alternative under both the Phase 1 and Project Buildout conditions would have a significant impact at this location.

Mitigation Measures: The Project Sponsor should provide a fair share contribution towards implementation of a traffic signal at the intersection of Huntington Avenue/Herman Street/Forest Avenue to alleviate potential conflicts associated with Project Buildout-related traffic. However, the traffic signal is not presently included in a capital improvement or fee program adopted by the City of San Bruno, therefore, the City of San Bruno does not have a mechanism for funding this mitigation and cannot ensure this mitigation occurs will be implemented. Therefore, while the proposed mitigation could reduce the Project Buildout impact on this intersection to a less-than-significant level, because a funding mechanism does not exist, the impact would be remain significant and unavoidable. ***(Significant and Unavoidable)***

7.5.2.5 Emergency Vehicle Access

Impact TRANS-30A: Development of the proposed Reduced Underground Parking Alternative would not produce a detrimental impact to emergency vehicle access in the study area, under Phase 1 conditions. ***(Less-than-Significant)***

Impact TRANS-30B: Development of the proposed Reduced Underground Parking Alternative would not produce a detrimental impact to emergency vehicle access in the study area, under Project Buildout conditions. ***(Less-than-Significant)***

As documented in Sections 4.4.5 and 7.4.5, the Reduced Underground Parking Alternative would not include design elements that would hinder emergency access, and all roadways and facilities will be designed to accommodate emergency vehicles. Therefore, the Reduced Underground Parking Alternative under the Phase 1 and Project Buildout conditions would have a less than significant impact on emergency vehicle access and no mitigation is required.

Mitigation Measures: None required

7.5.3 Bicycle, Pedestrian, and Transit

Impact TRANS-31A: Development of the proposed Reduced Underground Parking Alternative would not conflict with adopted policies, plans, or programs regarding transit, bicycle, or pedestrian facilities, under Phase 1 conditions, and results in a less than significant impact based on compliance with such plans and policies. ***(Less-than-Significant)***

Impact TRANS-31B: Development of the proposed Reduced Underground Parking Alternative would not conflict with adopted policies, plans, or programs regarding transit, bicycle, or pedestrian facilities, under Project Buildout conditions, and results in a less than significant impact based on compliance with such plans and policies. ***(Less-than-Significant)***

As documented in Sections 4.4.4 and 7.4.4, Reduced Underground Parking Alternative exhibits consistency with plans, policies, and programs adopted by the City of South San Francisco, City of San Bruno, C/CAG, BART, and MTC. The Project would provide employment near regional transit, would enhance bicycle and pedestrian facilities to support transit access, would connect local street networks, and would include a TDM program that meets City requirements. Therefore, the Reduced Underground Parking Alternative under Phase 1 Project and Project Buildout conditions would not conflict with adopted policies, plans, or programs and would have a less than significant impact.

Impact TRANS-32A: Development of the proposed Reduced Underground Parking Alternative would increase travel times for some bus routes, under Phase 1 conditions, but would not decrease the overall performance of transit service, and as such results in a less than significant impact on transit. ***(Less-than-Significant)***

Impact TRANS-32B: Development of the proposed Reduced Underground Parking Alternative would increase travel times for some bus routes, under Project Buildout conditions, but would not decrease the overall performance of transit service, and as such results in a less than significant impact on transit. ***(Less-than-Significant)***

As documented in Sections 4.4.4 and 7.4.4, the Reduced Underground Parking Alternative would increase average transit travel times on SamTrans ECR bus route (and portions of SamTrans routes 140 and 141) by one to three minutes, but is unlikely to affect the route's performance overall or require additional buses to maintain comparable headways. No other routes operating in the Project vicinity would have increased average transit times due to the Project. The Project would also add transit ridership to BART, SamTrans, and Caltrain, but would not materially contribute to overcrowding. In addition, the Project delivers pedestrian infrastructure designed to enhance access to the SamTrans transit center and BART station. Therefore, the Reduced Underground Parking Alternative under Phase 1 Project and Project Buildout conditions would have a less than significant impact on transit performance and no mitigation is required.

Mitigation Measure: None required.

Impact TRANS-33A: Development of the proposed Project Buildout Reduced Underground Parking Alternative would not decrease the performance and safety of bicycle and pedestrian facilities near the Project under Phase 1 conditions, resulting in a less-than-significant impact. ***(Less-than-Significant)***

Impact TRANS-33B: Development of the proposed Project Buildout Reduced Underground Parking Alternative would not decrease the performance and safety of bicycle and

pedestrian facilities near the Project under Project Buildout conditions, resulting in a significant impact. ***(Less-than-Significant)***

As documented in Sections 4.4.4 and 7.4.4, the Reduced Underground Parking Alternative would not degrade the performance or safety of bicycle or pedestrian facilities. The Project would extend the Centennial Way Trail, enhance bicycle and pedestrian access to the San Bruno BART Station, and provide new bike lane and sidewalk facilities. Therefore, the Reduced Underground Parking Alternative under Phase 1 Project and Project Buildout conditions would have a less than significant impact on bicycle and pedestrian facilities, and no mitigation is required.

Mitigation Measure: None required.

Appendix: VMT Totals for Greenhouse Gas Analysis

The following table summarizes VMT totals for use in greenhouse gas analysis. The C/CAG Model estimates VMT and auto mode share based on regional travel behavior and proximity to transit. However, the model outputs do not fully reflect the implementation of the Project's TDM program as required by city ordinance (most notably subsidized transit passes), and does not take into account active transportation facilities like the Centennial Way Trail as well as access improvements between the project and regional transit stations. It is anticipated that the project's TDM program would result in a 23 percent reduction in VMT over the C/CAG Model estimates based on these factors.

Appendix Table: VMT Totals for GHG Analysis

Scenario	TAZ Total VMT	Total Project VMT (Drive Alone Mode Share)	Total Project VMT with TDM Program
Existing	258,500	-	-
Existing Plus Phase I	362,200	103,800 (71%)	79,900 (55%)
2024	260,000	-	-
2024 Plus Phase I	363,800	103,800 (71%)	79,900 (55%)
2040 No Project	264,100	-	-
2040 Plus Project Buildout	663,500	399,400 (71%)	307,500 (55%)

Appendix: Traffic Operations Memo

The following memorandum analyzes traffic operations for the Phase 1 Project, Project Buildout, and Partial Circulation Alternative. The Phase 1 Project analysis also covers the Reduced Underground Parking Alternative as discussed in Section 7.

Memorandum

Date: January 4, 2022

To: Adena Friedman, City of South San Francisco

From: Fehr & Peers

Subject: Southline Traffic Operations Analysis

SF20-1089

Executive Summary

The following memorandum presents a traffic operations analysis of the Southline Specific Plan and associated transportation infrastructure changes ("Project"). The Project would redevelop an approximately 26.5-acre industrial site in the City of South San Francisco's Lindenville District, adjacent to the San Bruno Bay Area Rapid Transit (BART) rail station. The Project would demolish all existing on-site uses and construct a transit-oriented office/research and development (R&D) campus with a maximum anticipated building area of 2.8 million square feet. New development would include office/R&D and amenity space serving approximately 11,000 employees; approximately 5,700 parking spaces; a new east-west street connection between Sneath Lane and South Linden Avenue (referred to as "Southline Avenue"[1]); off-site transportation, circulation, and infrastructure improvements at several locations outside the Specific Plan area; supportive utilities and related infrastructure; and open space.

In addition to creating the new Southline Avenue, the Project would modify off-site transportation infrastructure including constructing a new intersection connecting Sneath Lane, Huntington Avenue, Maple Avenue, and Southline Avenue; extending the Centennial Way Trail to the San Bruno BART Station; providing a signalized driveway to the SamTrans Transit Center; and enhancing pedestrian access to the San Bruno BART station with new bulbouts and high visibility crosswalks. Most of this off-site transportation infrastructure is

[1] The South San Francisco General Plan identifies a proposed South Linden extension in a northeast/southwest direction across the Project site, connecting to South Maple Ave. (See General Plan, Figure 2-1.) Southline Avenue is provisionally named for the purpose of the Specific Plan and CEQA review.

located within the City of South San Francisco; however, certain improvements, including portions of the new intersection connecting Sneath Lane, Huntington Avenue, Maple Avenue, are located in the City of San Bruno.

The Project would be developed in phases over time with Phase 1 anticipated to be constructed by 2024, and full buildout in 2030. Phase 1 would include construction of the new Southline Avenue east–west connection road and the following development, generally located south of the new road: two new office buildings, with a total building area of up to 612,715 square feet; the four-story, 88,200-square foot amenities building; associated parking; and landscaping and open space amenities. Phase 1 also includes most of the proposed on-site and off-site infrastructure, roadway, and pedestrian improvements within the off-site improvement areas, including development of Southline Avenue and the intersection connecting Sneath Lane, Huntington Avenue, Maple Avenue.

This memorandum summarizes Project traffic patterns and anticipated changes in intersection Level of Service (LOS). Under California Senate Bill 743, passed in 2013, a development project's contributions to LOS no longer constitute a significant impact under the California Environmental Quality Act (CEQA). Since LOS has been eliminated from consideration under CEQA, this analysis is intended to be informational only, providing the City of South San Francisco and City of San Bruno with an overview of how the local roadway network surrounding the Project functions from an operations standpoint. However, for the purposes of evaluating environmental impacts under CEQA, the new regulations have removed traffic congestion from the range of required subjects analyzed within CEQA documents.

This memorandum summarizes the Project's projected travel patterns and effects on LOS under 6 different scenarios as further described in the Methodology section below. These scenarios include evaluation of both Phase 1 Project under 2024 conditions and Project Buildout under the 2040 condition, both as compared to a no project and existing condition. A Partial Circulation Scenario evaluates the Project's effects without the proposed reconfiguration of the intersection connecting Southline Avenue to Sneath Lane and Huntington Avenue.

Key Findings Include:

- Project-related traffic would be distributed across several streets connecting to 10 freeway ramps and several arterials; consequently, traffic volumes and associated congestion effects are not concentrated along any particular corridor. This information is shown in **Figures 9 and 10** as well as **Table 7.**
- Under existing conditions, three intersections (all within San Bruno) experience LOS E or F conditions under existing conditions, two of which do not meet LOS standards.

- Under 2024 no project conditions, five intersections experience LOS E or F conditions (one in South San Francisco, four in San Bruno), and three of these intersections do not meet LOS standards. Under 2024 plus Phase 1 conditions, the same four intersections experience LOS E or F conditions and the same three intersections do not meet LOS standards, while one intersection improves due to shifts in traffic patterns. This information is shown in **Table 7.**
- Under 2040 No Project conditions, nine intersections (five within South San Francisco and four within San Bruno) experience LOS E or F conditions, three of which do not meet LOS standards. Under 2040 Project Buildout conditions, 12 intersections (six within South San Francisco and six without San Bruno) experience LOS E or F conditions, and five intersections do not meet LOS standards. This information is shown in **Figures 11 and 12** as well as **Table 7.**
- Without the proposed Southline Avenue connection of South Linden Avenue to Sneath Lane, as studied here under the Partial Circulation Scenario, more trips would occur in areas south of the Project (particularly along Herman Avenue and San Mateo Avenue) and in areas to the north of the Project (along Victory Avenue and Spruce Avenue). These streets lack capacity to accommodate large increases in Project-related traffic. This information is shown in **Figures 9 through 12** and **Table 7,** and further described on pages 15 and 24.

City LOS Policies

This memorandum analyzes the effects of Project vehicle traffic at signalized and unsignalized intersections using level of service (LOS). LOS is a quantitative description of an intersection's performance based on the average delay experienced by drivers. Intersection levels of service range from LOS A, which indicates free flow conditions with short delays, to LOS F, which indicates congested or overloaded vehicle flow conditions with extremely long delays.

California Senate Bill 743 stipulates that vehicle LOS and similar measures related to auto delay shall not be used as the basis for determining the significance of transportation impacts under the California Environmental Quality Act (CEQA). However, local agencies may continue to use vehicle congestion metrics to inform non-CEQA transportation planning and evaluation.

The City of South San Francisco and City of San Bruno have each adopted LOS policies. These policies differ by jurisdiction as described below:

- The South San Francisco General Plan exempts development within one-quarter mile of a Caltrain or BART station, or a City-designated ferry terminal, from LOS standards (Policy 4.2-G-17). The City has concluded that Policy 4.2-G-17 applies to the entirety of the Project given most of the site is within ¼ mile of the San Bruno BART Station.
- The San Bruno General Plan strives to maintain acceptable levels of service for vehicular movement along the city's street network, and acknowledges that acceptable level of service could vary based on characteristics of the area under consideration (Policy T-B). It establishes a LOS D standard at intersections highlighted in yellow in (including the Huntington Avenue/Sneath Lane intersection, which has lane configurations affected by the Project).

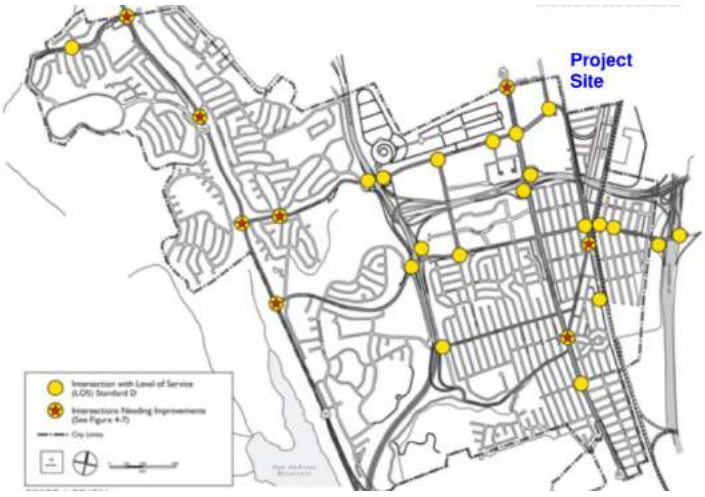


Figure 1 – City of San Bruno LOS Standards

Methodology

The following section describes the methodology for this analysis. The analysis scenarios, travel demand model methodology, and trip generation, distribution, and assignment are consistent with the approach presented in the Transportation Impact Analysis.

Analysis Scenarios

The impacts of the proposed Project to the surrounding transportation system were evaluated for the five scenarios listed below:

- Scenario 1: Existing Conditions
- Scenario 2: 2024 Baseline (No Project)
- Scenario 3: 2024 Baseline Plus Project Phase 1 Conditions
- Scenario 4: Cumulative 2040 Conditions
- Scenario 5: Cumulative 2040 Plus Project Buildout Conditions

A description of the methods used to estimate the amount of traffic and VMT generated by the proposed Project is provided below.

1. Existing Conditions (Pre-COVID-19)

Existing conditions represent the baseline condition upon which Project impacts are measured. The existing condition reflects transportation conditions prior to the COVID-19 pandemic. Due to the atypical travel patterns and transit service levels during the COVID-19 pandemic, new data was not collected for this analysis. Instead, to establish a representative existing condition, this analysis utilized local traffic data collected in 2017 and 2018 and transit service levels prior to the COVID-19 pandemic (including Caltrain service levels of five trains per hour, per direction). This approach enables analysis of an observed condition and no major developments have since been completed in the immediate Project area that might substantially affect traffic patterns; however, there is inherently some uncertainty in the data's representation of existing conditions due to its age and the unusual circumstances of the COVID-19 pandemic.

2. 2024 Baseline

The 2024 Baseline condition represents a near-term condition after the COVID-19 pandemic is presumed to have ended, in which travel patterns have returned to normal. The 2024 Baseline condition includes prorated local and regional growth consistent with the 2040 forecasts, reflecting the 2017/2018 conditions plus the addition of roughly one quarter of total growth between the 2017/2018 condition and 2040 forecasts. There remains substantial uncertainties around the

COVID-19 pandemic's effects on travel behavior and the duration of these effects; this approach assumes travel behavior returns to typical conditions and the effects of the pandemic are short term in nature. The 2024 Baseline also includes the completion of the Caltrain Electrification Project, a Project currently under construction that will increase Caltrain service levels to six trains per hour, per direction.

3. 2024 Baseline Plus Project Phase 1 Conditions

The 2024 Baseline Plus Phase 1 conditions represent the 2024 condition with the addition of Phase 1 of the Project based on the anticipated Phase 1 construction schedule. Phase 1 of the Project includes several major transportation network improvements, including the construction of Southline Avenue; constructing a new intersection connecting Sneath Lane, Huntington Avenue, Maple Avenue, and Southline Avenue; providing a signalized driveway to the SamTrans Transit Center; and extension of various bicycle and pedestrian facilities, including extending the Centennial Way Trail to the San Bruno BART station and enhancing pedestrian access to the San Bruno BART station with new bulbouts and high visibility crosswalks. As such, under 2024 Baseline Plus Phase 1 conditions, traffic volumes reflect the existing traffic volumes, some redistribution of traffic to the new Southline Avenue, and traffic associated with the land uses in Phase 1 of the Project.

4. Cumulative 2040 Conditions

Cumulative 2040 conditions include transportation demand resulting from reasonably foreseeable land use changes and conditions associated with planned transportation Projects. Cumulative conditions are based on forecasted land use and transportation conditions included in Plan Bay Area 2040, as represented in the C/CAG Model. Forecasts for cumulative conditions include several adjustments to reflect reasonably foreseeable Projects affecting the study area, including completion of all approved employment Projects within the City of South San Francisco as of May 2020, and completion of the Bayhill Specific Plan in the City of San Bruno (a plan that may be considered reasonably foreseeable even though it is not yet approved). Along the Caltrain railroad corridor, cumulative conditions include the operation of 12 trains per hour, per direction during peak periods; this service level reflects completion of the California High Speed Rail Project to operate four high speed trains per hour, per direction (as described in Plan Bay Area) as well as the Caltrain Business Plan's adopted service vision of operating eight trains per hour, per direction during peak periods.

Cumulative conditions do not assume completion of any roadway changes (with the exception of the US-101 Managed Lanes project south of I-380). The South Linden and Scott Street grade separations are also not included since these Projects are not yet fully funded or included in the regional transportation plan. As of September 2020, both South San Francisco and San Bruno have provided direction to proceed with studying a hybrid approach for the South Linden Avenue grade crossing that involves partially raising the railway and lowering the roadway, along with closing Scott Street to vehicles and maintaining a crossing for pedestrians and bicyclists.

5. Cumulative 2040 Plus Project Buildout Conditions

Cumulative plus Project conditions represent the cumulative condition with the addition of the complete Project buildout to determine the extent to which the proposed Project would contribute to long-term cumulative transportation impacts.

6. Partial Circulation Scenario (Cumulative 2040 Plus Project Buildout Conditions)

The Partial Circulation Scenario matches Scenario 5 (Cumulative 2040 Plus Project Buildout Conditions) with the omission of a new reconfiguration of the intersection connecting Southline Avenue to Sneath Lane and Huntington Avenue. In this scenario, Southline Avenue would terminate at Maple Avenue at its western portion.

Travel Demand Model Methodology

The City/County Association of Governments of San Mateo County Travel Demand Model (C/CAG Model) was used as a basis for analyzing travel behavior, including trip distribution and vehicle miles traveled. The C/CAG Model is a trip-based regional travel demand model that considers regional land use patterns, approximated highway congestion, and connecting transit service within the nine-county Bay Area region. As part of the ongoing City of South San Francisco General Plan Update study, the C/CAG model was reviewed, and updated through a series of diagnostic tests to assess the model's performance and reasonableness, and a series of refinements were made to the model inputs for land use, roadway network and transit service within South San Francisco. These updates improve the C/CAG model's effectiveness in reasonably estimating current travel patterns and changes in travel patterns in response to Project land use and transportation network changes.

To further enhance the reasonableness of trip assignment from the C/CAG Model, the City of South San Francisco's sub-area model was applied using Project trip generation and trip distribution from the C/CAG Model. The sub-area model, developed for the City of South San Francisco General Plan Update, reflects origin-destination patterns consistent with the C/CAG Model and incorporates refinements to the level of detail in the local street network. The sub-area model, developed in the Visum software platform, provides a more detailed representation of traffic circulation and operational performance of the roadway network in the vicinity of the Project and within the San Francisco and San Bruno areas. The roadway network in the sub-area model was refined to include most streets and major driveways in South San Francisco. The traffic assignment process in the sub-area model incorporates details such as signal timings, intersection lane geometries, and turning movement delays, allowing for a more realistic representation of existing traffic patterns and those associated with the Project land use and proposed street extension. Figure 2 illustrates the increased local network detail in the South San Francisco model compared to the C/CAG model. Figure 3 highlights the proposed street extension in the South San Francisco General Plan.

Figure 2. Comparison of Model Network Detail

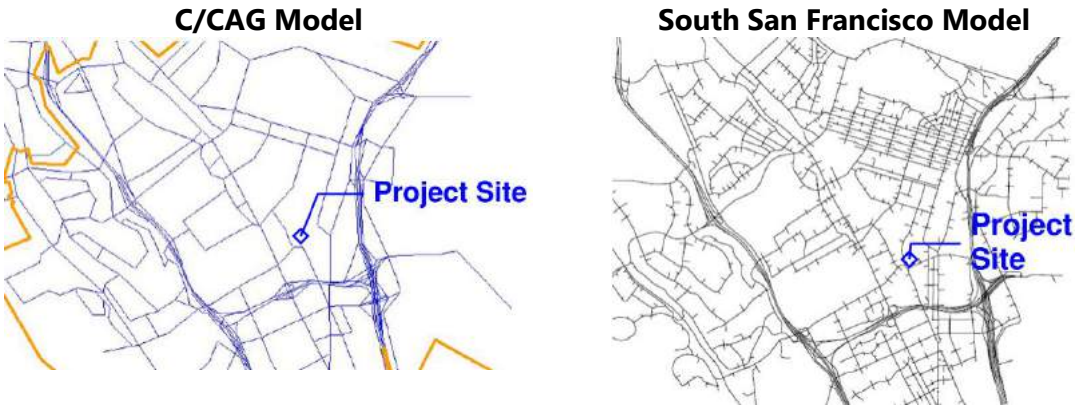
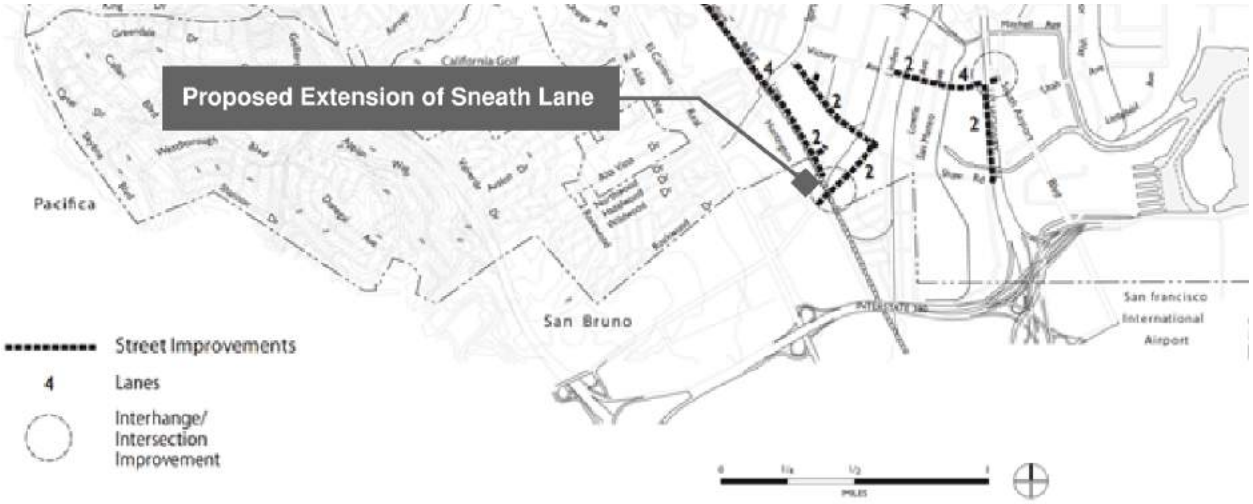


Figure 3. South San Francisco General Plan – Proposed Streets



Trip Generation, Distribution, and Assignment

The amount of traffic added to the roadway system by the proposed Project was estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. The first step, trip generation, estimates the amount of traffic that would be generated once the proposed Project was built and fully occupied. The second step, trip distribution, estimates the direction of travel to and from the Project. The third step, trip assignment, assigns the proposed Project trips to specific street segments and intersection turning movements. The results are described below.

Trip Generation

Project person trip and vehicle trip forecasts were developed to capture the multimodal nature of Project travel as a transit-oriented development. Person trip generation represents trips by one person in any mode of transportation, whereas vehicle trip generation represents trips by one

vehicle. Vehicle trip estimates include trips associated with single occupancy vehicles, taxis, ride-hailing companies (like Uber and Lyft), carpools, and shuttles.

The Project includes two land use alternatives – an office use and a life science use. For purposes of this analysis, the office use was analyzed to reflect a land use condition with a employee density – typically offices have one employee per 250 square feet, compared to one employee per 450 square feet for life science uses. Therefore, the Office Alternative would have a larger effect on the surrounding environment when compared to the Life Sciences Alternative. As such, this section analyzes the Office Alternative when considering project impacts under the buildout scenario.

Trip generation estimates were prepared for the Phase 1 Project (701,000 square feet), inclusive of the approximately 16,400 square foot publicly-accessible ground floor uses in the amenities buildings, in addition to the Project Buildout (up to 2,800,000 square feet).

The Project is subject to the City's Transportation Demand Management ordinance. The Project will be required to comply with a maximum drive alone mode share of 55 percent. Under the Transportation Demand Management ordinance, the Project must comply with standard monitoring practices to enforce these mode share requirements. A Preliminary TDM Plan has been prepared for the Project, which is applicable to the entire Project site.

Office Trip Generation

Office trip generation was calculated using local data from comparable sites, as further described below, based on the ITE Trip Generation Manual, 10th Edition recommendation for using local data for similar atypical developments like the proposed Project, which is very large in scale, adjacent to high frequency transit service, has a reduced parking supply, and is subject to stringent transportation demand management requirements. Based on the ITE recommendation, this analysis estimates person trip and vehicle trip rates based on observed counts and mode share surveys for comparable high intensity technology office uses in Downtown Redwood City near the Redwood City Caltrain Station, as analyzed in the Redwood City Moves Transportation Plan. Based on a review of comparable trip generation and mode share data for other transit-oriented office sites located in San Francisco, Oakland, and San Mateo, the Downtown Redwood City location was selected based on land use, transit, and TDM characteristics that most closely resemble the Project. These person trip and vehicle trip rates from the Downtown Redwood City data were adjusted to reflect the Project's mode share requirements consistent with the City of South San Francisco's TDM ordinance – a maximum peak period drive alone rate of 55 percent including single-occupancy vehicles and single-passenger trips via ride-hailing companies or taxis, as compared to an observed peak period drive-alone rate of 50 percent in the downtown Redwood City surveys.

Person trip generation for non-auto modes was based on transit, carpool, and active transportation data from South San Francisco TDM surveys and the proximity of the Project to transit services and active transportation facilities. An estimated 23 percent of peak hour trips would occur via BART,

10 percent via Caltrain, eight percent via Carpool, two percent via SamTrans buses, and two percent via bicycling. Trips via BART and SamTrans would require walking from the Project to the San Bruno BART Station or SamTrans bus transit center, while trips via Caltrain would connect via first/last mile shuttles or via biking.

Amenity Uses

Trip generation for the Project's publicly accessible restaurant/retail uses were estimated using the High Turnover Restaurant classification from the Trip Generation Manual, 10th Edition. Since the publicly accessible amenities are generally expected to draw pedestrian trips from elsewhere within the Project site and adjacent areas, the High Turnover Restaurant classification provides a conservative assessment of vehicle trips that is typically more reflective of a more automobile-oriented use.

Amenity uses accessible only to tenants of the Project such as an employee cafeteria, fitness center, basketball court, auditorium would not generate external vehicle trips, but would generate employee-related person trips for individuals employed at these services. Trip generation for these internal private amenities was estimated at about one quarter of office rates based on anticipated employee densities and mix of staffed and unstaffed uses . Trip generation for the public and private amenity uses were included in both the Phase 1 Project and Project Buildout.

Trip Internalization

Since the Project includes complementary mixed uses, some trips would be "internalized" within the Project Site (trips beginning and ending within the Project by walking). An internalization rate of three percent (AM peak hour) and two percent (PM peak hour) was applied to all vehicle trips during the respective peak hours based on the MXD+ Model, a weighted average of the Environmental Protection Agency's Mixed-Use Trip Generation Model (MXD) and the NHCRP 684 methodology.

Credit for Existing Trip Generation

The Project's net change in vehicle trips was calculated to reflect the estimated amount of vehicle trips occurring at the Project site under existing conditions. Due to the atypical travel patterns associated with the COVID-19 public health crisis and related shelter-in-place order, driveway counts of existing Project site uses were not conducted for purposes of this analysis. Instead, trip generation estimates for existing uses were estimated based on land use characteristics and the ITE Trip Generation Manual, 10th Edition. Existing land uses include approximately 344,000 square feet of light industrial and office uses, about 85 percent of which is occupied. Both Phase 1 and the Project Buildout would include the Southline Avenue extension and associated infrastructure; therefore, both Phase 1 and Project Buildout trip generation include the full trip credit associated with existing land uses. In total, existing uses generate an estimated 1,504 daily vehicle trips, including 171 AM peak hour vehicle trips and 150 PM peak hour vehicle trips.

Trip Generation Results

Phase 1 of the Project would generate approximately 7,930 daily person trips and 3,954 daily vehicle trips. These totals include 1,043 AM peak hour person trips, 485 net new AM peak hour vehicle trips, 950 PM peak hour person trips, and 455 net new PM peak hour vehicle trips. Table 1 and Table 2 show person trip and vehicle trip generation estimates for Phase 1, respectively.

The Project Buildout would generate approximately 28,461 daily person trips and 16,876 vehicle trips. These totals include 3,918 AM peak hour person trips, 2,150 net new AM peak hour vehicle trips, 3,528 PM peak hour person trips, and 1,952 PM peak hour vehicle trips. Table 3 and Table 4 show person trip and vehicle trip generation estimates for the Project Buildout respectively.

Table 1. Person Trip Generation | Phase 1

Mode	Mode Share	AM Peak Hour	PM Peak Hour	Daily
Drive Alone	55%	499	447	3,837
Carpool	8%	73	65	550
BART	23%	209	187	1,281
Caltrain[1]	10%	91	81	557
SamTrans	2%	18	16	111
Walk/Bike[2]	2%	18	16	111
Total Person Trips Monitored by TDM Ordinance	**100%**	**908**	**812**	**6,448**
Person Trips, Public Amenity Visitors	-	135	138	1,482
Total Person Trips	**-**	**1,043**	**950**	**7,930**

Notes:
1. Based on travel demand data from high intensity tech office mode share and person trip generation surveys from Downtown Redwood City near the Redwood City Caltrain Station as well as requirements from City of South San Francisco TDM Ordinance.
2. Mode share estimates based on City of South San Francisco TDM Surveys and analysis based on local context.

Source: Fehr & Peers, 2020.

Table 2. Vehicle Trip Generation | Phase 1

Land Use	Size (KSF)	AM Peak Hour				PM Peak Hour				Daily	
		Rate (per KSF)	In	Out	Total	Rate (per KSF)	In	Out	Total	Rate (per KSF)	Total
Office[1]	613	0.81	464	35	499	0.73	58	387	445	6.16	3,774
Private Amenities[2]	72	0.23	15	1	16	0.20	2	13	15	1.72	124
Public Amenities[3]	16	9.94	87	72	159	9.77	97	59	156	115	1,840
Internalization Adjustment (3% AM / 2% PM)			*-15*	*-3*	*-18*		*-3*	*-8*	*-11*		*-280*
Project Trips			**551**	**105**	**656**		**154**	**451**	**605**		**5,458**
Existing Office[4]	*11*	*ITE Equation*	-10	-2	-12	*ITE Equation*	-2	-12	-14	9.74	-125
Existing Light Industrial[5]	*278*	*ITE Equation*	-140	-19	-159	*ITE Equation*	-18	-118	-136	4.96	-1,379
Net New Project Trips			**401**	**84**	**485**		**134**	**321**	**455**		**3,954**

Notes:

1. Based on travel demand data from high intensity tech office mode share and vehicle trip generation surveys from Downtown Redwood City near the Redwood City Caltrain Station as well as requirements from City of South San Francisco TDM Ordinance. Values rounded in table.
2. Includes external trips associated with employee commutes and deliveries only, assumed to be 72 percent less than the office trip generation rate based upon expected uses and employee densities.
3. Source: ITE 932 High Turnover Restaurant, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Values rounded in table.
4. Source: ITE 710, General Office Building, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Fitted curve equation used for individual land uses. Includes occupied spaces only as of March 2020. Values rounded in table. All existing uses are assumed to be removed with the Phase 1 Project.
5. Source: ITE 110, General Light Industrial, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Fitted curve equation used for individual land uses. Includes occupied spaces only as of March 2020. Values rounded in table. All existing uses are assumed to be removed with the Phase 1 Project.

Source: Fehr & Peers, 2020.

Table 3. Person Trip Generation | Project Buildout

Mode	Mode Share	AM Peak Hour	PM Peak Hour	Daily
Drive Alone	55%	2,105	1,879	15,984
Carpool	8%	306	273	2,317
BART	23%	880	786	5,394
Caltrain[1]	10%	383	342	2,345
SamTrans	2%	77	68	469
Walk/Bike[2]	2%	77	68	469
Total Person Trips Monitored by TDM Ordinance	**100%**	**3,828**	**3,416**	**26,978**
Person Trips, Public Amenity Visitors	-	90	112	1,483
Total Person Trips	**-**	**3,918**	**3,528**	**28,461**

Notes:

1. Based on travel demand data from high intensity tech office mode share and person trip generation surveys from Downtown Redwood City near the Redwood City Caltrain Station as well as requirements from City of South San Francisco TDM Ordinance.
2. Mode share estimates based on City of South San Francisco TDM Surveys and assignment to transit providers based on local context and expected travel patterns.

Source: Fehr & Peers, 2020.

Table 4. Vehicle Trip Generation | Project Buildout

Land Use	Size (KSF)	AM Peak Hour				PM Peak Hour				Daily	
		Rate (per KSF)	In	Out	Total	Rate (per KSF)	In	Out	Total	Rate (per KSF)	Total
Office[1]	2,712	0.81	2,053	155	2,208	0.73	256	1,713	1,969	6.16	16,696
Private Amenities[2]	72	0.23	15	1	16	0.20	2	13	15	1.72	124
Public Amenities[3]	16	9.94	87	72	159	9.77	97	59	156	115	1,840
Internalization Adjustment (3% AM / 2% PM)			-56	-6	-62		*-6*	*-32*	*-38*		*-280*
Project Trips			**2,099**	**222**	**2,321**		**349**	**1,753**	**2,102**		**18,380**
Existing Office[4]	*11*	*ITE Equation*	-10	-2	-12	*ITE Equation*	-2	-12	-14	9.74	-125
Existing Light Industrial[5]	*278*	*ITE Equation*	-140	-19	-159	*ITE Equation*	-18	-118	-136	4.96	-1,379
Net New Project Trips			**1,949**	**201**	**2,150**		**329**	**1,623**	**1,952**		**16,876**

Notes:

1. Based on travel demand data from high intensity tech office mode share and vehicle trip generation surveys from Downtown Redwood City near the Redwood City Caltrain Station as well as requirements from City of South San Francisco TDM Ordinance. Values rounded in table.
2. Includes external trips associated with employee commutes and deliveries only, assumed to be 72 percent less than the office trip generation rate based upon expected uses and employee densities.
3. Source: ITE 932 High Turnover Restaurant, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Values rounded in table.
4. Source: ITE 710, General Office Building, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Fitted curve equation used for individual land uses. Includes occupied spaces only as of March 2020. Values rounded in table.
5. Source: ITE 110, General Light Industrial, Institute of Transportation Engineers. Trip Generation Manual, 10th ed. Fitted curve equation used for individual land uses. Includes occupied spaces only as of March 2020. Values rounded in table.

Source: Fehr & Peers, 2020.

Project Vehicle Trip Distribution, and Project Vehicle Trip Assignment

Figure 4 displays vehicle trip distribution by county based on the C/CAG Model. Approximately 65 percent of vehicle trips would travel between the Project and other locations in San Mateo County. About 21 percent of trips would travel between the Project and San Francisco County. The remainder of trips would be split between Alameda County, Santa Clara County, and elsewhere in the East Bay and North Bay. This summary does not include trip distribution associated with non-auto trips.

Figure 4 Vehicle Trip Distribution – Summary by County

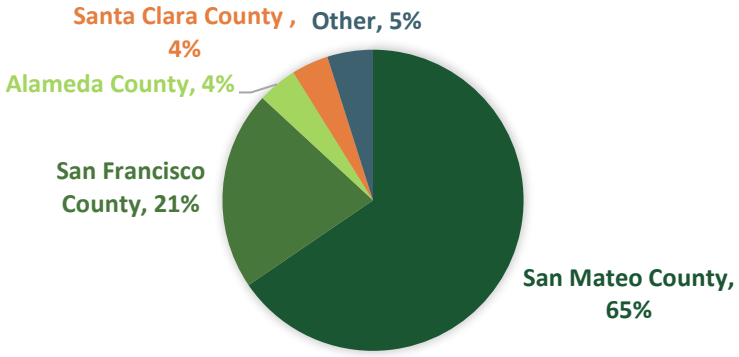


Figure 5 and Figure 6 illustrate Phase 1 and Project Buildout trip distribution and assignment based on the City's sub-area model, depicting street segments with greater than 25 Project-generated trips. Vehicle trip distribution from the Project is shown in green, while volumes assigned to individual streets are illustrated proportionally in blue. The Project's location and access to multiple freeway ramps would result in drivers using several different routes to access US-101, I-380, and I-280. Because 2040 freeway conditions are projected to be highly congested, some Project trips may travel somewhat longer distances via parallel corridors such as El Camino Real or Junipero Serra Boulevard. Approximately 56 percent of Project-generated trips would travel via San Bruno, and 44 percent via South San Francisco.

Figure 7 and Figure 8 illustrate the total difference in volumes associated with the Project Buildout (the Project Buildout trip assignment plus the change in travel patterns associated with the new street connection). By adding the Southline Avenue connection between Sneath Lane/Huntington Avenue and South Linden Avenue, the Project would shift vehicle trips from other routes, resulting in a net decrease in traffic volumes on parallel routes like Spruce Avenue and Scott Street. 2024 conditions generally mirror those shown in 2040 with lower traffic volumes associated with Phase 1.

Figure 9 and 10 illustrate the difference in AM and PM peak hour volumes for the Partial Circulation Scenario as compared to the Project Buildout. Under the Partial Circulation Scenario, more Project traffic uses Spruce Avenue, Herman Street, and San Mateo Avenue to access the Project via a more circuitous paths, while Huntington Avenue, Sneath Lane, and El Camino Real experience comparatively lower volumes given the lack of direct connection to the Project.

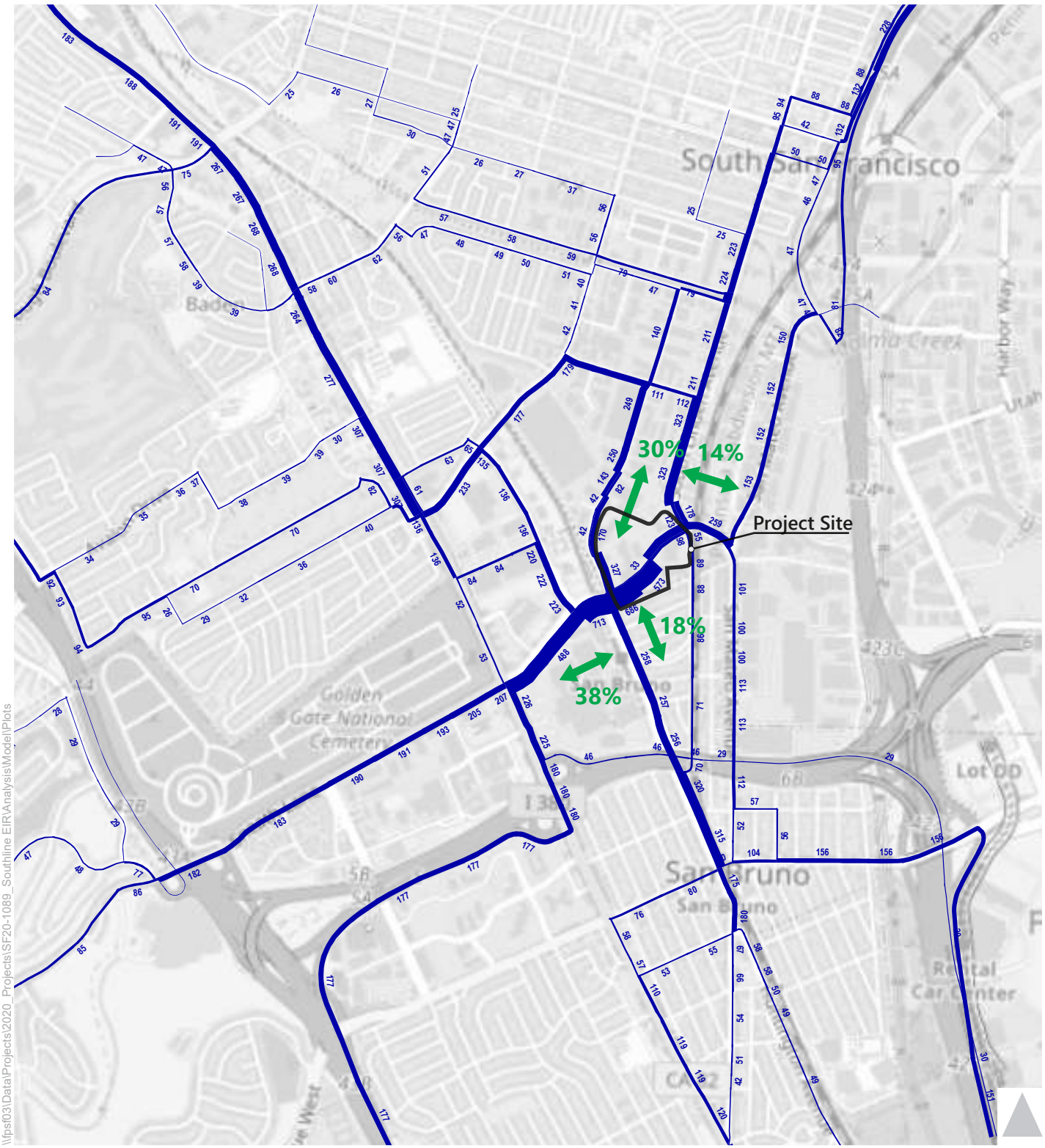


Figure 5

Project Trip Distribution & Assignment - AM Peak Hour

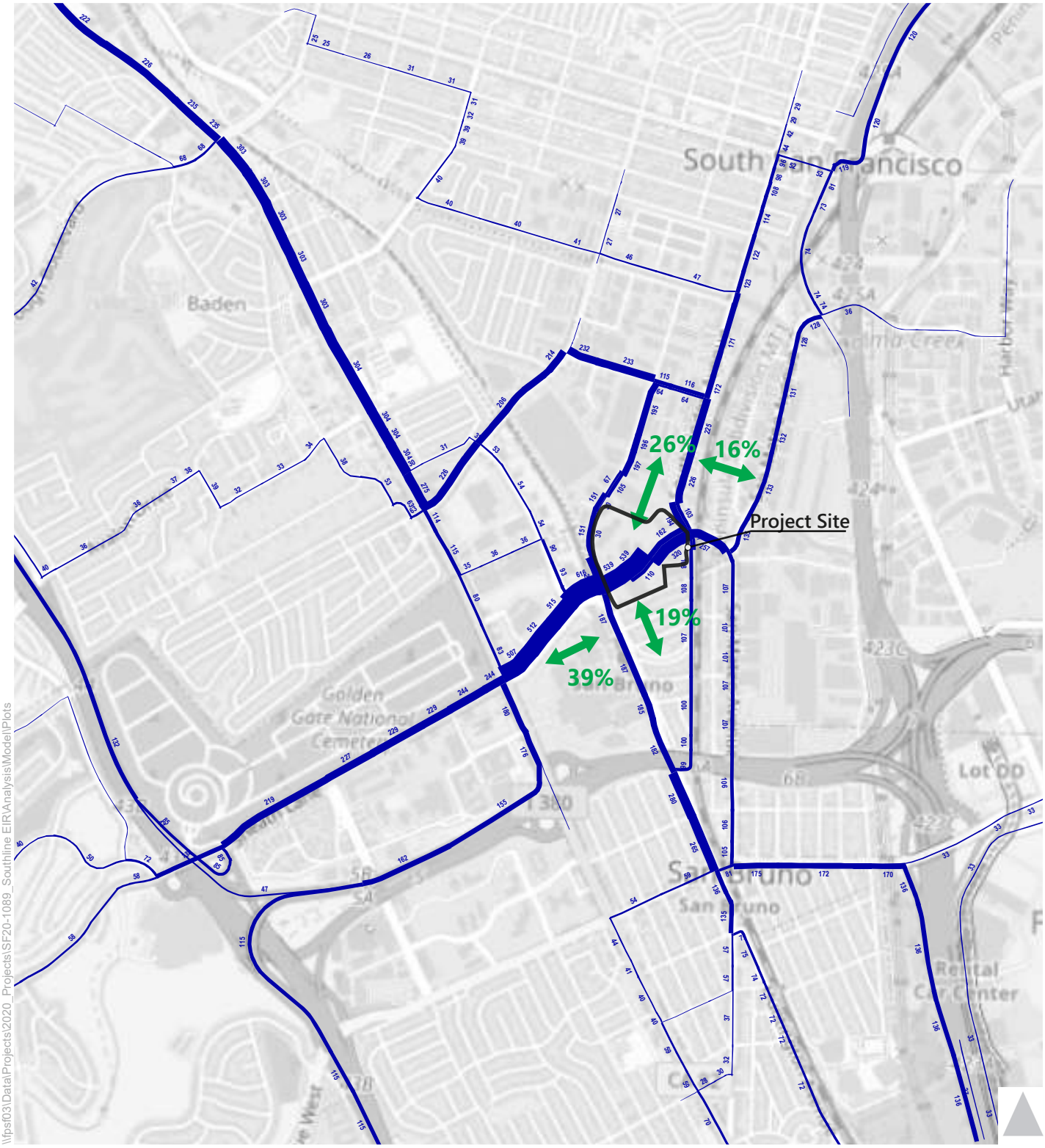
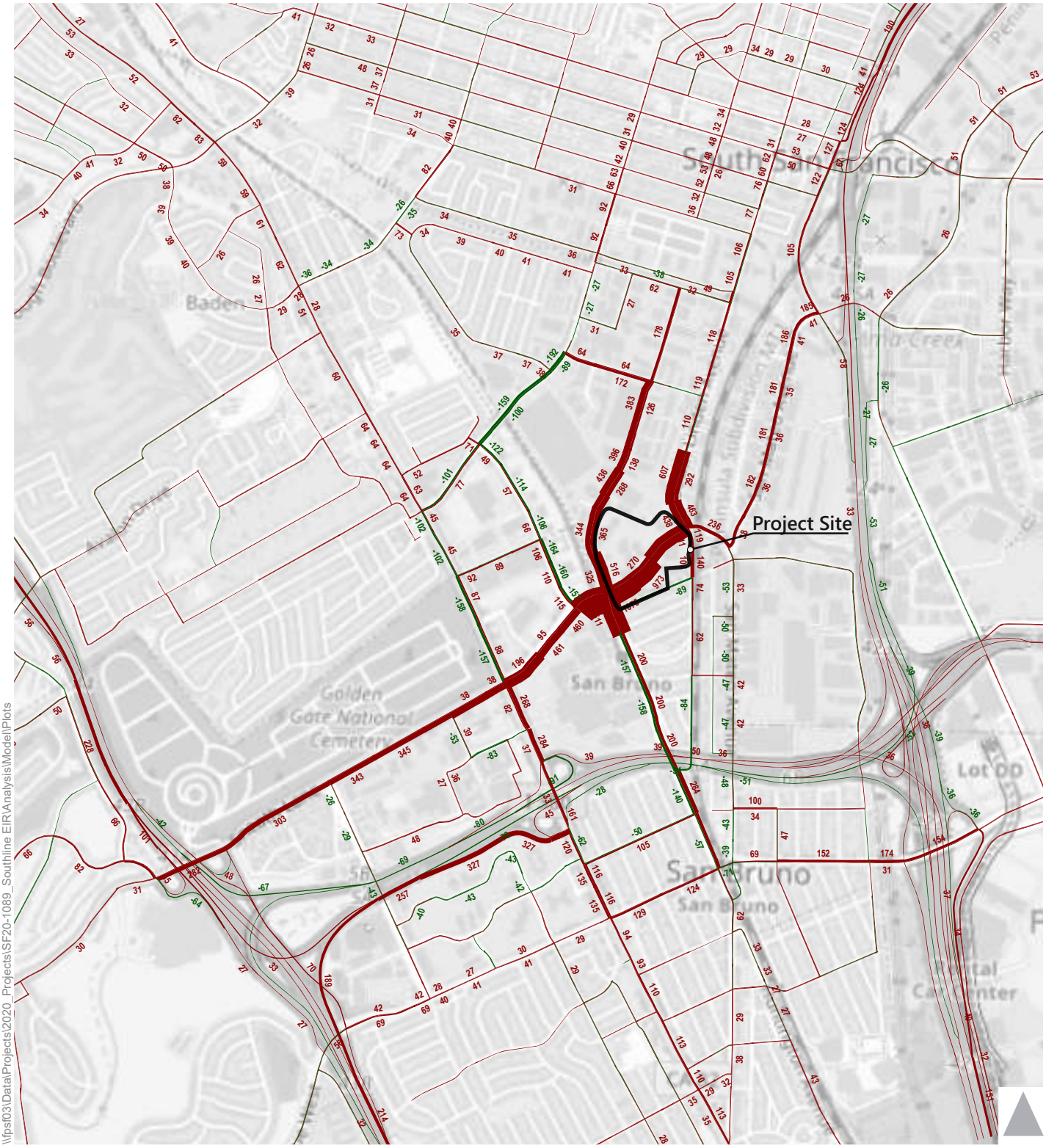


Figure 6

Project Trip Distribution & Assignment - PM Peak Hour



Change in Volume

Decrease

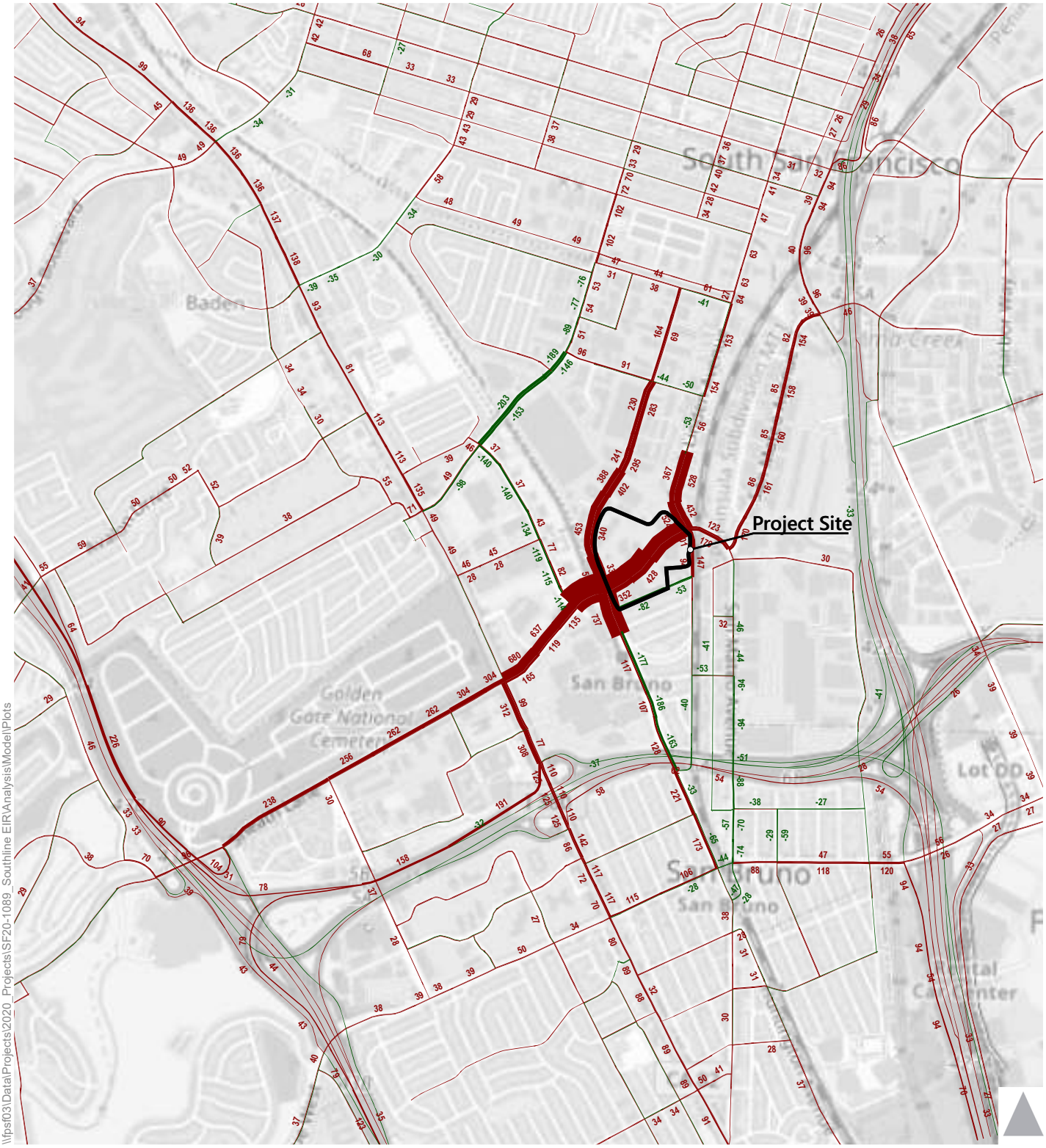
Increase

Volume - *veh/hr*

350 700 1400

Figure 7

2040 Project Buildout
Volume Difference - AM Peak Hour



Change in Volume

Decrease

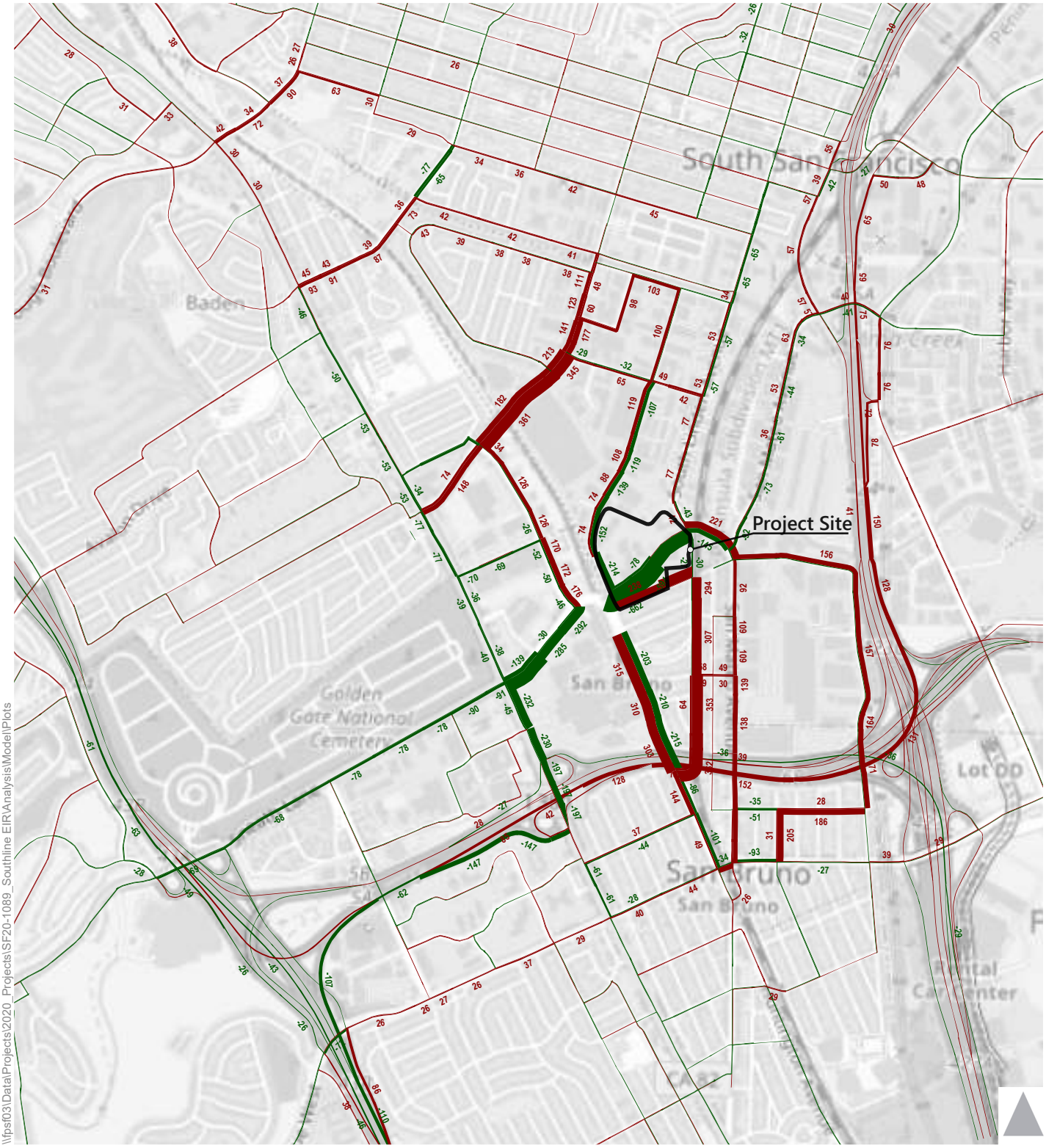
Increase

Volume - *veh/hr*

350 700 1400

Figure 8

2040 Project Buildout
Volume Difference - PM Peak Hour



Change in Volume

Decrease

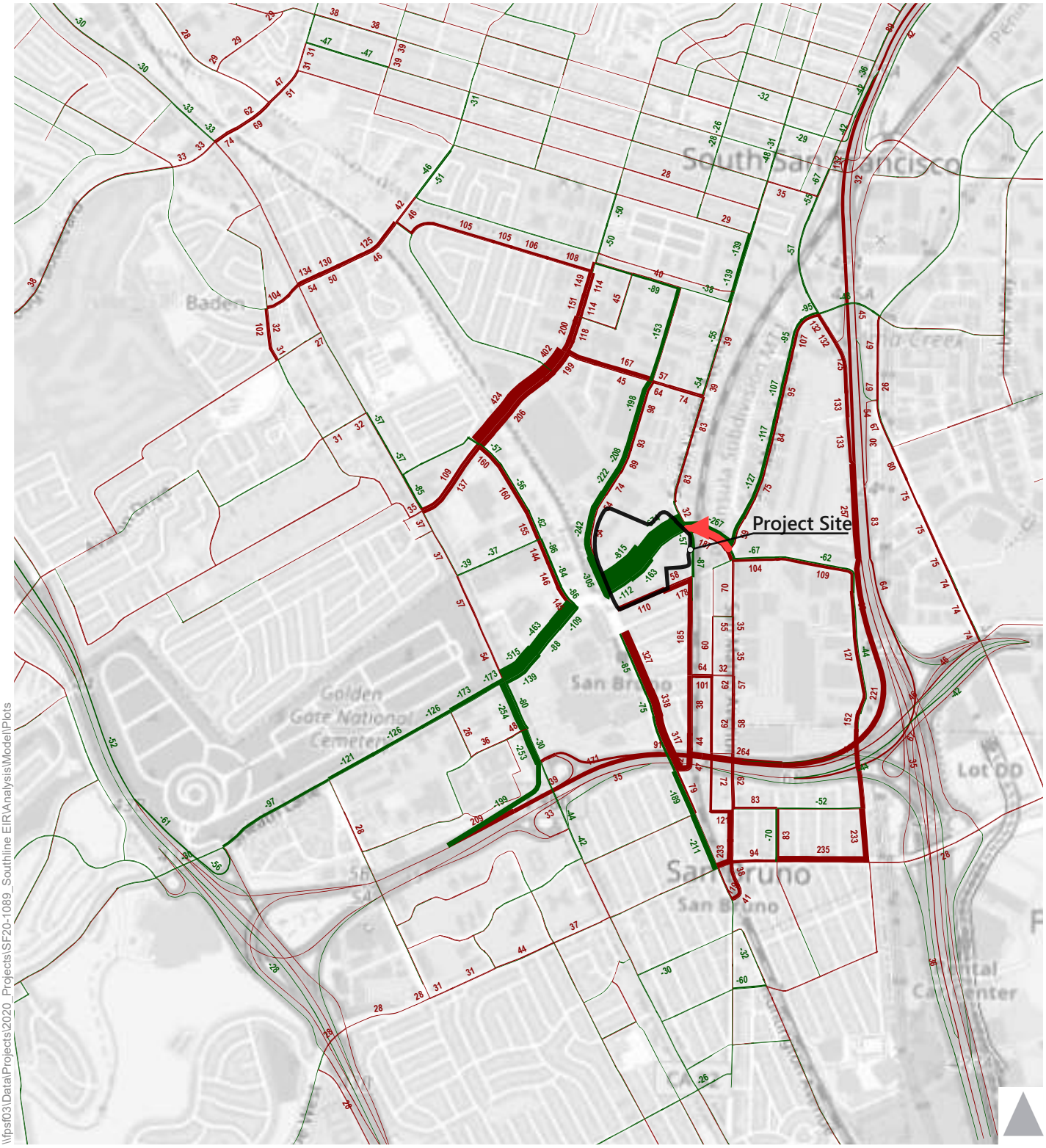
Increase

Volume - *veh/hr*

150 350 650

Figure 9

Southline - 2040 Full Buildout / Partial Circulation Scenario
Volume Difference - AM Peak Hour



Change in Volume

Decrease

Increase

Volume - *veh/hr*

200 400 800

Figure 10

Southline - 2040 Full Buildout / Partial Circulation Scenario
Volume Difference - PM Peak Hour

Level of Service Methodology

LOS for the study intersections were analyzed using the Highway Capacity Manual (HCM) 6th Edition and HCM 2000 methodologies. While HCM methodology and Synchro traffic analysis software represents the state of the practice in evaluating isolated intersection operations, this methodology presents some limitations for both signalized and unsignalized intersections within a congested network. As congestion increases, use of deterministic traffic modeling tools such as Synchro may not fully reflect the extent of vehicular queuing and spillover effects between intersections.

To better evaluate the congested and multimodal traffic conditions characterized by high vehicular and pedestrian demand, dedicated pedestrian and bicycle facilities, transit stops and the adjacent Caltrain rail crossing, Vissim, a microsimulation software was selected as the analysis tool for the roadway network and study intersections adjacent to the Project site and the San Bruno BART station. Vissim analyzes traffic by simulating and capturing the interactions between individual cars, trucks, buses, pedestrians and bicycles. In addition to vehicular LOS, Vissim can evaluate vehicle queuing, transit and emergency vehicle delays, pedestrian and bicycle delays, and pedestrian density – topics that are covered in the Project's Transportation Impact Analysis EIR section.

Signalized Intersections

The method from Chapter 19 of the HCM 6th Edition bases signalized intersection operations on the average control delay experienced by motorists traveling through it. Control delay incorporates delay associated with deceleration, acceleration, stopping, and moving up in the queue. This method uses various intersection characteristics (such as traffic volumes, lane geometry, and signal phasing) to estimate the average control delay**. Table 5** summarizes the relationship between average delay per vehicle and LOS for signalized intersections according to the HCM 6th Edition methodology.

For select intersections where the HCM 6th Edition methodology was not able to process results (typically due to non-standard signal phasing), the HCM 2000 methodology was used instead.

Unsignalized Intersections

Traffic conditions at the unsignalized study intersections (stop sign and yield sign-controlled intersections) were evaluated using the method from Chapters 20 and 21 of the HCM 6th Edition. With this method, operations are defined by the average control delay per vehicle (measured in seconds) for each stop-controlled approach that must yield the right-of-way. At four-way stop-controlled intersections, the control delay is calculated for the entire intersection and for each approach. The delays and corresponding LOS for the entire intersection are reported. At two-way stop-controlled intersections the movement with the highest delay and corresponding LOS is reported. **Table 6** summarizes the relationship between delay and LOS for unsignalized intersections.

Table 5: Signalized Intersection LOS Criteria

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle length.	≤ 10
B	Operations with low delay occurring with good progression and/or short cycle lengths.	> 10 and ≤ 20
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	> 20 and ≤ 35
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	> 35 and ≤ 55
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55 and ≤ 80
F	Operation with delays unacceptable to most drivers occurring due to over saturation poor progression, or very long cycle lengths.	> 80

Source: Transportation Research Board, 2016. Highway Capacity Manual 6th Edition

Table 6: Unsignalized Intersection LOS Criteria

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Little or no traffic delays.	≤ 10
B	Short traffic delays.	> 10 and ≤ 15
C	Average traffic delays.	> 15 and ≤ 25
D	Long traffic delays.	> 25 and ≤ 35
E	Very long traffic delays.	> 35 and ≤ 50
F	Extreme traffic delays with intersection capacity exceeded.	> 50

Source: Transportation Research Board, 2016. Highway Capacity Manual 6th Edition

LOS Results

Table 7, Figure 11, and **Figure 12** show LOS results in relation to LOS Standards in the City of San Bruno (see **Figure 1** for LOS D intersections). As a transit-oriented development adjacent to the San Bruno BART station, the Project is exempt from the City of South San Francisco's LOS standards as noted above in the policy review section. Overall, the LOS results mirror the trends described in previous sections: Project-related trips travel across several routes connecting to US-101, I-380, I-280, and surface streets, and as such, few intersections within the study area experience a large enough change in traffic volumes to see highly congested conditions specifically due to Project trips. Overall, the analysis yielded the following findings:

- Under Existing conditions, two intersections (both within San Bruno) experience LOS E or F conditions under existing conditions, two of which do not meet LOS standards under the City of San Bruno's LOS D policy.
- Under 2024 No Project conditions, four intersections experience LOS E or F conditions (one in South San Francisco, three in San Bruno), and two of these intersections do not meet LOS standards. under the City of San Bruno's LOS D policy
- Under 2024 plus Phase 1 conditions, three of the same intersections experience LOS E or F conditions and two of these intersections do not meet LOS standards under the City of San Bruno's LOS D policy, while one intersection improves due to shifts in traffic patterns.
- Under 2040 No Project conditions, eight intersections (five within South San Francisco and three within San Bruno) experience LOS E or F conditions, two of which do not meet LOS standards under the City of San Bruno's LOS D policy.
- Under 2040 Project Buildout conditions, 11 intersections (six within South San Francisco and five without San Bruno) experience LOS E or F conditions, and four intersections do not meet LOS standards under the City of San Bruno's LOS D policy.

While LOS results typically worsen over time and between no project and plus project conditions, this is not always the case as traffic patterns may change and congestion may improve over time due to a range of factors including implementation of transportation and circulation improvements that allow for improved circulation. With respect to this analysis, in some locations, LOS improves between 2024 and 2040 due to signal optimization. In others, LOS improves due to shifts in traffic patterns associated with the Project's Southline Avenue extension and new intersection.

Under the Partial Circulation Scenario, Project-generated traffic would shift from a relatively balanced distribution between north, south, east, and west to a heavier concentration of trips traveling north and south on smaller residential and industrial streets such as Herman Street/Dollar Avenue, San Mateo Avenue, South Maple Avenue, and Victory Avenue. Additionally, cut-through traffic on Southline Avenue would not occur. As a result, while LOS would be comparatively

improved intersections such as El Camino Real/Sneath Lane (#12) and Sneath Lane/Huntington Avenue (#30), while LOS would deteriorate at intersections such as Herman Avenue/Scott Street (#11), San Bruno Avenue/San Mateo Avenue (#19), and Huntington Avenue/Herman Avenue (#21). Under these conditions, eight intersections experience LOS E or F conditions, and three intersections do not meet LOS standards (within the City of San Bruno). Although queueing effects were not simulated along smaller residential and industrial streets around the Project site, it is anticipated that residents and businesses would see more congested local street segments under the Partial Circulation Scenario that could cause additional delay and difficulty accessing driveways (particularly along Herman Street, San Mateo Avenue, and South Maple Avenue).

A sensitivity test was performed to understand the effects of closing the Scott Street at-grade rail crossing (adjacent to intersections 11 and 16). This closure was found to shift traffic to the South Linden Avenue and San Bruno Avenue grade crossings, but would have minimal overall effect on intersection LOS (in part due to the shifts in traffic patterns that would already occur by adding the Southline Avenue extension).

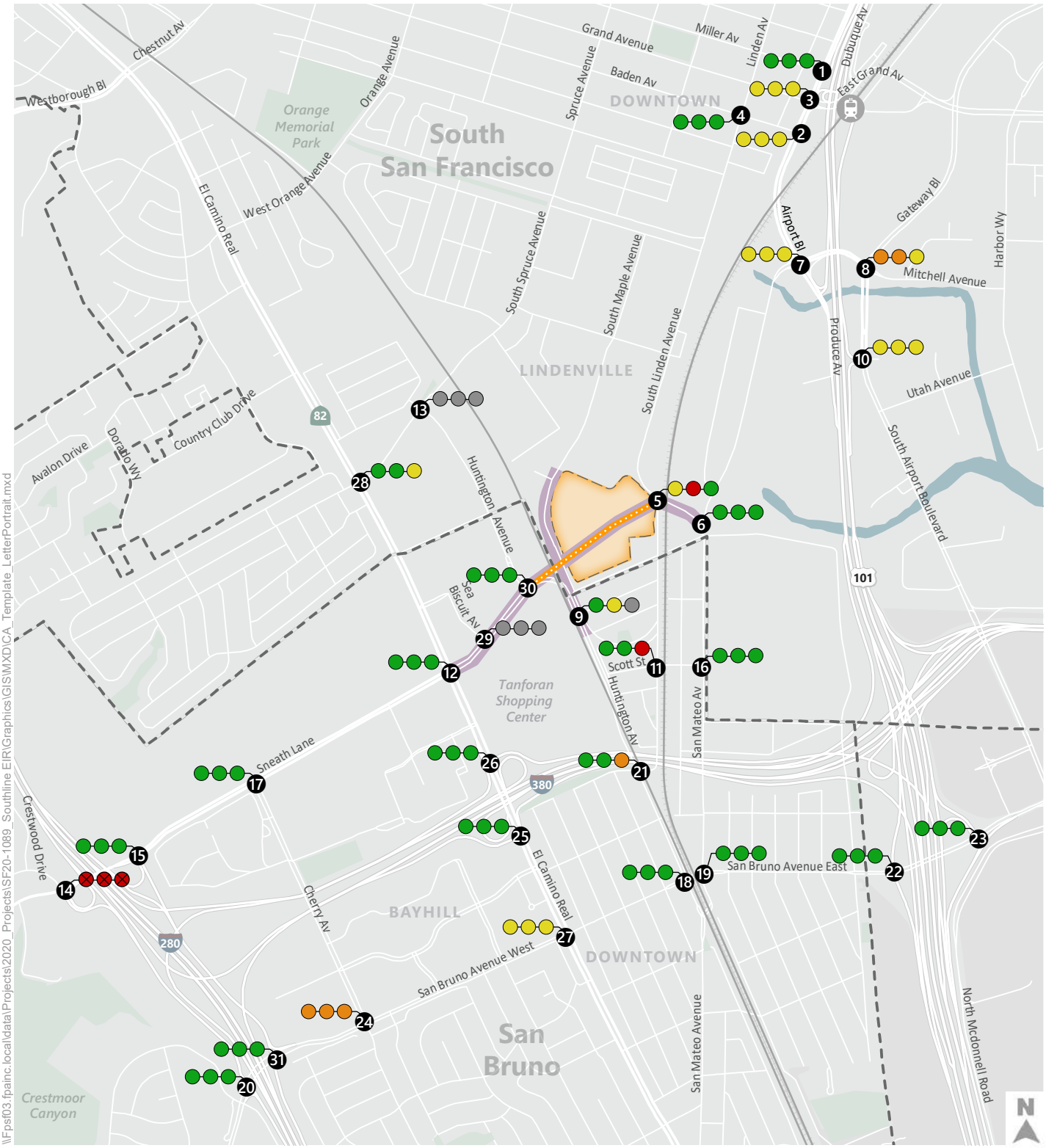


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Figure 11

Study Intersection Level of Service (AM)

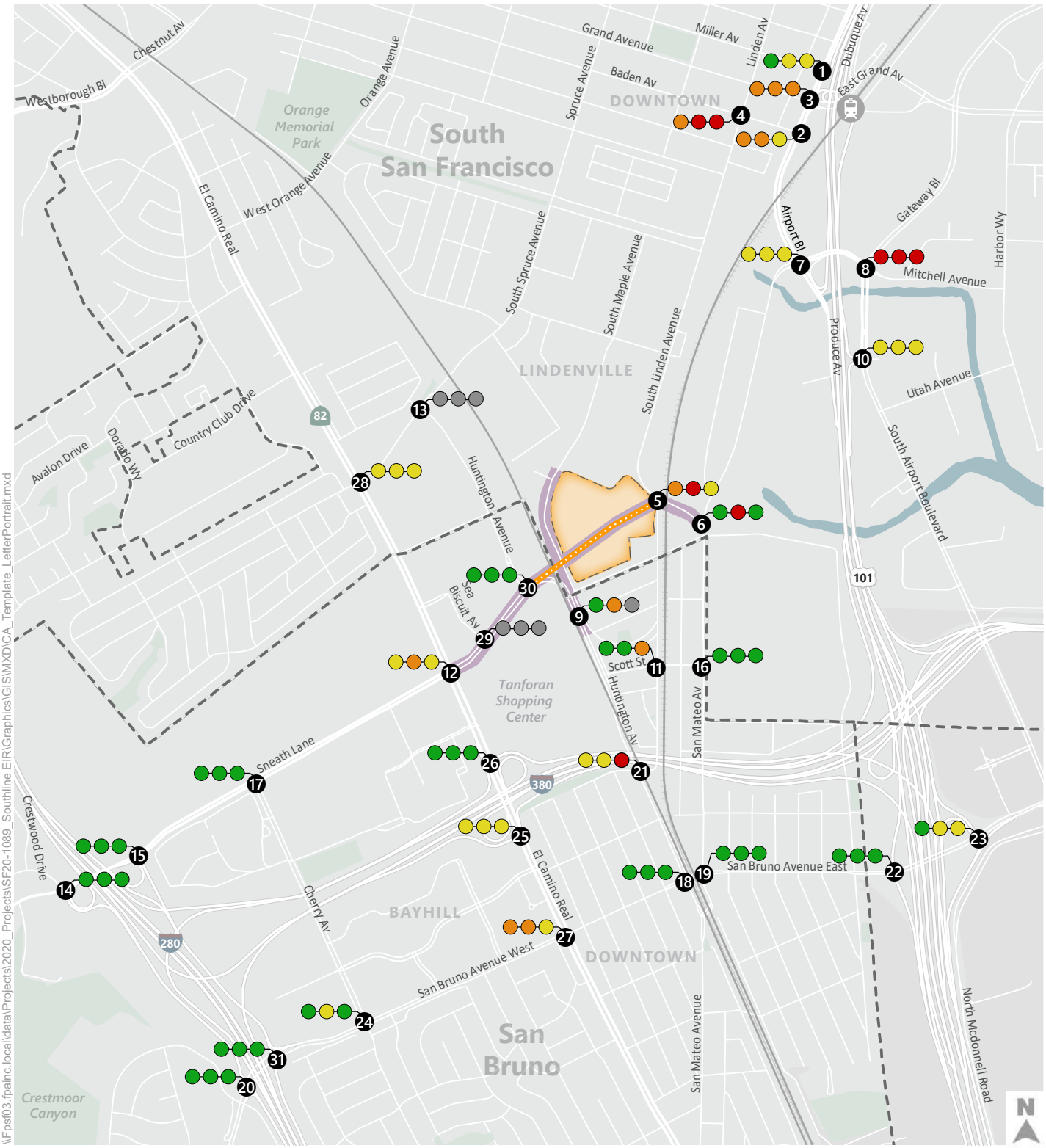

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Figure 12

Study Intersection Level of Service (PM)

LOS Results Notes (Table 7)

As shown on **Table 7: LOS Results (bold text)** indicates LOS E or F. Highlighting indicates that the intersection does not meet City LOS standards (no standards applicable in South San Francisco, noted SSF; LOS D standard for select intersections in San Bruno, noted as SB). Delay is reported as a weighted average of seconds per vehicle for all movements. As explained in Level of Service Methodology, LOS is based on the methodology in the Highway Capacity Manual 6th Edition. Intersections 5, 6, 9, 12, and 30 were analyzed using Vissim to provide a more detailed simulation of traffic congestions at closely-spaced Project intersections. Intersections 1, 3, 4, 10, 11, 19, 22, 23, 26, and 27 were analyzed based on HCM 2000 in Synchro due to signal timing conditions incompatible with Highway Capacity Manual 6th Edition analysis. All others were analyzed using the Highway Capacity Manual 6th Edition in Synchro. Calculations based on signal timing were provided by the City of South San Francisco, the City of San Bruno, and Caltrans from 2017-2020.

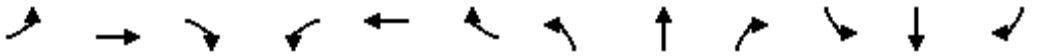
Table 7: LOS Results

	Intersection	City	Peak Hour	2017/2018		2024 No Project		2024 + Phase 1		2040 No Project		2040 + Full Buildout		2040 +Full Buildout Partial Circulation	
				Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS
1	Airport Boulevard / Miller Avenue[1]	SSF	AM	27.2	C	27.5	C	27.9	C	28.7	C	30.3	C	31.4	C
			PM	20.7	C	22	C	23.1	C	32.4	C	37.6	D	36.5	D
2	Airport Boulevard / Baden Avenue	SSF	AM	42.2	D	42.3	D	41.5	D	37.6	D	37.3	D	37.1	D
			PM	30.4	C	30.1	C	29.6	C	**56.8**	**E**	**64.3**	**E**	47.1	D
3	Airport Boulevard / Grand Avenue[1]	SSF	AM	35.9	D	36.9	D	36.9	D	39.6	D	42.4	D	44.8	D
			PM	45.2	D	47.3	D	47.8	D	**65.1**	**E**	**74.3**	**E**	**68.9**	**E**
4	Linden Avenue / Baden Avenue[1]	SSF	AM	23.7	C	23.7	C	25.4	C	24.6	C	29	C	29.6	C
			PM	35.4	D	36.2	D	43.5	D	**60.1**	**E**	**>80**	**F**	**>80**	**F**
5	Linden Avenue / Dollar Avenue[2]	SSF	AM	27.3	C	28.9	C	24.8	C	47.0	D	**67.0**	**E**	30.0	C
			PM	26.6	C	41.2	D	31.5	C	**66.7**	**E**	**69.4**	**E**	37.9	D
6	Linden Avenue / San Mateo Avenue[2]	SSF	AM	6.4	A	5.6	A	11.5	B	6.8	A	8.8	A	19.1	B
			PM	7.5	A	8.8	A	17.3	B	10.2	B	**>80**	**F**	18.4	B
7	Airport Boulevard / San Mateo Avenue / Produce Avenue[1]	SSF	AM	34.6	C	37.3	D	39.4	D	38.6	D	41.7	D	41.8	D
			PM	42.8	D	43	D	43.7	D	41.6	D	45.2	D	47.1	D
8	Airport Boulevard / Gateway Boulevard / Mitchell Avenue	SSF	AM	42.1	D	45.9	D	47.4	D	**55.9**	**E**	**62.6**	**E**	53.6	D
			PM	53.9	D	**67.0**	**E**	**70.0**	**E**	**>80**	**F**	**>80**	**F**	**>80**	**F**
9	Huntington Avenue / San Bruno BART Station[2]	SB	AM	10.0	A	10.8	B	10.8	A	8.4	B	22.6	C	12.0	B
			PM	9.2	A	9.7	A	11.4	A	8.7	A	15.2	C	13.0	B
10	Airport Boulevard / Wondercolor Lane / NB 101 On/Off Ramps[1]	SSF	AM	30.3	C	33.5	C	33.9	C	41.4	D	40.1	D	54.6	D
			PM	27.3	C	29.0	C	29.6	C	46.9	D	48.8	D	54.7	D
11	Herman Street / Scott Street	SB	AM	8.2	A	7.6	A	8.4	A	10.7	A	10.1	B	**>80**	**F**
			PM	6.8	A	7.4	A	7.4	A	10.5	B	9.9	A	**35.2**	**E**
12	El Camino Real / Sneath Lane[2]	SB	AM	29.5	C	30.8	C	32.0	C	33.1	C	42.4	D	33.6	C
			PM	42.5	D	44.4	D	48.8	D	48.3	D	**77.0**	**E**	51.4	D
13	Spruce Avenue / Huntington Avenue	SB	AM	Not analyzed – no data available due to COVID-19											
			PM												
14	Sneath Lane / 280 SB On/Off Ramp	SB	AM	**78.6**	**E**	**>80**	**F**	**>80**	**F**	**>80**	**F**	**>80**	**F**	**>80**	**F**
			PM	17.4	B	18.5	B	19.7	B	25.3	C	29.7	C	29.5	C
15	Sneath Lane / 280 NB On/Off Ramp	SB	AM	16.0	B	16.8	B	18.0	B	20.6	C	30.1	C	28.8	C
			PM	19.0	B	21	C	22.2	C	27.3	C	31.2	C	31.7	C

	Intersection	City	Peak Hour	2017/2018		2024 No Project		2024 + Project		2040 No Project		2040 + Full Buildout		2040 +Full Buildout Partial Circulation	
				Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS
16	San Mateo Avenue / Scott Street	SB	AM	6.0	A	6.2	A	5.7	A	7.1	A	7.4	A	10.2	B
			PM	6.3	A	6.6	A	5.8	A	7.5	A	7.1	A	11.9	B
17	Sneath Lane / Cherry Avenue	SB	AM	7.1	A	7.3	A	7.6	A	8.9	A	10.5	B	10.2	B
			PM	10.3	B	10.6	B	10.6	B	12.7	B	13.4	B	13.5	B
18	San Bruno Avenue / Huntington Avenue[1]	SB	AM	15.0	B	13.8	B	15.0	B	17.3	B	20.1	C	23.1	C
			PM	16.6	B	17.5	B	16.4	B	22.1	C	18.7	B	24.9	C
19	San Bruno Avenue / San Mateo Avenue[1]	SB	AM	16.5	B	15.5	B	17.5	B	18.1	B	20.1	C	29.5	C
			PM	19.8	B	20.5	C	20.2	C	25.6	C	25.8	C	28.1	C
20	San Bruno Avenue / 280 SB Off Ramp	SB	AM	21.3	C	21.4	C	21.5	C	21.8	C	22.3	C	22.1	B
			PM	12.5	B	12.6	B	12.8	B	15.6	B	15.9	B	15.4	B
21	Huntington Avenue / Herman Street	SB	AM	11.9	B	12.3	B	11.8	B	13.8	B	18.2	C	**43.0**	**E**
			PM	19.5	C	22.2	C	18.9	C	32.1	D	32.6	D	**73.0**	**F**
22	San Bruno Avenue / 101 SB On/Off Ramps[1]	SB	AM	20.5	C	20.5	C	20.9	C	21.3	C	23.0	C	23.4	C
			PM	19.9	B	20.2	C	21.0	C	22	C	26.5	C	27.3	C
23	San Bruno Avenue / 101 NB On/Off Ramps[1]	SB	AM	20.5	C	21.0	C	22.6	C	27.8	C	34.4	C	34.6	C
			PM	27.0	C	27.9	C	28.9	C	34.5	C	37.3	D	38.1	D
24	San Bruno Avenue / Cherry Avenue	SB	AM	37.3	D	40.3	D	40.7	D	**67.8**	**E**	**74.9**	**E**	**78.8**	**E**
			PM	53.1	D	**60.9**	**E**	**66.1**	**E**	37.9	D	40.8	D	38.1	D
25	El Camino Real / 380 EB On/Off Ramp[1]	SB	AM	21.0	C	18.0	B	18.5	B	22.6	C	21.3	C	20.7	C
			PM	32.8	C	33.2	C	32.0	C	39.3	D	38.1	D	41.1	D
26	El Camino Real / 380 WB On/Off Ramp[1]	SB	AM	14.3	B	15.5	B	17.5	B	9.9	A	34.4	C	26.8	C
			PM	21.7	C	23.9	C	24.4	C	15.6	B	25.2	C	27.0	C
27	El Camino Real / San Bruno Avenue	SB	AM	40.5	D	38.1	D	39.2	D	42.7	D	52.9	D	45.0	D
			PM	**60.2**	**E**	**64.2**	**E**	52.8	D	**56.3**	**E**	**63.6**	**E**	53.3	D
28	El Camino Real / Spruce Avenue / Hazelwood Drive	SB	AM	28.2	C	29.1	C	28.2	C	30.9	C	32.6	C	37.7	D
			PM	35.1	D	36.6	D	35.6	D	44.2	D	46.8	D	52.3	D
29	Sneath Lane / Sea Biscuit Avenue	SB	AM	Not analyzed – no data available due to COVID-19											
			PM												
30	Sneath Lane / Huntington Avenue[2]	SB	AM	13.1	B	13.1	B	17.4	B	13.6	B	18.2	B	20.6	C
			PM	25.3	C	25.3	C	33.8	C	26.9	C	**56.9**	**E**	27.0	C
31	San Bruno Avenue / 280 NB Off Ramp	SB	AM	21.0	C	21.1	C	20.3	C	24.6	C	23.7	C	25.6	C
			PM	24.5	C	25.5	C	25.6	C	26.1	C	25.5	C	26.5	C

Notes: [1]HCM 2000 Methodology [2]Analyzed with Vissim instead of Synchro

Existing AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	52	449	154	3	29	126	0	0	362	32
Future Volume (vph)	0	0	52	449	154	3	29	126	0	0	362	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.6	4.0	4.0			4.6			4.6	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.99	
Flt Protected			1.00	0.95	0.98			0.99			1.00	
Satd. Flow (prot)			1580	1649	1692			3439			3417	
Flt Permitted			1.00	0.95	0.98			0.99			1.00	
Satd. Flow (perm)			1580	1649	1692			3439			3417	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	0	59	510	175	3	33	143	0	0	411	36
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	0	59	342	346	0	0	176	0	0	441	0
Confl. Peds. (#/hr)							6					6
Confl. Bikes (#/hr)									4			4
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	2%	4%	4%	4%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			11.4	52.4	52.4			11.4			23.0	
Effective Green, g (s)			11.4	52.4	52.4			11.4			23.0	
Actuated g/C Ratio			0.11	0.52	0.52			0.11			0.23	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			180	864	886			392			785	
v/s Ratio Prot			0.04					c0.05			c0.13	
v/s Ratio Perm				c0.21	0.20							
v/c Ratio			0.33	0.40	0.39			0.45			0.56	
Uniform Delay, d1			40.8	14.3	14.2			41.4			34.0	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			1.5	1.4	1.3			1.1			2.9	
Delay (s)			42.2	15.7	15.5			42.5			36.9	
Level of Service			D	B	B			D			D	
Approach Delay (s)		42.2			15.6			42.5			36.9	
Approach LOS		D			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	27.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/24/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	526	282	25	125	141	3	374	207
Future Volume (veh/h)	526	282	25	125	141	3	374	207
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.96
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1590	1710		1590	1590		1590	1590
Adj Flow Rate, veh/h	380	392		130	147		390	29
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	9	0		9	9		9	9
Cap, veh/h	444	425		1209	1874		492	212
Arrive On Green	0.29	0.29		0.41	0.62		0.16	0.16
Sat Flow, veh/h	1514	1449		2938	3100		3100	1299
Grp Volume(v), veh/h	380	392		130	147		390	29
Grp Sat Flow(s),veh/h/ln	1514	1449		1469	1510		1510	1299
Q Serve(g_s), s	23.7	26.2		2.7	1.9		12.4	1.9
Cycle Q Clear(g_c), s	23.7	26.2		2.7	1.9		12.4	1.9
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	444	425		1209	1874		492	212
V/C Ratio(X)	0.85	0.92		0.11	0.08		0.79	0.14
Avail Cap(c_a), veh/h	500	478		1209	1874		1190	512
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.93	0.93		0.63	0.63		0.79	0.79
Uniform Delay (d), s/veh	33.3	34.2		18.1	7.6		40.2	35.8
Incr Delay (d2), s/veh	10.7	19.8		0.0	0.1		9.9	1.1
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	9.9	11.4		0.9	0.6		5.2	0.7
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	44.0	54.0		18.1	7.6		50.2	36.9
LnGrp LOS	D	D		B	A		D	D
Approach Vol, veh/h	772				277		419	
Approach Delay, s/veh	49.1				12.6		49.2	
Approach LOS	D				B		D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	45.7	20.9				66.6		33.4
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	13.0	* 39				48.4		33.0
Max Q Clear Time (g_c+I1), s	4.7	14.4				3.9		28.2
Green Ext Time (p_c), s	0.2	1.6				0.6		1.2

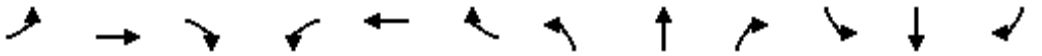
Intersection Summary	
HCM 6th Ctrl Delay	42.2
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

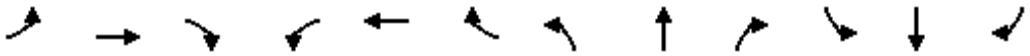
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	186	205	82	192	110	59	33	333	282	383	391	124
Future Volume (vph)	186	205	82	192	110	59	33	333	282	383	391	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.99		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (prot)		3000		2814	1527	1298	1464	2927	1309	1421	2956	1285
Flt Permitted		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (perm)		3000		2814	1527	1298	1464	2927	1309	1421	2956	1285
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	196	216	86	202	116	62	35	351	297	403	412	131
RTOR Reduction (vph)	0	18	0	0	0	56	0	0	0	0	0	86
Lane Group Flow (vph)	0	480	0	202	116	6	35	351	297	266	549	45
Confl. Peds. (#/hr)			58									20
Heavy Vehicles (%)	2%	2%	2%	12%	12%	12%	11%	11%	11%	4%	4%	4%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		22.6		11.0	11.0	11.0	16.4	16.4	73.5	36.3	36.3	36.3
Effective Green, g (s)		22.6		11.0	11.0	11.0	16.4	16.4	73.5	36.3	36.3	36.3
Actuated g/C Ratio		0.22		0.10	0.10	0.10	0.16	0.16	0.70	0.35	0.35	0.35
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		645		294	159	135	228	457	916	491	1021	444
v/s Ratio Prot		c0.16		0.07	c0.08		0.02	c0.12	0.23	c0.19	0.19	
v/s Ratio Perm						0.01						0.04
v/c Ratio		0.74		0.69	0.73	0.05	0.15	0.77	0.32	0.54	0.54	0.10
Uniform Delay, d1		38.5		45.3	45.6	42.3	38.3	42.5	6.1	27.7	27.6	23.3
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		4.1		6.5	15.4	0.1	0.2	7.3	0.2	4.2	2.0	0.5
Delay (s)		42.6		51.9	61.0	42.4	38.5	49.7	6.3	31.9	29.6	23.8
Level of Service		D		D	E	D	D	D	A	C	C	C
Approach Delay (s)		42.6			53.1			30.3			29.5	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	35.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

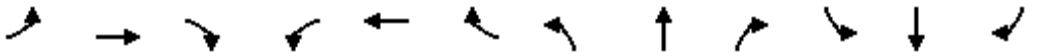
! Phase conflict between lane groups.
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	347	39	233	75	11	9	118	428	40	229	28
Future Volume (vph)	27	347	39	233	75	11	9	118	428	40	229	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		3.5	3.5			3.0	3.0		3.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.99	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2765		1413	1451			1482	2224		1451	
Flt Permitted		1.00		0.95	1.00			0.98	1.00		0.95	
Satd. Flow (perm)		2765		1413	1451			1450	2224		1386	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	29	373	42	251	81	12	10	127	460	43	246	30
RTOR Reduction (vph)	0	10	0	0	8	0	0	0	170	0	5	0
Lane Group Flow (vph)	0	434	0	251	85	0	0	137	290	0	314	0
Confl. Peds. (#/hr)			13			9			9			19
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		26.7		16.6	16.6			19.7	39.8		19.7	
Effective Green, g (s)		26.7		16.6	16.6			19.7	36.3		19.7	
Actuated g/C Ratio		0.37		0.23	0.23			0.27	0.50		0.27	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		1011		321	329			391	1105		374	
v/s Ratio Prot		c0.16		c0.18	0.06				0.13			
v/s Ratio Perm								0.09			c0.23	
v/c Ratio		0.43		0.78	0.26			0.35	0.26		0.84	
Uniform Delay, d1		17.4		26.5	23.2			21.5	10.6		25.2	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.3		10.9	0.2			0.2	0.0		14.5	
Delay (s)		18.8		37.4	23.3			21.7	10.7		39.7	
Level of Service		B		D	C			C	B		D	
Approach Delay (s)		18.8			33.6			13.2			39.7	
Approach LOS		B			C			B			D	

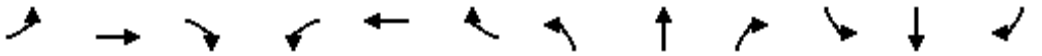
Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	122	182	147	307	167	168	160	39	404	202	644	98
Future Volume (vph)	122	182	147	307	167	168	160	39	404	202	644	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.6	4.6	4.6	4.6	4.6	4.0	4.9		4.0	4.9	4.9
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96	1.00	0.98		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.86		1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1254	2625	1201	1380	2839	1309	1687	2867		1703	3406	1490
Flt Permitted	0.95	0.99	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1254	2625	1201	1380	2839	1309	1687	2867		1703	3406	1490
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	128	192	155	323	176	177	168	41	425	213	678	103
RTOR Reduction (vph)	0	0	134	0	0	147	0	386	0	0	0	64
Lane Group Flow (vph)	104	216	21	165	334	30	168	80	0	213	678	39
Confl. Peds. (#/hr)			3			15			3			1
Confl. Bikes (#/hr)			6			1						
Heavy Vehicles (%)	31%	31%	31%	19%	19%	19%	7%	7%	7%	6%	6%	6%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4		8	8		1	6		5	2	
Permitted Phases			4			8						2
Actuated Green, G (s)	14.4	14.4	14.4	18.0	18.0	18.0	14.7	9.6		44.9	39.8	39.8
Effective Green, g (s)	14.4	14.4	14.4	18.0	18.0	18.0	14.7	9.6		44.9	39.8	39.8
Actuated g/C Ratio	0.14	0.14	0.14	0.17	0.17	0.17	0.14	0.09		0.43	0.38	0.38
Clearance Time (s)	4.6	4.6	4.6	4.6	4.6	4.6	4.0	4.9		4.0	4.9	4.9
Vehicle Extension (s)	2.0	2.0	2.0	3.0	3.0	3.0	2.0	2.0		2.0	3.5	3.5
Lane Grp Cap (vph)	171	360	164	236	486	224	236	262		728	1291	564
v/s Ratio Prot	c0.08	0.08		c0.12	0.12		c0.10	0.03		0.13	c0.20	
v/s Ratio Perm			0.02			0.02						0.03
v/c Ratio	0.61	0.60	0.13	0.70	0.69	0.14	0.71	0.30		0.29	0.53	0.07
Uniform Delay, d1	42.6	42.6	39.8	41.0	40.9	36.9	43.1	44.6		19.7	25.3	20.8
Progression Factor	1.00	1.00	1.00	0.73	0.74	0.54	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.2	1.8	0.1	8.3	3.8	0.3	8.2	0.2		1.0	1.5	0.2
Delay (s)	46.8	44.4	39.9	38.2	33.9	20.0	51.3	44.8		20.7	26.8	21.0
Level of Service	D	D	D	D	C	C	D	D		C	C	C
Approach Delay (s)		43.5			31.3			46.5			24.9	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	34.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	18.1
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	96	314	368	29	159	18	330	456	349	22	116	187
Future Volume (veh/h)	96	314	368	29	159	18	330	456	349	22	116	187
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		1.00	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1722	1722	1722	1574	1574	1574	1811	1811	1811	1663	1663	1663
Adj Flow Rate, veh/h	103	338	116	31	171	15	355	490	0	24	125	13
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	12	12	12	22	22	22	6	6	6	16	16	16
Cap, veh/h	224	406	337	85	213	19	1445	1486		164	172	139
Arrive On Green	0.12	0.22	0.22	0.06	0.15	0.15	0.45	0.45	0.00	0.10	0.10	0.10
Sat Flow, veh/h	1640	1722	1430	1499	1422	125	3346	3532	0	1584	1663	1338
Grp Volume(v), veh/h	103	338	116	31	0	186	355	490	0	24	125	13
Grp Sat Flow(s),veh/h/ln	1640	1722	1430	1499	0	1546	1673	1721	0	1584	1663	1338
Q Serve(g_s), s	6.2	20.0	7.2	2.1	0.0	12.2	6.9	9.6	0.0	1.4	7.7	0.9
Cycle Q Clear(g_c), s	6.2	20.0	7.2	2.1	0.0	12.2	6.9	9.6	0.0	1.4	7.7	0.9
Prop In Lane	1.00		1.00	1.00		0.08	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	224	406	337	85	0	232	1445	1486		164	172	139
V/C Ratio(X)	0.46	0.83	0.34	0.36	0.00	0.80	0.25	0.33		0.15	0.73	0.09
Avail Cap(c_a), veh/h	196	426	354	144	0	364	1502	1545		353	371	298
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.91	0.91	0.91	1.00	0.00	1.00	0.75	0.75	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.8	39.7	33.4	47.7	0.0	43.1	19.0	19.8	0.0	42.8	45.6	42.6
Incr Delay (d2), s/veh	0.8	11.4	0.4	1.0	0.0	3.1	0.3	0.4	0.0	0.2	2.2	0.1
Initial Q Delay(d3),s/veh	0.0	44.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	16.1	2.5	0.8	0.0	4.8	2.7	3.9	0.0	0.6	3.3	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.6	95.4	33.8	48.7	0.0	46.2	19.3	20.2	0.0	43.0	47.8	42.7
LnGrp LOS	D	F	C	D	A	D	B	C		D	D	D
Approach Vol, veh/h		557			217			845	A		162	
Approach Delay, s/veh		72.8			46.6			19.8			46.7	
Approach LOS		E			D			B			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	27.5		51.7	17.1	20.3		15.8				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.6	* 4.6		4.9				
Max Green Setting (Gmax), s	10.1	26.0		27.4	11.4	* 25		23.4				
Max Q Clear Time (g_c+I1), s	4.1	22.0		11.6	8.2	14.2		9.7				
Green Ext Time (p_c), s	0.0	0.8		2.8	0.0	0.4		0.4				

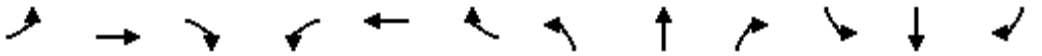
Intersection Summary		
HCM 6th Ctrl Delay	42.1	
HCM 6th LOS	D	

Notes

User approved volume balancing among the lanes for turning movement.

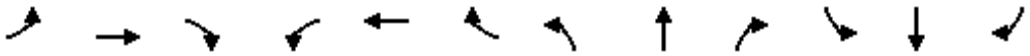
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	829	18	670	11	9	14	199	221	16	24	427	118
Future Volume (vph)	829	18	670	11	9	14	199	221	16	24	427	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	0.95	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1633	1641	2707		1695	1482	1656	3278		1626	3252	1455
Flt Permitted	0.95	0.95	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1633	1641	2707		1695	1482	1656	3278		1626	3252	1455
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	873	19	705	12	9	15	209	233	17	25	449	124
RTOR Reduction (vph)	0	0	497	0	0	14	0	4	0	0	0	94
Lane Group Flow (vph)	445	447	208	0	21	1	209	246	0	25	449	30
Heavy Vehicles (%)	5%	5%	5%	9%	9%	9%	9%	9%	9%	11%	11%	11%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	20.8	20.8	20.8		3.7	3.7	14.0	28.6		2.7	17.3	17.3
Effective Green, g (s)	20.8	20.8	20.8		3.7	3.7	14.0	28.6		2.7	17.3	17.3
Actuated g/C Ratio	0.29	0.29	0.29		0.05	0.05	0.20	0.41		0.04	0.25	0.25
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	481	483	797		88	77	328	1327		62	796	356
v/s Ratio Prot	c0.27	0.27			c0.01		c0.13	0.07		0.02	c0.14	
v/s Ratio Perm			0.08			0.00						0.02
v/c Ratio	0.93	0.93	0.26		0.24	0.01	0.64	0.19		0.40	0.56	0.09
Uniform Delay, d1	24.1	24.1	19.0		32.1	31.7	26.0	13.5		33.2	23.3	20.5
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	23.7	23.7	0.2		1.4	0.1	4.0	0.1		4.2	0.9	0.1
Delay (s)	47.8	47.8	19.2		33.5	31.8	30.0	13.6		37.4	24.3	20.7
Level of Service	D	D	B		C	C	C	B		D	C	C
Approach Delay (s)		35.2			32.8			21.1			24.1	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	30.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	70.6	Sum of lost time (s)	14.8
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	710	280	47	267	190	26	14	161	350	300	20
Future Volume (veh/h)	50	710	280	47	267	190	26	14	161	350	300	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	55	780	298	52	293	80	29	15	0	385	330	21
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	88	639	244	86	926	782	53	27		437	427	27
Arrive On Green	0.05	0.50	0.50	0.05	0.50	0.50	0.04	0.04	0.00	0.25	0.25	0.25
Sat Flow, veh/h	1781	1288	492	1781	1870	1580	1193	617	1585	1781	1740	111
Grp Volume(v), veh/h	55	0	1078	52	293	80	44	0	0	385	0	351
Grp Sat Flow(s),veh/h/ln	1781	0	1780	1781	1870	1580	1811	0	1585	1781	0	1850
Q Serve(g_s), s	2.7	0.0	45.0	2.6	8.5	2.4	2.2	0.0	0.0	18.9	0.0	16.0
Cycle Q Clear(g_c), s	2.7	0.0	45.0	2.6	8.5	2.4	2.2	0.0	0.0	18.9	0.0	16.0
Prop In Lane	1.00		0.28	1.00		1.00	0.66		1.00	1.00		0.06
Lane Grp Cap(c), veh/h	88	0	884	86	926	782	80	0		437	0	454
V/C Ratio(X)	0.62	0.00	1.22	0.60	0.32	0.10	0.55	0.00		0.88	0.00	0.77
Avail Cap(c_a), veh/h	393	0	884	393	928	784	439	0		550	0	571
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.2	0.0	22.8	42.3	13.7	12.2	42.4	0.0	0.0	32.9	0.0	31.8
Incr Delay (d2), s/veh	2.7	0.0	109.3	2.5	0.3	0.1	2.2	0.0	0.0	11.2	0.0	3.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	44.0	1.2	3.3	0.8	1.0	0.0	0.0	9.4	0.0	7.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.9	0.0	132.1	44.8	14.0	12.3	44.6	0.0	0.0	44.1	0.0	35.6
LnGrp LOS	D	A	F	D	B	B	D	A		D	A	D
Approach Vol, veh/h		1133			425			44	A		736	
Approach Delay, s/veh		127.9			17.4			44.6			40.1	
Approach LOS		F			B			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	49.4		25.8	7.9	49.5		7.5				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	20.0	45.0		28.0	20.0	45.0		22.0				
Max Q Clear Time (g_c+I1), s	4.7	10.5		20.9	4.6	47.0		4.2				
Green Ext Time (p_c), s	0.0	3.0		1.4	0.0	0.0		0.1				

Intersection Summary			
HCM 6th Ctrl Delay		78.6	
HCM 6th LOS		E	

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (veh/h)	2	2	1031	187	103	367	1	134	4	233	0	2
Future Volume (veh/h)	2	2	1031	187	103	367	1	134	4	233	0	2
Initial Q (Qb), veh		0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00		0.98	1.00		0.99	1.00		1.00	1.00	
Parking Bus, Adj		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach			No			No			No			No
Adj Sat Flow, veh/h/ln		1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h		2	1133	165	113	403	1	153	0	11	0	2
Peak Hour Factor		0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %		2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h		3	1586	680	318	666	2	362	0	161	0	6
Arrive On Green		0.44	0.44	0.44	0.18	0.18	0.18	0.10	0.00	0.10	0.00	0.00
Sat Flow, veh/h		6	3641	1561	1781	3730	9	3563	0	1585	0	1870
Grp Volume(v), veh/h		609	526	165	113	202	202	153	0	11	0	2
Grp Sat Flow(s),veh/h/ln		1870	1777	1561	1781	1870	1869	1781	0	1585	0	1870
Q Serve(g_s), s		14.7	12.8	3.6	3.0	5.4	5.4	2.2	0.0	0.3	0.0	0.1
Cycle Q Clear(g_c), s		14.7	12.8	3.6	3.0	5.4	5.4	2.2	0.0	0.3	0.0	0.1
Prop In Lane		0.00		1.00	1.00		0.00	1.00		1.00	0.00	
Lane Grp Cap(c), veh/h		814	774	680	318	334	334	362	0	161	0	6
V/C Ratio(X)		0.75	0.68	0.24	0.36	0.61	0.61	0.42	0.00	0.07	0.00	0.33
Avail Cap(c_a), veh/h		1418	1347	1184	1186	1245	1244	1581	0	704	0	692
HCM Platoon Ratio		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh		12.8	12.2	9.6	19.5	20.5	20.5	22.8	0.0	22.0	0.0	26.9
Incr Delay (d2), s/veh		1.0	0.8	0.1	0.5	1.3	1.3	0.3	0.0	0.1	0.0	11.0
Initial Q Delay(d3),s/veh		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln		4.9	4.0	1.0	1.1	2.2	2.2	0.8	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh		13.8	13.0	9.8	20.0	21.8	21.8	23.1	0.0	22.0	0.0	37.8
LnGrp LOS		B	B	A	B	C	C	C	A	C	A	D
Approach Vol, veh/h			1300			517			164			2
Approach Delay, s/veh			13.0			21.4			23.0			37.8
Approach LOS			B			C			C			D

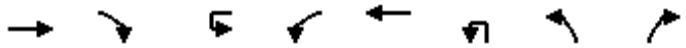
Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	13.8	9.0	27.6	3.7
Change Period (Y+Rc), s	4.1	3.5	4.1	3.5
Max Green Setting (Gmax), s	36.0	24.0	41.0	20.0
Max Q Clear Time (g_c+I1), s	7.4	4.2	16.7	2.1
Green Ext Time (p_c), s	2.0	0.3	6.6	0.0

Intersection Summary	
HCM 6th Ctrl Delay	16.0
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	1
Future Volume (veh/h)	1
Initial Q (Qb), veh	0
Ped-Bike Adj(A_pbT)	1.00
Parking Bus, Adj	1.00
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	1870
Adj Flow Rate, veh/h	0
Peak Hour Factor	0.91
Percent Heavy Veh, %	2
Cap, veh/h	0
Arrive On Green	0.00
Sat Flow, veh/h	0
Grp Volume(v), veh/h	0
Grp Sat Flow(s),veh/h/ln	0
Q Serve(g_s), s	0.0
Cycle Q Clear(g_c), s	0.0
Prop In Lane	0.00
Lane Grp Cap(c), veh/h	0
V/C Ratio(X)	0.00
Avail Cap(c_a), veh/h	0
HCM Platoon Ratio	1.00
Upstream Filter(I)	0.00
Uniform Delay (d), s/veh	0.0
Incr Delay (d2), s/veh	0.0
Initial Q Delay(d3),s/veh	0.0
%ile BackOfQ(50%),veh/ln	0.0
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	0.0
LnGrp LOS	A
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	
Timer - Assigned Phs	



Movement	EBT	EBR	WBU	WBL	WBT	NBU	NBL	NBR
Lane Configurations								
Traffic Volume (veh/h)	952	312	1	78	356	3	115	149
Future Volume (veh/h)	952	312	1	78	356	3	115	149
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)		0.98		1.00			1.00	1.00
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870		1870	1870
Adj Flow Rate, veh/h	992	220		81	371		120	15
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	2	2		2	2		2	2
Cap, veh/h	2061	898		118	2641		286	131
Arrive On Green	0.58	0.58		0.07	0.74		0.08	0.08
Sat Flow, veh/h	3647	1548		1781	3647		3456	1585
Grp Volume(v), veh/h	992	220		81	371		120	15
Grp Sat Flow(s),veh/h/ln	1777	1548		1781	1777		1728	1585
Q Serve(g_s), s	8.4	1.4		2.3	1.5		1.7	0.5
Cycle Q Clear(g_c), s	8.4	1.4		2.3	1.5		1.7	0.5
Prop In Lane		1.00		1.00			1.00	1.00
Lane Grp Cap(c), veh/h	2061	898		118	2641		286	131
V/C Ratio(X)	0.48	0.24		0.68	0.14		0.42	0.11
Avail Cap(c_a), veh/h	4191	1826		1205	6871		2472	1134
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	6.3	0.8		23.6	1.9		22.5	22.0
Incr Delay (d2), s/veh	0.2	0.2		2.6	0.0		1.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.7		0.9	0.1		0.7	0.2
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	6.6	1.0		26.2	1.9		23.5	22.3
LnGrp LOS	A	A		C	A		C	C
Approach Vol, veh/h	1212				452		135	
Approach Delay, s/veh	5.6				6.3		23.4	
Approach LOS	A				A		C	

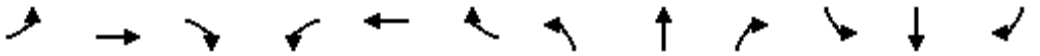
Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	8.4	35.0				43.4		8.3
Change Period (Y+Rc), s	5.0	* 5				5.0		4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0		37.0
Max Q Clear Time (g_c+I1), s	4.3	10.4				3.5		3.7
Green Ext Time (p_c), s	0.1	14.9				3.7		0.4

Intersection Summary	
HCM 6th Ctrl Delay	7.1
HCM 6th LOS	A

Notes

User approved ignoring U-Turning movement.

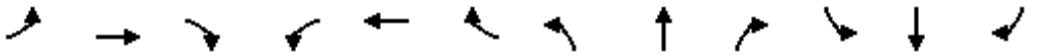
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	457	49	6	310	0	0	178	7	84	125	124
Future Volume (vph)	89	457	49	6	310	0	0	178	7	84	125	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7		3.7	2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.99		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1719	3155		1719	3209			1797		1719	3139	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1719	3155		1719	3209			1797		1719	3139	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	97	497	53	7	337	0	0	193	8	91	136	135
RTOR Reduction (vph)	0	5	0	0	0	0	0	2	0	0	86	0
Lane Group Flow (vph)	97	545	0	7	337	0	0	199	0	91	185	0
Confl. Peds. (#/hr)	18		13	13					9	9		17
Confl. Bikes (#/hr)			1						1			2
Heavy Vehicles (%)	5%	5%	5%	5%	5%	2%	2%	5%	5%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	6.9	30.1		1.0	24.2			13.9		6.8	24.4	
Effective Green, g (s)	6.9	31.1		1.0	25.2			13.9		6.8	24.4	
Actuated g/C Ratio	0.10	0.47		0.02	0.38			0.21		0.10	0.37	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	178	1473		25	1214			375		175	1150	
v/s Ratio Prot	c0.06	c0.17		0.00	0.11			c0.11		c0.05	0.06	
v/s Ratio Perm												
v/c Ratio	0.54	0.37		0.28	0.28			0.53		0.52	0.16	
Uniform Delay, d1	28.4	11.4		32.4	14.4			23.5		28.4	14.2	
Progression Factor	1.00	1.00		1.45	0.43			1.00		1.00	1.00	
Incremental Delay, d2	1.8	0.2		2.2	0.1			1.5		1.3	0.1	
Delay (s)	30.2	11.6		49.2	6.3			24.9		29.6	14.3	
Level of Service	C	B		D	A			C		C	B	
Approach Delay (s)		14.4			7.2			24.9			18.1	
Approach LOS		B			A			C			B	

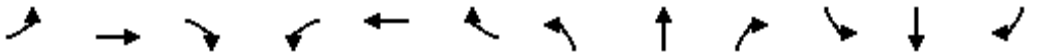
Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	66.6	Sum of lost time (s)	14.8
Intersection Capacity Utilization	56.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	136	412	0	66	305	117	4	112	131	0	26	70
Future Volume (vph)	136	412	0	66	305	117	4	112	131	0	26	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.96			1.00	0.85		0.89	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1687	3374		1687	3209			1773	1479		1567	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (perm)	1687	3374		1687	3209			1767	1479		1567	
Peak-hour factor, PHF	0.91	0.91	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.91	0.91
Adj. Flow (vph)	149	453	0	73	335	129	4	123	144	0	29	77
RTOR Reduction (vph)	0	0	0	0	31	0	0	0	91	0	48	0
Lane Group Flow (vph)	149	453	0	73	433	0	0	127	53	0	58	0
Confl. Peds. (#/hr)	5			7		5	1		6			1
Confl. Bikes (#/hr)									7			1
Heavy Vehicles (%)	7%	7%	2%	7%	7%	7%	7%	7%	7%	2%	7%	7%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	11.7	24.8		6.3	19.4			24.4	24.4		24.4	
Effective Green, g (s)	11.7	24.8		6.3	20.4			25.4	24.4		25.4	
Actuated g/C Ratio	0.18	0.37		0.09	0.31			0.38	0.37		0.38	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	296	1256		159	982			673	541		597	
v/s Ratio Prot	c0.09	0.13		0.04	c0.14						0.04	
v/s Ratio Perm								c0.07	0.04			
v/c Ratio	0.50	0.36		0.46	0.44			0.19	0.10		0.10	
Uniform Delay, d1	24.8	15.2		28.5	18.5			13.7	13.9		13.2	
Progression Factor	1.16	0.65		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.5	0.2		0.8	0.3			0.1	0.1		0.1	
Delay (s)	29.3	10.0		29.3	18.8			13.9	13.9		13.3	
Level of Service	C	B		C	B			B	B		B	
Approach Delay (s)		14.8			20.3			13.9			13.3	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	66.6	Sum of lost time (s)	14.8
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	862	347	201	385	0	0	0	0	326	335	165
Future Volume (veh/h)	0	862	347	201	385	0	0	0	0	326	335	165
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1885	1885	1885	1885	0				1885	1885	1885
Adj Flow Rate, veh/h	0	907	0	212	405	0				229	513	53
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	1	1	1	1	0				1	1	1
Cap, veh/h	0	2173		840	2575	0				317	666	282
Arrive On Green	0.00	0.42	0.00	0.48	1.00	0.00				0.18	0.18	0.18
Sat Flow, veh/h	0	5316	1598	3483	3676	0				1795	3770	1598
Grp Volume(v), veh/h	0	907	0	212	405	0				229	513	53
Grp Sat Flow(s),veh/h/ln	0	1716	1598	1742	1791	0				1795	1885	1598
Q Serve(g_s), s	0.0	11.1	0.0	3.2	0.0	0.0				10.8	11.7	2.5
Cycle Q Clear(g_c), s	0.0	11.1	0.0	3.2	0.0	0.0				10.8	11.7	2.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2173		840	2575	0				317	666	282
V/C Ratio(X)	0.00	0.42		0.25	0.16	0.00				0.72	0.77	0.19
Avail Cap(c_a), veh/h	0	2173		840	2575	0				531	1114	472
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.96	0.96	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	18.2	0.0	18.5	0.0	0.0				35.0	35.3	31.6
Incr Delay (d2), s/veh	0.0	0.6	0.0	0.1	0.1	0.0				1.2	0.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.2	0.0	1.2	0.0	0.0				4.7	5.3	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	18.8	0.0	18.6	0.1	0.0				36.1	36.0	31.7
LnGrp LOS	A	B		B	A	A				D	D	C
Approach Vol, veh/h		907	A		617						795	
Approach Delay, s/veh		18.8			6.5						35.8	
Approach LOS		B			A						D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	26.7	43.0		20.3		69.7
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	12.5	* 38		26.6		54.0
Max Q Clear Time (g_c+I1), s	5.2	13.1		13.7		2.0
Green Ext Time (p_c), s	0.2	8.9		2.2		4.2

Intersection Summary	
HCM 6th Ctrl Delay	21.3
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	19	19	18	137	0	62	5	0	200	142	143	175
Future Vol, veh/h	19	19	18	137	0	62	5	0	200	142	143	175
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	21	21	20	149	0	67	5	0	217	154	155	190
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	10.5	13.8	12.6	10.2
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	34%	69%	100%	0%	0%
Vol Thru, %	100%	41%	34%	0%	0%	100%	100%
Vol Right, %	0%	59%	32%	31%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	105	242	56	199	143	88	88
LT Vol	0	0	19	137	143	0	0
Through Vol	105	100	19	0	0	88	88
RT Vol	0	142	18	62	0	0	0
Lane Flow Rate	114	263	61	216	155	95	95
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.204	0.439	0.115	0.4	0.284	0.161	0.113
Departure Headway (Hd)	6.424	6.007	6.827	6.65	6.589	6.081	4.285
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	557	597	523	541	544	589	831
Service Time	4.18	3.762	4.595	4.403	4.342	3.834	2.037
HCM Lane V/C Ratio	0.205	0.441	0.117	0.399	0.285	0.161	0.114
HCM Control Delay	10.8	13.4	10.5	13.8	12	10	7.6
HCM Lane LOS	B	B	B	B	B	A	A
HCM 95th-tile Q	0.8	2.2	0.4	1.9	1.2	0.6	0.4

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.92
Heavy Vehicles, %	4
Mvmt Flow	0
Number of Lanes	0

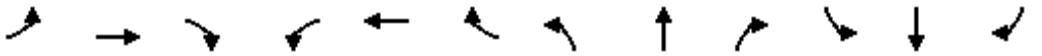
Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	0	459	313	4	147	381	0	0	0	0	1	242
Future Volume (vph)	0	459	313	4	147	381	0	0	0	0	1	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0						4.5
Lane Util. Factor		0.95			0.91	0.91						0.95
Frpb, ped/bikes		0.99			1.00	1.00						1.00
Flpb, ped/bikes		1.00			1.00	1.00						1.00
Frt		0.94			1.00	1.00						1.00
Flt Protected		1.00			0.95	1.00						0.95
Satd. Flow (prot)		3142			1535	3226						1603
Flt Permitted		1.00			0.95	1.00						0.95
Satd. Flow (perm)		3142			1535	3226						1603
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	478	326	4	153	397	0	0	0	0	1	252
RTOR Reduction (vph)	0	131	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	673	0	0	142	412	0	0	0	0	0	127
Confl. Peds. (#/hr)	3		3		3		3					
Confl. Bikes (#/hr)			7									
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type		NA		Split	Split	NA					Split	Split
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		20.1			20.3	20.3						10.7
Effective Green, g (s)		20.1			20.3	20.3						10.7
Actuated g/C Ratio		0.31			0.31	0.31						0.16
Clearance Time (s)		5.0			5.0	5.0						4.5
Vehicle Extension (s)		3.0			3.0	3.0						3.0
Lane Grp Cap (vph)		962			475	998						261
v/s Ratio Prot		c0.21			0.09	c0.13						c0.08
v/s Ratio Perm												
v/c Ratio		0.70			0.30	0.41						0.49
Uniform Delay, d1		20.1			17.2	17.9						25.0
Progression Factor		1.00			1.00	1.00						1.00
Incremental Delay, d2		2.2			0.4	0.3						1.4
Delay (s)		22.3			17.6	18.2						26.4
Level of Service		C			B	B						C
Approach Delay (s)		22.3				18.1			0.0			
Approach LOS		C				B			A			

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	65.6	Sum of lost time (s)	14.5
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

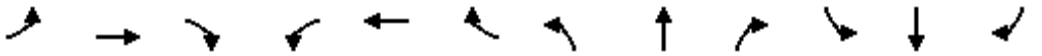
Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	1	151
Future Volume (vph)	1	151
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.5	5.0
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	1.00
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	0.95	1.00
Satd. Flow (prot)	1607	1509
Flt Permitted	0.95	1.00
Satd. Flow (perm)	1607	1509
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	1	157
RTOR Reduction (vph)	0	83
Lane Group Flow (vph)	127	74
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	7%	7%
Turn Type	NA	custom
Protected Phases	4	5
Permitted Phases		4
Actuated Green, G (s)	10.7	30.8
Effective Green, g (s)	10.7	30.8
Actuated g/C Ratio	0.16	0.47
Clearance Time (s)	4.5	5.0
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	262	708
v/s Ratio Prot	0.08	0.03
v/s Ratio Perm		0.02
v/c Ratio	0.48	0.10
Uniform Delay, d1	24.9	9.7
Progression Factor	1.00	1.00
Incremental Delay, d2	1.4	0.1
Delay (s)	26.4	9.8
Level of Service	C	A
Approach Delay (s)	20.0	
Approach LOS	C	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	212	488	0	0	218	111	261	0	275	69	0	50
Future Volume (vph)	212	488	0	0	218	111	261	0	275	69	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00	0.99	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3242	1759			3343	1473		1671	1475	1671		1495
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3242	1759			3343	1473		1671	1475	1671		1495
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	247	567	0	0	253	129	303	0	320	80	0	58
RTOR Reduction (vph)	0	0	0	0	0	99	0	0	222	0	0	53
Lane Group Flow (vph)	247	567	0	0	253	30	0	303	98	80	0	5
Confl. Peds. (#/hr)	5		4	4		5			2	2		
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	11.5	30.9			14.9	14.9		15.8	15.8	5.7		5.7
Effective Green, g (s)	11.5	30.9			14.9	14.9		15.8	15.8	5.7		5.7
Actuated g/C Ratio	0.18	0.48			0.23	0.23		0.25	0.25	0.09		0.09
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	583	850			779	343		413	364	149		133
v/s Ratio Prot	0.08	c0.32			0.08					c0.05		0.00
v/s Ratio Perm						0.02		0.18	0.07			
v/c Ratio	0.42	0.67			0.32	0.09		0.73	0.27	0.54		0.04
Uniform Delay, d1	23.3	12.6			20.3	19.2		22.1	19.4	27.8		26.6
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	0.5	1.5			0.1	0.0		5.7	0.1	1.9		0.0
Delay (s)	23.8	14.1			20.4	19.2		27.8	19.5	29.7		26.6
Level of Service	C	B			C	B		C	B	C		C
Approach Delay (s)		17.0			20.0			23.6			28.4	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	63.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



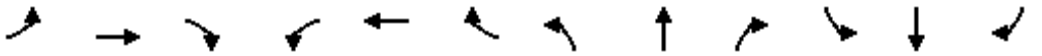
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	348	920	63	22	511	92	138	102	38	117	64	84
Future Volume (veh/h)	348	920	63	22	511	92	138	102	38	117	64	84
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1930
Adj Flow Rate, veh/h	362	958	62	23	532	81	144	106	40	122	67	88
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	373	1606	104	79	988	150	211	354	134	257	128	797
Arrive On Green	0.07	0.16	0.16	0.04	0.32	0.32	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1767	3361	218	1767	3065	465	1218	1276	481	688	459	1625
Grp Volume(v), veh/h	362	502	518	23	305	308	144	0	146	189	0	88
Grp Sat Flow(s),veh/h/ln	1767	1763	1816	1767	1763	1768	1218	0	1757	1147	0	1625
Q Serve(g_s), s	18.4	23.9	23.9	1.1	12.8	12.9	9.7	0.0	5.9	9.4	0.0	2.6
Cycle Q Clear(g_c), s	18.4	23.9	23.9	1.1	12.8	12.9	25.0	0.0	5.9	15.3	0.0	2.6
Prop In Lane	1.00		0.12	1.00		0.26	1.00		0.27	0.65		1.00
Lane Grp Cap(c), veh/h	373	842	867	79	568	570	211	0	488	384	0	797
V/C Ratio(X)	0.97	0.60	0.60	0.29	0.54	0.54	0.68	0.00	0.30	0.49	0.00	0.11
Avail Cap(c_a), veh/h	373	842	867	98	568	570	211	0	488	384	0	797
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.84	0.84	0.83	0.83	0.83	1.00	0.00	1.00	0.95	0.00	0.95
Uniform Delay (d), s/veh	41.6	29.8	29.8	41.6	25.0	25.0	40.6	0.0	25.6	30.4	0.0	12.4
Incr Delay (d2), s/veh	34.8	2.6	2.5	0.6	3.0	3.0	7.3	0.0	0.1	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.2	11.7	12.0	0.5	5.6	5.6	3.6	0.0	2.5	3.7	0.0	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.4	32.5	32.4	42.3	28.0	28.1	47.9	0.0	25.7	30.8	0.0	12.5
LnGrp LOS	E	C	C	D	C	C	D	A	C	C	A	B
Approach Vol, veh/h		1382			636			290			277	
Approach Delay, s/veh		43.9			28.6			36.7			25.0	
Approach LOS		D			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	38.0		29.0	13.0	48.0		29.0				
Change Period (Y+Rc), s	4.0	9.0		4.0	9.0	* 5		4.0				
Max Green Setting (Gmax), s	19.0	29.0		25.0	5.0	* 43		25.0				
Max Q Clear Time (g_c+I1), s	20.4	14.9		17.3	3.1	25.9		27.0				
Green Ext Time (p_c), s	0.0	4.2		0.6	0.0	8.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		37.3	
HCM 6th LOS		D	

Notes

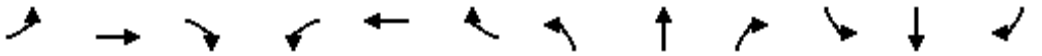
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	493	0	673	0	791	306	0	2090	234
Future Volume (vph)	0	0	0	493	0	673	0	791	306	0	2090	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.6		4.6		4.4	4.4		4.4	4.4
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.95		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3400		2760		5036	1495		5036	1523
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3400		2760		5036	1495		5036	1523
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	508	0	694	0	815	315	0	2155	241
RTOR Reduction (vph)	0	0	0	0	0	116	0	0	128	0	0	60
Lane Group Flow (vph)	0	0	0	508	0	578	0	815	187	0	2155	181
Confl. Peds. (#/hr)							13		10	10		13
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				21.1		39.7		71.3	71.3		89.9	89.9
Effective Green, g (s)				21.1		36.1		71.3	71.3		89.9	89.9
Actuated g/C Ratio				0.18		0.30		0.59	0.59		0.75	0.75
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				597		830		2992	888		3772	1140
v/s Ratio Prot				c0.15		c0.21		0.16			c0.43	
v/s Ratio Perm									0.13			0.12
v/c Ratio				0.85		0.70		0.27	0.21		0.57	0.16
Uniform Delay, d1				47.9		37.1		11.8	11.3		6.6	4.3
Progression Factor				1.00		1.00		1.09	4.13		1.00	1.00
Incremental Delay, d2				10.8		2.1		0.2	0.5		0.6	0.3
Delay (s)				58.7		39.2		13.1	47.1		7.2	4.6
Level of Service				E		D		B	D		A	A
Approach Delay (s)		0.0			47.4			22.6			7.0	
Approach LOS		A			D			C			A	

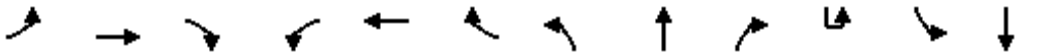
Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	0	132	0	0	0	0	972	573	0	1511	1072
Future Volume (vph)	125	0	132	0	0	0	0	972	573	0	1511	1072
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.91	0.85					0.94			1.00	0.85
Flt Protected	0.95	0.98	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1665	1502	1490					4552			5036	1495
Flt Permitted	0.95	0.98	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1665	1502	1490					4552			5036	1495
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	133	0	140	0	0	0	0	1034	610	0	1607	1140
RTOR Reduction (vph)	0	40	40	0	0	0	0	0	0	0	0	168
Lane Group Flow (vph)	94	52	47	0	0	0	0	1644	0	0	1607	972
Confl. Peds. (#/hr)	5					5	9		11	11		9
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	9.5	9.5	9.5					101.5			101.5	101.5
Effective Green, g (s)	9.5	9.5	9.5					101.5			101.5	101.5
Actuated g/C Ratio	0.08	0.08	0.08					0.85			0.85	0.85
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	131	118	117					3850			4259	1264
v/s Ratio Prot	c0.06	0.03						0.36			0.32	
v/s Ratio Perm			0.03									c0.65
v/c Ratio	0.72	0.44	0.41					0.43			0.38	0.77
Uniform Delay, d1	53.9	52.7	52.6					2.2			2.1	4.1
Progression Factor	1.00	1.00	1.00					0.48			0.91	8.75
Incremental Delay, d2	14.4	1.0	0.8					0.3			0.2	3.9
Delay (s)	68.4	53.7	53.4					1.4			2.1	39.6
Level of Service	E	D	D					A			A	D
Approach Delay (s)		58.7			0.0			1.4			17.7	
Approach LOS		E			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (veh/h)	207	454	185	201	241	119	214	1043	142	10	201	882
Future Volume (veh/h)	207	454	185	201	241	119	214	1043	142	10	201	882
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0		0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.95	1.00		0.98		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Work Zone On Approach		No			No			No				No
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856		1856	1856
Adj Flow Rate, veh/h	218	478	111	212	254	64	225	1098	81		212	928
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3		3	3
Cap, veh/h	244	1007	430	266	624	153	697	1490	455		712	1490
Arrive On Green	0.14	0.29	0.29	0.08	0.23	0.23	0.20	0.29	0.29		0.21	0.29
Sat Flow, veh/h	1767	3526	1506	3428	2772	680	3428	5066	1545		3428	5066
Grp Volume(v), veh/h	218	478	111	212	159	159	225	1098	81		212	928
Grp Sat Flow(s),veh/h/ln	1767	1763	1506	1714	1763	1689	1714	1689	1545		1714	1689
Q Serve(g_s), s	14.6	13.4	4.2	7.3	9.2	9.7	6.7	23.4	3.8		6.3	19.0
Cycle Q Clear(g_c), s	14.6	13.4	4.2	7.3	9.2	9.7	6.7	23.4	3.8		6.3	19.0
Prop In Lane	1.00		1.00	1.00		0.40	1.00		1.00		1.00	
Lane Grp Cap(c), veh/h	244	1007	430	266	397	380	697	1490	455		712	1490
V/C Ratio(X)	0.89	0.47	0.26	0.80	0.40	0.42	0.32	0.74	0.18		0.30	0.62
Avail Cap(c_a), veh/h	295	1234	527	371	529	507	697	1490	455		712	1490
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Upstream Filter(I)	0.88	0.88	0.88	0.09	0.09	0.09	1.00	1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	50.9	35.4	12.5	54.4	39.6	39.8	40.7	38.2	20.2		40.2	36.6
Incr Delay (d2), s/veh	20.1	0.1	0.1	0.5	0.0	0.0	0.1	3.3	0.9		0.1	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	7.7	5.7	2.4	3.1	4.0	4.0	2.8	10.0	1.8		2.6	8.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.9	35.5	12.6	54.9	39.6	39.8	40.8	41.5	21.1		40.2	38.6
LnGrp LOS	E	D	B	D	D	D	D	D	C		D	D
Approach Vol, veh/h		807			530			1404				1201
Approach Delay, s/veh		41.9			45.8			40.2				37.7
Approach LOS		D			D			D				D

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	27.9	39.9	20.1	32.1	28.4	39.4	12.8	39.4
Change Period (Y+Rc), s	3.5	4.6	3.5	* 5.1	3.5	4.1	3.5	5.1
Max Green Setting (Gmax), s	13.0	35.3	20.0	* 36	13.0	35.3	13.0	42.0
Max Q Clear Time (g_c+I1), s	8.7	21.0	16.6	11.7	8.3	25.4	9.3	15.4
Green Ext Time (p_c), s	0.0	1.3	0.0	0.3	0.0	1.4	0.0	0.6

Intersection Summary	
HCM 6th Ctrl Delay	40.5
HCM 6th LOS	D

Notes

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	123
Future Volume (veh/h)	123
Initial Q (Qb), veh	0
Ped-Bike Adj(A_pbT)	0.98
Parking Bus, Adj	1.00
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	1856
Adj Flow Rate, veh/h	61
Peak Hour Factor	0.95
Percent Heavy Veh, %	3
Cap, veh/h	455
Arrive On Green	0.29
Sat Flow, veh/h	1545
Grp Volume(v), veh/h	61
Grp Sat Flow(s),veh/h/ln	1545
Q Serve(g_s), s	2.5
Cycle Q Clear(g_c), s	2.5
Prop In Lane	1.00
Lane Grp Cap(c), veh/h	455
V/C Ratio(X)	0.13
Avail Cap(c_a), veh/h	455
HCM Platoon Ratio	1.00
Upstream Filter(I)	1.00
Uniform Delay (d), s/veh	15.6
Incr Delay (d2), s/veh	0.6
Initial Q Delay(d3),s/veh	0.0
%ile BackOfQ(50%),veh/ln	1.4
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	16.2
LnGrp LOS	B
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	
Timer - Assigned Phs	

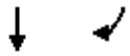
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	49	119	50	239	68	229	23	51	665	359	20	436
Future Volume (veh/h)	49	119	50	239	68	229	23	51	665	359	20	436
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.98		1.00		1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856		1856	1856	1856		1856
Adj Flow Rate, veh/h	52	125	25	162	198	39		54	700	137		459
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	3	3	3	3	3	3		3	3	3		3
Cap, veh/h	122	319	70	221	358	298		70	2203	681		494
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19		0.04	0.43	0.43		0.28
Sat Flow, veh/h	389	1653	360	1211	1856	1541		1767	5066	1567		1767
Grp Volume(v), veh/h	90	0	112	162	198	39		54	700	137		459
Grp Sat Flow(s),veh/h/ln	793	0	1609	1211	1856	1541		1767	1689	1567		1767
Q Serve(g_s), s	5.6	0.0	7.2	15.9	11.6	2.5		3.6	10.9	6.5		30.3
Cycle Q Clear(g_c), s	17.2	0.0	7.2	23.2	11.6	2.5		3.6	10.9	6.5		30.3
Prop In Lane	0.58		0.22	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	200	0	311	221	358	298		70	2203	681		494
V/C Ratio(X)	0.45	0.00	0.36	0.73	0.55	0.13		0.77	0.32	0.20		0.93
Avail Cap(c_a), veh/h	359	0	500	221	358	298		265	2203	681		648
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	48.0	0.0	42.0	52.1	43.7	40.1		57.1	22.2	21.0		42.1
Incr Delay (d2), s/veh	1.6	0.0	0.7	11.9	1.8	0.2		16.1	0.4	0.7		16.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	3.0	5.6	5.5	1.0		1.9	4.4	2.5		15.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.6	0.0	42.7	64.0	45.6	40.3		73.2	22.6	21.7		59.0
LnGrp LOS	D	A	D	E	D	D		E	C	C		E
Approach Vol, veh/h		202			399				891			
Approach Delay, s/veh		45.8			52.5				25.5			
Approach LOS		D			D				C			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.8	85.4		26.9	36.5	56.6		26.9				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	18.0	53.6		19.0	44.0	27.6		37.3				
Max Q Clear Time (g_c+I1), s	5.6	15.1		25.2	32.3	12.9		19.2				
Green Ext Time (p_c), s	0.1	11.9		0.0	1.2	4.7		1.1				

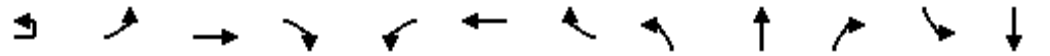
Intersection Summary		
HCM 6th Ctrl Delay		28.2
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1196	44
Future Volume (veh/h)	1196	44
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		1.00
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1856	1856
Adj Flow Rate, veh/h	1259	44
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	3	3
Cap, veh/h	3390	118
Arrive On Green	0.67	0.67
Sat Flow, veh/h	5025	176
Grp Volume(v), veh/h	846	457
Grp Sat Flow(s),veh/h/ln	1689	1823
Q Serve(g_s), s	13.0	13.1
Cycle Q Clear(g_c), s	13.0	13.1
Prop In Lane		0.10
Lane Grp Cap(c), veh/h	2279	1230
V/C Ratio(X)	0.37	0.37
Avail Cap(c_a), veh/h	2279	1230
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	8.5	8.5
Incr Delay (d2), s/veh	0.5	0.9
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	5.1
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	8.9	9.3
LnGrp LOS	A	A
Approach Vol, veh/h	1762	
Approach Delay, s/veh	22.1	
Approach LOS	C	
Timer - Assigned Phs		



Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (veh/h)	1	317	870	0	0	477	256	113	227	461	0	0
Future Volume (veh/h)	1	317	870	0	0	477	256	113	227	461	0	0
Initial Q (Qb), veh		0	0	0	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00		1.00	1.00		1.00	1.00		1.00		
Parking Bus, Adj		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Work Zone On Approach			No			No			No			
Adj Sat Flow, veh/h/ln		1870	1870	0	0	1870	1870	1870	1870	1870		
Adj Flow Rate, veh/h		327	897	0	0	492	0	116	346	354		
Peak Hour Factor		0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %		2	2	0	0	2	2	2	2	2		
Cap, veh/h		699	2258	0	0	1343		451	474	402		
Arrive On Green		0.40	1.00	0.00	0.00	0.12	0.00	0.25	0.25	0.25		
Sat Flow, veh/h		3456	3647	0	0	3647	1585	1781	1870	1585		
Grp Volume(v), veh/h		327	897	0	0	492	0	116	346	354		
Grp Sat Flow(s),veh/h/ln		1728	1777	0	0	1777	1585	1781	1870	1585		
Q Serve(g_s), s		6.3	0.0	0.0	0.0	11.4	0.0	4.7	15.3	19.3		
Cycle Q Clear(g_c), s		6.3	0.0	0.0	0.0	11.4	0.0	4.7	15.3	19.3		
Prop In Lane		1.00		0.00	0.00		1.00	1.00		1.00		
Lane Grp Cap(c), veh/h		699	2258	0	0	1343		451	474	402		
V/C Ratio(X)		0.47	0.40	0.00	0.00	0.37		0.26	0.73	0.88		
Avail Cap(c_a), veh/h		699	2258	0	0	1343		574	603	511		
HCM Platoon Ratio		2.00	2.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00		
Upstream Filter(I)		0.91	0.91	0.00	0.00	0.90	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh		23.2	0.0	0.0	0.0	29.5	0.0	26.8	30.8	32.3		
Incr Delay (d2), s/veh		0.2	0.5	0.0	0.0	0.7	0.0	0.1	2.2	11.9		
Initial Q Delay(d3),s/veh		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln		2.2	0.1	0.0	0.0	5.5	0.0	1.9	6.9	8.4		
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh		23.4	0.5	0.0	0.0	30.2	0.0	26.9	33.0	44.2		
LnGrp LOS		C	A	A	A	C		C	C	D		
Approach Vol, veh/h			1224			492	A		816			
Approach Delay, s/veh			6.6			30.2			37.0			
Approach LOS			A			C			D			

Timer - Assigned Phs	2			5	6		8					
Phs Duration (G+Y+Rc), s	62.2			23.2	39.0		27.8					
Change Period (Y+Rc), s	5.0			5.0	* 5		5.0					
Max Green Setting (Gmax), s	44.0			13.0	* 34		29.0					
Max Q Clear Time (g_c+I1), s	2.0			8.3	13.4		21.3					
Green Ext Time (p_c), s	10.5			0.3	4.3		1.5					

Intersection Summary	
HCM 6th Ctrl Delay	21.0
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

4: Train & Scott St Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0
Total Del/Veh (s)	2.8	8.3	3.8	4.7
Vehicles Entered	156	90	12	258
Vehicles Exited	157	90	12	259
Hourly Exit Rate	157	90	12	259
Input Volume	158	84	10	251
% of Volume	100	108	117	103
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.3	0.2	0.2	0.2	0.2
Total Del/Veh (s)	6.4	9.2	2.8	3.9	4.5	2.7	7.3	11.0	9.6	10.1	6.7	4.8
Vehicles Entered	4	6	12	49	3	34	5	155	112	39	127	3
Vehicles Exited	4	6	12	49	3	34	5	154	111	40	127	3
Hourly Exit Rate	4	6	12	49	3	34	5	154	111	40	127	3
Input Volume	5	5	13	47	3	30	5	155	111	41	123	2
% of Volume	80	120	91	104	100	113	100	99	100	97	103	150
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	8.2
Vehicles Entered	549
Vehicles Exited	548
Hourly Exit Rate	548
Input Volume	541
% of Volume	101
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	0.3	0.2	0.2	0.2
Total Del/Veh (s)	5.8	0.8	4.0	6.3	7.0	6.4	4.3	6.0
Vehicles Entered	93	10	61	51	224	132	34	605
Vehicles Exited	93	10	61	51	224	131	34	604
Hourly Exit Rate	93	10	61	51	224	131	34	604
Input Volume	95	10	61	48	229	131	31	605
% of Volume	98	100	100	106	98	100	111	100
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	12.2
Vehicles Entered	930
Vehicles Exited	927
Hourly Exit Rate	927
Input Volume	2543
% of Volume	36
Denied Entry Before	0
Denied Entry After	0

Intersection: 4: Train & Scott St

Movement	EB	WB	SB
Directions Served	T	T	T
Maximum Queue (ft)	79	87	32
Average Queue (ft)	38	21	6
95th Queue (ft)	84	65	26
Link Distance (ft)	5	142	1849
Upstream Blk Time (%)	10		
Queuing Penalty (veh)	16		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Dollar Ave/Herman Ave & Scott St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	33	58	200	132
Average Queue (ft)	16	30	68	62
95th Queue (ft)	40	47	142	107
Link Distance (ft)	525	5	1137	1856
Upstream Blk Time (%)		5		
Queuing Penalty (veh)		4		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

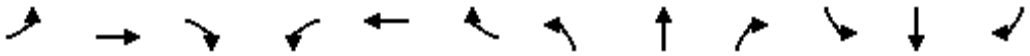
Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	107	130	102
Average Queue (ft)	48	67	53
95th Queue (ft)	84	105	89
Link Distance (ft)	174	939	1430
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 20

Existing PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	85	272	302	2	122	387	0	0	264	92
Future Volume (vph)	0	0	85	272	302	2	122	387	0	0	264	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.6	4.0	4.0			4.6			4.6	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			0.99	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.96	
Flt Protected			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)			1565	1633	1741			3488			3275	
Flt Permitted			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (perm)			1565	1633	1741			3488			3275	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	93	299	332	2	134	425	0	0	290	101
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	80	0
Lane Group Flow (vph)	0	0	93	269	364	0	0	559	0	0	311	0
Confl. Peds. (#/hr)												10
Heavy Vehicles (%)	0%	0%	5%	5%	3%	0%	0%	3%	0%	0%	5%	5%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			12.9	13.5	13.5			12.9			10.4	
Effective Green, g (s)			12.9	13.5	13.5			12.9			10.4	
Actuated g/C Ratio			0.26	0.27	0.27			0.26			0.21	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			403	440	470			899			681	
v/s Ratio Prot			0.06					c0.16			c0.09	
v/s Ratio Perm				0.16	0.21							
v/c Ratio			0.23	0.61	0.77			0.62			0.46	
Uniform Delay, d1			14.6	16.0	16.8			16.4			17.3	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			0.4	6.2	11.8			1.5			0.5	
Delay (s)			15.0	22.2	28.6			17.9			17.8	
Level of Service			B	C	C			B			B	
Approach Delay (s)		15.0			25.9			17.9			17.8	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/24/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	344	222	19	297	334	3	803	421
Future Volume (veh/h)	344	222	19	297	334	3	803	421
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				1.00
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1657	1710		1657	1657		1657	1657
Adj Flow Rate, veh/h	229	239		316	355		854	154
Peak Hour Factor	0.94	0.94		0.94	0.94		0.94	0.94
Percent Heavy Veh, %	4	0		4	4		4	4
Cap, veh/h	301	277		1121	2276		978	435
Arrive On Green	0.19	0.19		0.37	0.72		0.31	0.31
Sat Flow, veh/h	1578	1449		3061	3230		3230	1399
Grp Volume(v), veh/h	229	239		316	355		854	154
Grp Sat Flow(s),veh/h/ln	1578	1449		1530	1574		1574	1399
Q Serve(g_s), s	13.7	16.0		7.3	3.5		25.7	8.5
Cycle Q Clear(g_c), s	13.7	16.0		7.3	3.5		25.7	8.5
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	301	277		1121	2276		978	435
V/C Ratio(X)	0.76	0.86		0.28	0.16		0.87	0.35
Avail Cap(c_a), veh/h	521	478		1121	2276		1240	551
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.97	0.97		0.85	0.85		0.55	0.55
Uniform Delay (d), s/veh	38.3	39.2		22.4	4.3		32.6	26.7
Incr Delay (d2), s/veh	1.5	3.1		0.0	0.1		6.3	1.2
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	5.9		2.6	1.0		10.3	2.9
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	39.7	42.3		22.4	4.4		38.9	27.9
LnGrp LOS	D	D		C	A		D	C
Approach Vol, veh/h	468				671		1008	
Approach Delay, s/veh	41.0				12.9		37.2	
Approach LOS	D				B		D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	41.2	35.7				76.9		23.1
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	13.0	* 39				48.4		33.0
Max Q Clear Time (g_c+I1), s	9.3	27.7				5.5		18.0
Green Ext Time (p_c), s	0.3	3.4				1.5		1.1

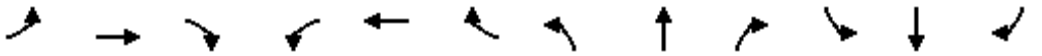
Intersection Summary	
HCM 6th Ctrl Delay	30.4
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



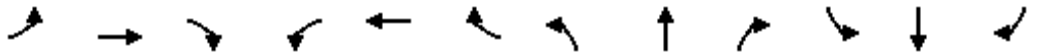
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	152	50	85	638	233	232	59	455	120	108	447	102
Future Volume (vph)	152	50	85	638	233	232	59	455	120	108	447	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.97		1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.96
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		2893		3060	1660	1387	1547	3094	1384	1408	2953	1333
Flt Permitted		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		2893		3060	1660	1387	1547	3094	1384	1408	2953	1333
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	157	52	88	658	240	239	61	469	124	111	461	105
RTOR Reduction (vph)	0	42	0	0	0	175	0	0	0	0	0	81
Lane Group Flow (vph)	0	255	0	658	240	64	61	469	124	73	499	25
Confl. Peds. (#/hr)			74									5
Confl. Bikes (#/hr)			2			6			4			
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	5%	5%	5%	5%	5%	5%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		20.1		32.2	32.2	32.2	21.0	21.0	91.0	28.0	28.0	28.0
Effective Green, g (s)		20.1		32.2	32.2	32.2	21.0	21.0	91.0	28.0	28.0	28.0
Actuated g/C Ratio		0.17		0.27	0.27	0.27	0.18	0.18	0.76	0.23	0.23	0.23
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		484		821	445	372	270	541	1049	328	689	311
v/s Ratio Prot		c0.09		c0.22	0.14		0.04	c0.15	0.09	0.05	c0.17	
v/s Ratio Perm						0.05						0.02
v/c Ratio		0.53		0.80	0.54	0.17	0.23	0.87	0.12	0.22	0.72	0.08
Uniform Delay, d1		45.6		40.9	37.6	33.7	42.5	48.1	3.8	37.2	42.4	35.9
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.5		5.7	1.3	0.2	0.3	13.6	0.0	1.6	6.5	0.5
Delay (s)		46.1		46.6	38.8	33.9	42.8	61.7	3.9	38.8	49.0	36.4
Level of Service		D		D	D	C	D	E	A	D	D	D
Approach Delay (s)		46.1			42.3			49.0			45.9	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	45.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	170	35	353	238	23	17	188	409	36	234	41
Future Volume (vph)	30	170	35	353	238	23	17	188	409	36	234	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		3.5	3.5			3.0	3.0		3.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	1.00		0.99	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2724		1413	1462			1481	2224		1439	
Flt Permitted		0.99		0.95	1.00			0.96	1.00		0.94	
Satd. Flow (perm)		2724		1413	1462			1424	2224		1368	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	183	38	380	256	25	18	202	440	39	252	44
RTOR Reduction (vph)	0	15	0	0	4	0	0	0	197	0	6	0
Lane Group Flow (vph)	0	238	0	380	277	0	0	220	243	0	329	0
Confl. Peds. (#/hr)			13			9			9			19
Confl. Bikes (#/hr)			2			1			2			7
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		30.2		27.0	27.0			22.8	53.3		22.8	
Effective Green, g (s)		30.2		27.0	27.0			22.8	49.8		22.8	
Actuated g/C Ratio		0.34		0.30	0.30			0.25	0.55		0.25	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		914		423	438			360	1230		346	
v/s Ratio Prot		c0.09		c0.27	0.19				0.11			
v/s Ratio Perm								0.15			c0.24	
v/c Ratio		0.26		0.90	0.63			0.61	0.20		0.95	
Uniform Delay, d1		21.8		30.2	27.2			29.7	10.1		33.0	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.7		20.7	2.2			2.2	0.0		35.3	
Delay (s)		22.5		50.9	29.4			31.8	10.1		68.4	
Level of Service		C		D	C			C	B		E	
Approach Delay (s)		22.5			41.8			17.4			68.4	
Approach LOS		C			D			B			E	

Intersection Summary			
HCM 2000 Control Delay	35.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	169	169	200	760	224	378	101	15	269	158	827	130
Future Volume (veh/h)	169	169	200	760	224	378	101	15	269	158	827	130
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1811	1811	1811	1811	1811	1678	1678	1678	1856	1856	1856
Adj Flow Rate, veh/h	199	148	0	800	236	0	106	16	0	166	871	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	6	6	6	15	15	15	3	3	3
Cap, veh/h	381	200		878	461		142	821		387	1393	
Arrive On Green	0.11	0.11	0.00	0.25	0.25	0.00	0.09	0.26	0.00	0.22	0.40	0.00
Sat Flow, veh/h	3450	1811	1535	3450	1811	1535	1598	3272	0	1767	3526	1572
Grp Volume(v), veh/h	199	148	0	800	236	0	106	16	0	166	871	0
Grp Sat Flow(s),veh/h/ln	1725	1811	1535	1725	1811	1535	1598	1594	0	1767	1763	1572
Q Serve(g_s), s	6.5	9.5	0.0	27.0	13.4	0.0	7.8	0.4	0.0	9.7	23.8	0.0
Cycle Q Clear(g_c), s	6.5	9.5	0.0	27.0	13.4	0.0	7.8	0.4	0.0	9.7	23.8	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	381	200		878	461		142	821		387	1393	
V/C Ratio(X)	0.52	0.74		0.91	0.51		0.75	0.02		0.43	0.63	
Avail Cap(c_a), veh/h	635	334		914	480		160	821		387	1393	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.93	0.93	0.00	0.47	0.47	0.00	1.00	1.00	0.00	0.71	0.71	0.00
Uniform Delay (d), s/veh	50.4	51.7	0.0	43.4	38.3	0.0	53.3	33.2	0.0	40.4	29.1	0.0
Incr Delay (d2), s/veh	0.4	1.9	0.0	6.8	0.4	0.0	12.7	0.0	0.0	2.4	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	4.4	0.0	12.4	6.1	0.0	3.6	0.2	0.0	4.5	10.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.8	53.6	0.0	50.2	38.8	0.0	66.0	33.3	0.0	42.8	30.7	0.0
LnGrp LOS	D	D		D	D		E	C		D	C	
Approach Vol, veh/h		347	A		1036	A		122	A		1037	A
Approach Delay, s/veh		52.0			47.6			61.7			32.6	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.7	52.3		17.8	31.2	35.8		35.1				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	12.0	36.0		22.1	17.1	* 31		31.8				
Max Q Clear Time (g_c+I1), s	9.8	25.8		11.5	11.7	2.4		29.0				
Green Ext Time (p_c), s	0.0	4.6		0.8	0.1	0.0		1.5				

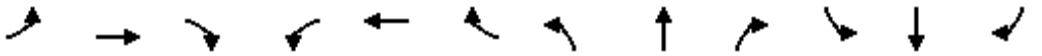
Intersection Summary		
HCM 6th Ctrl Delay	42.8	
HCM 6th LOS	D	

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	100	391	58	355	14	486	192	61	5	189	521
Future Volume (veh/h)	50	100	391	58	355	14	486	192	61	5	189	521
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		1.00	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1781	1781	1781	1811	1811	1811	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	53	131	123	62	378	11	517	204	0	5	201	368
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	8	8	8	6	6	6	9	9	9	4	4	4
Cap, veh/h	127	424	382	137	458	13	875	900		391	410	332
Arrive On Green	0.07	0.23	0.23	0.08	0.24	0.24	0.29	0.29	0.00	0.22	0.22	0.22
Sat Flow, veh/h	1697	1781	1484	1725	1749	51	3264	3445	0	1753	1841	1489
Grp Volume(v), veh/h	53	131	123	62	0	389	517	204	0	5	201	368
Grp Sat Flow(s),veh/h/ln	1697	1781	1484	1725	0	1800	1632	1678	0	1753	1841	1489
Q Serve(g_s), s	3.1	6.4	7.3	3.6	0.0	22.1	14.0	4.8	0.0	0.2	10.0	23.4
Cycle Q Clear(g_c), s	3.1	6.4	7.3	3.6	0.0	22.1	14.0	4.8	0.0	0.2	10.0	23.4
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	127	424	382	137	0	471	875	900		391	410	332
V/C Ratio(X)	0.42	0.31	0.32	0.45	0.00	0.83	0.59	0.23		0.01	0.49	1.11
Avail Cap(c_a), veh/h	179	492	410	182	0	497	959	986		391	410	332
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.80	0.80	1.00	0.00	1.00	0.95	0.95	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.4	34.1	31.6	46.1	0.0	36.5	33.4	30.0	0.0	31.8	35.6	40.8
Incr Delay (d2), s/veh	0.6	0.2	0.3	0.9	0.0	9.7	2.8	0.6	0.0	0.0	0.3	81.9
Initial Q Delay(d3),s/veh	0.0	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	5.3	2.5	1.6	0.0	10.5	5.9	2.0	0.0	0.1	4.5	16.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.0	44.2	31.9	47.0	0.0	46.2	36.2	30.5	0.0	31.8	35.9	122.7
LnGrp LOS	D	D	C	D	A	D	D	C		C	D	F
Approach Vol, veh/h		307			451			721	A		574	
Approach Delay, s/veh		39.8			46.3			34.6			91.5	
Approach LOS		D			D			C			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.4	28.9		35.4	11.9	29.4		28.3				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.0	4.6		4.9				
Max Green Setting (Gmax), s	11.1	29.0		23.4	11.1	29.0		23.4				
Max Q Clear Time (g_c+I1), s	5.6	9.3		16.0	5.1	24.1		25.4				
Green Ext Time (p_c), s	0.0	0.9		1.5	0.0	0.7		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		53.9	
HCM 6th LOS		D	

Notes

User approved volume balancing among the lanes for turning movement.

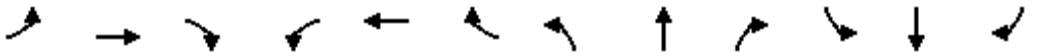
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	381	24	271	31	44	29	5	352	335	45	11	18
Future Volume (vph)	381	24	271	31	44	29	5	352	335	45	11	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00		1.00	0.95			1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	0.97		1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Frt	1.00	1.00	0.85		1.00	0.85		1.00	0.98			1.00
Flt Protected	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (prot)	1618	1631	2682		1756	1482		1703	3313			1703
Flt Permitted	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (perm)	1618	1631	2682		1756	1482		1703	3313			1703
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	397	25	282	32	46	30	5	367	349	47	11	19
RTOR Reduction (vph)	0	0	224	0	0	27	0	0	7	0	0	0
Lane Group Flow (vph)	202	220	58	0	78	3	0	372	389	0	0	30
Confl. Peds. (#/hr)	18					18				26		26
Confl. Bikes (#/hr)										3		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	Prot	NA		Prot	Prot
Protected Phases	4	4		3	3		5	5	2		1	1
Permitted Phases			4			3						
Actuated Green, G (s)	16.0	16.0	16.0		7.2	7.2		20.8	36.9			2.9
Effective Green, g (s)	16.0	16.0	16.0		7.2	7.2		20.8	36.9			2.9
Actuated g/C Ratio	0.21	0.21	0.21		0.09	0.09		0.27	0.47			0.04
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0			3.0
Lane Grp Cap (vph)	332	335	551		162	137		455	1571			63
v/s Ratio Prot	0.12	c0.13			c0.04			c0.22	0.12			0.02
v/s Ratio Perm			0.02			0.00						
v/c Ratio	0.61	0.66	0.11		0.48	0.02		0.82	0.25			0.48
Uniform Delay, d1	28.1	28.4	25.1		33.5	32.1		26.7	12.2			36.7
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Incremental Delay, d2	3.1	4.6	0.1		2.2	0.1		10.9	0.1			5.6
Delay (s)	31.2	33.0	25.2		35.8	32.2		37.6	12.3			42.3
Level of Service	C	C	C		D	C		D	B			D
Approach Delay (s)		29.3			34.8				24.5			
Approach LOS		C			C				C			

Intersection Summary			
HCM 2000 Control Delay	27.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	77.8	Sum of lost time (s)	14.8
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	489	172
Future Volume (vph)	489	172
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.1	4.1
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	0.98
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3406	1486
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3406	1486
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	509	179
RTOR Reduction (vph)	0	135
Lane Group Flow (vph)	509	44
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		3
Heavy Vehicles (%)	6%	6%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	19.0	19.0
Effective Green, g (s)	19.0	19.0
Actuated g/C Ratio	0.24	0.24
Clearance Time (s)	4.1	4.1
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	831	362
v/s Ratio Prot	c0.15	
v/s Ratio Perm		0.03
v/c Ratio	0.61	0.12
Uniform Delay, d1	26.1	22.9
Progression Factor	1.00	1.00
Incremental Delay, d2	1.3	0.2
Delay (s)	27.5	23.0
Level of Service	C	C
Approach Delay (s)	27.0	
Approach LOS	C	

Intersection Summary



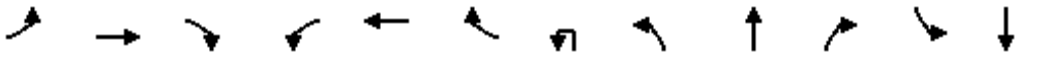
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	280	24	85	630	549	92	82	267	132	82	54
Future Volume (veh/h)	32	280	24	85	630	549	92	82	267	132	82	54
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	33	286	22	87	643	350	94	84	0	135	84	35
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	76	737	57	139	869	721	124	111		205	145	60
Arrive On Green	0.04	0.43	0.43	0.08	0.46	0.46	0.13	0.13	0.00	0.11	0.11	0.11
Sat Flow, veh/h	1795	1728	133	1795	1885	1564	970	867	1598	1795	1264	527
Grp Volume(v), veh/h	33	0	308	87	643	350	178	0	0	135	0	119
Grp Sat Flow(s),veh/h/ln	1795	0	1861	1795	1885	1564	1837	0	1598	1795	0	1790
Q Serve(g_s), s	1.1	0.0	6.7	2.8	16.5	9.2	5.5	0.0	0.0	4.3	0.0	3.7
Cycle Q Clear(g_c), s	1.1	0.0	6.7	2.8	16.5	9.2	5.5	0.0	0.0	4.3	0.0	3.7
Prop In Lane	1.00		0.07	1.00		1.00	0.53		1.00	1.00		0.29
Lane Grp Cap(c), veh/h	76	0	793	139	869	721	235	0		205	0	205
V/C Ratio(X)	0.43	0.00	0.39	0.63	0.74	0.49	0.76	0.00		0.66	0.00	0.58
Avail Cap(c_a), veh/h	608	0	1418	608	1436	1192	684	0		851	0	849
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.6	0.0	11.6	26.4	13.0	11.1	24.9	0.0	0.0	25.1	0.0	24.8
Incr Delay (d2), s/veh	1.4	0.0	0.4	1.7	1.8	0.7	1.9	0.0	0.0	1.3	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	2.5	1.1	5.8	2.6	2.3	0.0	0.0	1.8	0.0	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.0	0.0	12.1	28.2	14.8	11.8	26.7	0.0	0.0	26.4	0.0	25.8
LnGrp LOS	C	A	B	C	B	B	C	A		C	A	C
Approach Vol, veh/h		341			1080			178	A		254	
Approach Delay, s/veh		13.7			14.9			26.7			26.1	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.0	31.7		10.3	8.1	29.7		11.1				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	20.0	45.0		28.0	20.0	45.0		22.0				
Max Q Clear Time (g_c+I1), s	3.1	18.5		6.3	4.8	8.7		7.5				
Green Ext Time (p_c), s	0.0	8.8		0.6	0.1	2.9		0.5				

Intersection Summary			
HCM 6th Ctrl Delay		17.4	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (veh/h)	2	592	85	339	892	0	3	370	0	163	0	1
Future Volume (veh/h)	2	592	85	339	892	0	3	370	0	163	0	1
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00		1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No				No			No
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885		1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	2	598	34	342	901	0		375	0	2	0	1
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99		0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	1	1	1	1	1	1		1	1	1	1	1
Cap, veh/h	3	896	390	616	1294	0		527	0	234	0	3
Arrive On Green	0.24	0.24	0.24	0.34	0.34	0.00		0.15	0.00	0.15	0.00	0.00
Sat Flow, veh/h	12	3664	1594	1795	3770	0		3591	0	1594	0	1885
Grp Volume(v), veh/h	322	278	34	342	901	0		375	0	2	0	1
Grp Sat Flow(s),veh/h/ln	1885	1791	1594	1795	1885	0		1795	0	1594	0	1885
Q Serve(g_s), s	9.0	8.0	0.9	8.9	11.9	0.0		5.7	0.0	0.1	0.0	0.0
Cycle Q Clear(g_c), s	9.0	8.0	0.9	8.9	11.9	0.0		5.7	0.0	0.1	0.0	0.0
Prop In Lane	0.01		1.00	1.00		0.00		1.00		1.00	0.00	
Lane Grp Cap(c), veh/h	461	438	390	616	1294	0		527	0	234	0	3
V/C Ratio(X)	0.70	0.64	0.09	0.56	0.70	0.00		0.71	0.00	0.01	0.00	0.31
Avail Cap(c_a), veh/h	1341	1275	1134	1122	2356	0		1496	0	664	0	654
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00		1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.8	19.5	16.8	15.3	16.3	0.0		23.4	0.0	21.0	0.0	28.7
Incr Delay (d2), s/veh	1.4	1.1	0.1	0.6	0.5	0.0		0.7	0.0	0.0	0.0	18.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	3.0	0.3	3.1	4.3	0.0		2.3	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.3	20.6	16.9	15.9	16.8	0.0		24.1	0.0	21.0	0.0	47.1
LnGrp LOS	C	C	B	B	B	A		C	A	C	A	D
Approach Vol, veh/h		634			1243				377			1
Approach Delay, s/veh		20.7			16.6				24.1			47.1
Approach LOS		C			B				C			D

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	23.9	12.0	18.2	3.6
Change Period (Y+Rc), s	4.1	3.5	4.1	3.5
Max Green Setting (Gmax), s	36.0	24.0	41.0	20.0
Max Q Clear Time (g_c+I1), s	13.9	7.7	11.0	2.0
Green Ext Time (p_c), s	5.9	0.6	2.9	0.0

Intersection Summary	
HCM 6th Ctrl Delay	19.0
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	2
Future Volume (veh/h)	2
Initial Q (Qb), veh	0
Ped-Bike Adj(A_pbT)	1.00
Parking Bus, Adj	1.00
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	1885
Adj Flow Rate, veh/h	0
Peak Hour Factor	0.99
Percent Heavy Veh, %	1
Cap, veh/h	0
Arrive On Green	0.00
Sat Flow, veh/h	0
Grp Volume(v), veh/h	0
Grp Sat Flow(s),veh/h/ln	0
Q Serve(g_s), s	0.0
Cycle Q Clear(g_c), s	0.0
Prop In Lane	0.00
Lane Grp Cap(c), veh/h	0
V/C Ratio(X)	0.00
Avail Cap(c_a), veh/h	0
HCM Platoon Ratio	1.00
Upstream Filter(I)	0.00
Uniform Delay (d), s/veh	0.0
Incr Delay (d2), s/veh	0.0
Initial Q Delay(d3),s/veh	0.0
%ile BackOfQ(50%),veh/ln	0.0
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	0.0
LnGrp LOS	A
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	
Timer - Assigned Phs	

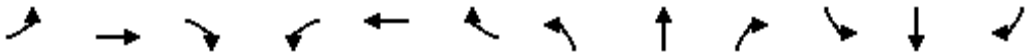
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	624	131	152	924	307	167
Future Volume (veh/h)	624	131	152	924	307	167
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	643	61	157	953	316	30
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1
Cap, veh/h	1828	814	201	2533	487	223
Arrive On Green	0.51	0.51	0.11	0.71	0.14	0.14
Sat Flow, veh/h	3676	1594	1795	3676	3483	1598
Grp Volume(v), veh/h	643	61	157	953	316	30
Grp Sat Flow(s),veh/h/ln	1791	1594	1795	1791	1742	1598
Q Serve(g_s), s	6.3	0.5	5.0	6.2	5.0	1.0
Cycle Q Clear(g_c), s	6.3	0.5	5.0	6.2	5.0	1.0
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1828	814	201	2533	487	223
V/C Ratio(X)	0.35	0.07	0.78	0.38	0.65	0.13
Avail Cap(c_a), veh/h	3716	1654	1069	6092	2192	1005
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	8.6	1.2	25.4	3.4	23.9	22.2
Incr Delay (d2), s/veh	0.2	0.1	2.5	0.1	1.5	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.3	2.1	1.0	2.0	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.8	1.2	27.9	3.6	25.4	22.4
LnGrp LOS	A	A	C	A	C	C
Approach Vol, veh/h	704			1110	346	
Approach Delay, s/veh	8.1			7.0	25.1	
Approach LOS	A			A	C	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	11.6	35.0				46.6	12.2
Change Period (Y+Rc), s	5.0	* 5				5.0	4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0	37.0
Max Q Clear Time (g_c+I1), s	7.0	8.3				8.2	7.0
Green Ext Time (p_c), s	0.1	7.4				12.5	1.2

Intersection Summary	
HCM 6th Ctrl Delay	10.3
HCM 6th LOS	B

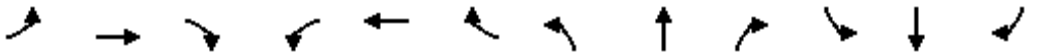
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	346	87	13	603	0	0	217	9	123	268	199
Future Volume (vph)	80	346	87	13	603	0	0	217	9	123	268	199
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7		3.7	2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00			0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1770	3187		1770	3303			1850		1770	3257	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1770	3187		1770	3303			1850		1770	3257	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	364	92	14	635	0	0	228	9	129	282	209
RTOR Reduction (vph)	0	13	0	0	0	0	0	2	0	0	109	0
Lane Group Flow (vph)	84	443	0	14	635	0	0	235	0	129	382	0
Confl. Peds. (#/hr)	39		14	14					19	19		31
Confl. Bikes (#/hr)			1									1
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	6.9	33.4		1.1	27.6			15.8		10.5	30.0	
Effective Green, g (s)	6.9	34.4		1.1	28.6			15.8		10.5	30.0	
Actuated g/C Ratio	0.09	0.46		0.01	0.38			0.21		0.14	0.40	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	161	1450		25	1249			386		245	1292	
v/s Ratio Prot	c0.05	c0.14		0.01	c0.19			c0.13		c0.07	0.12	
v/s Ratio Perm												
v/c Ratio	0.52	0.31		0.56	0.51			0.61		0.53	0.30	
Uniform Delay, d1	32.8	13.0		37.0	18.1			27.1		30.2	15.6	
Progression Factor	1.00	1.00		1.39	0.45			1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.1		14.8	0.3			2.7		0.9	0.1	
Delay (s)	34.2	13.2		66.3	8.4			29.8		31.2	15.7	
Level of Service	C	B		E	A			C		C	B	
Approach Delay (s)		16.4			9.6			29.8			18.9	
Approach LOS		B			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	75.6	Sum of lost time (s)	14.8
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	355	0	138	606	56	7	48	122	0	98	207
Future Volume (vph)	89	355	0	138	606	56	7	48	122	0	98	207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.99			1.00	0.85		0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)	1736	3471		1736	3421			1816	1523		1626	
Flt Permitted	0.95	1.00		0.95	1.00			0.97	1.00		1.00	
Satd. Flow (perm)	1736	3471		1736	3421			1764	1523		1626	
Peak-hour factor, PHF	0.97	0.97	0.92	0.97	0.97	0.97	0.97	0.97	0.97	0.92	0.97	0.97
Adj. Flow (vph)	92	366	0	142	625	58	7	49	126	0	101	213
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	76	0	90	0
Lane Group Flow (vph)	92	366	0	142	678	0	0	56	50	0	224	0
Confl. Peds. (#/hr)				8					10			
Confl. Bikes (#/hr)						1						2
Heavy Vehicles (%)	4%	4%	2%	4%	4%	4%	4%	4%	4%	2%	4%	4%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	7.0	23.4		11.1	27.5			30.0	30.0		30.0	
Effective Green, g (s)	7.0	23.4		11.1	28.5			31.0	30.0		31.0	
Actuated g/C Ratio	0.09	0.31		0.15	0.38			0.41	0.40		0.41	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	160	1074		254	1289			723	604		666	
v/s Ratio Prot	c0.05	0.11		c0.08	c0.20						c0.14	
v/s Ratio Perm								0.03	0.03			
v/c Ratio	0.57	0.34		0.56	0.53			0.08	0.08		0.34	
Uniform Delay, d1	32.9	20.1		30.0	18.3			13.6	14.2		15.3	
Progression Factor	1.19	0.90		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	3.0	0.2		1.5	0.4			0.0	0.1		0.3	
Delay (s)	42.0	18.2		31.5	18.7			13.6	14.3		15.6	
Level of Service	D	B		C	B			B	B		B	
Approach Delay (s)		23.0			20.9			14.1			15.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	75.6	Sum of lost time (s)	14.8
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↑↑↑	↱		↰↰	↑↑					↰	↕↱
Traffic Volume (veh/h)	0	461	146	1	419	834	0	0	0	0	197	113
Future Volume (veh/h)	0	461	146	1	419	834	0	0	0	0	197	113
Initial Q (Qb), veh	0	0	0		0	0	0				0	0
Ped-Bike Adj(A_pbT)	1.00		1.00		1.00		1.00				1.00	
Parking Bus, Adj	1.00	1.00	1.00		1.00	1.00	1.00				1.00	1.00
Work Zone On Approach		No				No						No
Adj Sat Flow, veh/h/ln	0	1900	1900		1900	1900	0				1900	1900
Adj Flow Rate, veh/h	0	507	0		460	916	0				235	98
Peak Hour Factor	0.91	0.91	0.91		0.91	0.91	0.91				0.91	0.91
Percent Heavy Veh, %	0	0	0		0	0	0				0	0
Cap, veh/h	0	1960			1297	2898	0				335	176
Arrive On Green	0.00	0.38	0.00		0.74	1.00	0.00				0.09	0.09
Sat Flow, veh/h	0	5358	1610		3510	3705	0				3619	1900
Grp Volume(v), veh/h	0	507	0		460	916	0				235	98
Grp Sat Flow(s),veh/h/ln	0	1729	1610		1755	1805	0				1810	1900
Q Serve(g_s), s	0.0	6.1	0.0		4.2	0.0	0.0				5.7	4.4
Cycle Q Clear(g_c), s	0.0	6.1	0.0		4.2	0.0	0.0				5.7	4.4
Prop In Lane	0.00		1.00		1.00		0.00				1.00	
Lane Grp Cap(c), veh/h	0	1960			1297	2898	0				335	176
V/C Ratio(X)	0.00	0.26			0.35	0.32	0.00				0.70	0.56
Avail Cap(c_a), veh/h	0	1960			1297	2898	0				869	456
HCM Platoon Ratio	1.00	1.00	1.00		2.00	2.00	1.00				1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00		0.74	0.74	0.00				1.00	1.00
Uniform Delay (d), s/veh	0.0	19.3	0.0		7.9	0.0	0.0				39.6	39.1
Incr Delay (d2), s/veh	0.0	0.3	0.0		0.0	0.2	0.0				1.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0		0.0	0.0	0.0				0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.3	0.0		1.3	0.1	0.0				2.5	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	19.6	0.0		8.0	0.2	0.0				40.6	40.1
LnGrp LOS	A	B			A	A	A				D	D
Approach Vol, veh/h		507	A			1376						352
Approach Delay, s/veh		19.6				2.8						40.3
Approach LOS		B				A						D

Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	38.3	39.0		12.7		77.3						
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0						
Max Green Setting (Gmax), s	21.5	* 34		21.6		59.0						
Max Q Clear Time (g_c+I1), s	6.2	8.1		7.7		2.0						
Green Ext Time (p_c), s	0.8	4.7		0.7		11.9						

Intersection Summary		
HCM 6th Ctrl Delay		12.5
HCM 6th LOS		B

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	260
Future Volume (veh/h)	260
Initial Q (Qb), veh	0
Ped-Bike Adj(A_pbT)	1.00
Parking Bus, Adj	1.00
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	1900
Adj Flow Rate, veh/h	19
Peak Hour Factor	0.91
Percent Heavy Veh, %	0
Cap, veh/h	149
Arrive On Green	0.09
Sat Flow, veh/h	1610
Grp Volume(v), veh/h	19
Grp Sat Flow(s),veh/h/ln	1610
Q Serve(g_s), s	1.0
Cycle Q Clear(g_c), s	1.0
Prop In Lane	1.00
Lane Grp Cap(c), veh/h	149
V/C Ratio(X)	0.13
Avail Cap(c_a), veh/h	386
HCM Platoon Ratio	1.00
Upstream Filter(I)	1.00
Uniform Delay (d), s/veh	37.5
Incr Delay (d2), s/veh	0.1
Initial Q Delay(d3),s/veh	0.0
%ile BackOfQ(50%),veh/ln	0.4
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	37.6
LnGrp LOS	D
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	

Timer - Assigned Phs

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	19.5
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	29	16	20	168	0	192	8	0	362	91	134	469
Future Vol, veh/h	29	16	20	168	0	192	8	0	362	91	134	469
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	30	16	20	171	0	196	8	0	369	93	137	479
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	12.9	30.2	19.3	14
HCM LOS	B	D	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	45%	47%	100%	0%	0%
Vol Thru, %	100%	67%	25%	0%	0%	100%	100%
Vol Right, %	0%	33%	31%	53%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	189	272	65	360	134	235	235
LT Vol	0	0	29	168	134	0	0
Through Vol	189	181	16	0	0	235	235
RT Vol	0	91	20	192	0	0	0
Lane Flow Rate	193	278	66	367	137	239	239
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.426	0.594	0.158	0.76	0.295	0.482	0.364
Departure Headway (Hd)	7.948	7.705	8.549	7.445	7.772	7.257	5.474
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	451	466	419	485	462	495	653
Service Time	5.719	5.476	6.329	5.2	5.534	5.019	3.234
HCM Lane V/C Ratio	0.428	0.597	0.158	0.757	0.297	0.483	0.366
HCM Control Delay	16.5	21.2	12.9	30.2	13.8	16.6	11.4
HCM Lane LOS	C	C	B	D	B	C	B
HCM 95th-tile Q	2.1	3.8	0.6	6.5	1.2	2.6	1.7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.98
Heavy Vehicles, %	2
Mvmt Flow	0
Number of Lanes	0

Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	391	333	26	417	689	0	0	0	0	164	0
Future Volume (vph)	0	391	333	26	417	689	0	0	0	0	164	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0					4.5	4.5
Lane Util. Factor		0.95			0.91	0.91					0.95	0.95
Frpb, ped/bikes		0.99			1.00	1.00					1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00					1.00	1.00
Frt		0.93			1.00	1.00					1.00	1.00
Flt Protected		1.00			0.95	1.00					0.95	0.95
Satd. Flow (prot)		3242			1595	3341					1665	1665
Flt Permitted		1.00			0.95	1.00					0.95	0.95
Satd. Flow (perm)		3242			1595	3341					1665	1665
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	412	351	27	439	725	0	0	0	0	173	0
RTOR Reduction (vph)	0	158	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	605	0	0	387	804	0	0	0	0	86	87
Confl. Peds. (#/hr)	6		2		2		6					
Confl. Bikes (#/hr)							6					
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type		NA		Split	Split	NA					Split	NA
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		19.8			24.7	24.7					7.3	7.3
Effective Green, g (s)		19.8			24.7	24.7					7.3	7.3
Actuated g/C Ratio		0.30			0.37	0.37					0.11	0.11
Clearance Time (s)		5.0			5.0	5.0					4.5	4.5
Vehicle Extension (s)		3.0			3.0	3.0					3.0	3.0
Lane Grp Cap (vph)		968			594	1244					183	183
v/s Ratio Prot		c0.19			c0.24	0.24					0.05	0.05
v/s Ratio Perm												
v/c Ratio		0.63			0.65	0.65					0.47	0.48
Uniform Delay, d1		20.1			17.2	17.2					27.7	27.7
Progression Factor		1.00			1.00	1.00					1.00	1.00
Incremental Delay, d2		1.3			2.6	1.2					1.9	1.9
Delay (s)		21.3			19.8	18.4					29.6	29.6
Level of Service		C			B	B					C	C
Approach Delay (s)		21.3				18.8			0.0			20.1
Approach LOS		C				B			A			C

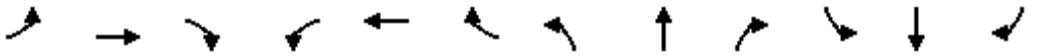
Intersection Summary			
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	66.3	Sum of lost time (s)	14.5
Intersection Capacity Utilization	60.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	312
Future Volume (vph)	312
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.0
Lane Util. Factor	1.00
Frpb, ped/bikes	1.00
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	328
RTOR Reduction (vph)	15
Lane Group Flow (vph)	313
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	3%
Turn Type	custom
Protected Phases	5
Permitted Phases	4
Actuated Green, G (s)	27.1
Effective Green, g (s)	27.1
Actuated g/C Ratio	0.41
Clearance Time (s)	5.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	640
v/s Ratio Prot	c0.15
v/s Ratio Perm	0.05
v/c Ratio	0.49
Uniform Delay, d1	14.5
Progression Factor	1.00
Incremental Delay, d2	0.6
Delay (s)	15.1
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary

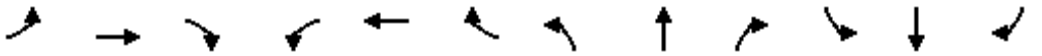
HCM Signalized Intersection Capacity Analysis
23: US 101 NB Off Ramp/US 101 NB On Ramp & San Bruno Ave/San Bruno Avenue

01/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	388	0	0	698	347	350	0	333	104	0	72
Future Volume (vph)	195	388	0	0	698	347	350	0	333	104	0	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00	1.00	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3367	1827			3471	1518		1736	1553	1736		1553
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3367	1827			3471	1518		1736	1553	1736		1553
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	210	417	0	0	751	373	376	0	358	112	0	77
RTOR Reduction (vph)	0	0	0	0	0	272	0	0	261	0	0	68
Lane Group Flow (vph)	210	417	0	0	751	101	0	376	97	112	0	9
Confl. Peds. (#/hr)	6		2	2		6						
Confl. Bikes (#/hr)						7						
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	11.0	36.8			21.3	21.3		21.1	21.1	9.0		9.0
Effective Green, g (s)	11.0	36.8			21.3	21.3		21.1	21.1	9.0		9.0
Actuated g/C Ratio	0.14	0.47			0.27	0.27		0.27	0.27	0.11		0.11
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	472	857			943	412		467	417	199		178
v/s Ratio Prot	0.06	c0.23			c0.22					c0.06		0.01
v/s Ratio Perm						0.07		0.22	0.06			
v/c Ratio	0.44	0.49			0.80	0.25		0.81	0.23	0.56		0.05
Uniform Delay, d1	30.9	14.3			26.5	22.3		26.7	22.3	32.8		30.9
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	0.7	0.2			4.4	0.1		9.2	0.1	2.2		0.0
Delay (s)	31.6	14.5			31.0	22.4		36.0	22.4	35.0		30.9
Level of Service	C	B			C	C		D	C	D		C
Approach Delay (s)		20.2			28.1			29.4			33.3	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	78.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	201	471	128	70	1100	150	100	120	40	120	120	400
Future Volume (veh/h)	201	471	128	70	1100	150	100	120	40	120	120	400
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945
Adj Flow Rate, veh/h	216	506	119	75	1183	161	108	129	43	129	129	430
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	431	1566	366	96	1100	149	98	357	119	193	157	830
Arrive On Green	0.24	0.55	0.55	0.05	0.35	0.35	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	1781	2857	668	1781	3142	426	848	1333	444	518	585	1610
Grp Volume(v), veh/h	216	314	311	75	667	677	108	0	172	258	0	430
Grp Sat Flow(s),veh/h/ln	1781	1777	1748	1781	1777	1791	848	0	1778	1104	0	1610
Q Serve(g_s), s	10.5	9.7	9.8	4.2	35.0	35.0	3.1	0.0	7.8	15.8	0.0	0.0
Cycle Q Clear(g_c), s	10.5	9.7	9.8	4.2	35.0	35.0	26.8	0.0	7.8	23.7	0.0	0.0
Prop In Lane	1.00		0.38	1.00		0.24	1.00		0.25	0.50		1.00
Lane Grp Cap(c), veh/h	431	974	958	96	622	627	98	0	476	350	0	830
V/C Ratio(X)	0.50	0.32	0.32	0.78	1.07	1.08	1.10	0.00	0.36	0.74	0.00	0.52
Avail Cap(c_a), veh/h	431	974	958	143	622	627	98	0	476	382	0	866
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.93	0.93	0.93	0.55	0.55	0.55	1.00	0.00	1.00	0.93	0.00	0.93
Uniform Delay (d), s/veh	32.7	12.4	12.4	46.7	32.5	32.5	49.6	0.0	29.7	38.2	0.0	16.2
Incr Delay (d2), s/veh	0.3	0.8	0.8	4.5	48.6	50.9	119.6	0.0	0.2	5.2	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	3.7	3.7	1.9	22.7	23.3	5.7	0.0	3.4	6.6	0.0	6.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.0	13.2	13.3	51.2	81.1	83.4	169.2	0.0	29.8	43.4	0.0	16.4
LnGrp LOS	C	B	B	D	F	F	F	A	C	D	A	B
Approach Vol, veh/h		841			1419			280			688	
Approach Delay, s/veh		18.3			80.6			83.6			26.5	
Approach LOS		B			F			F			C	

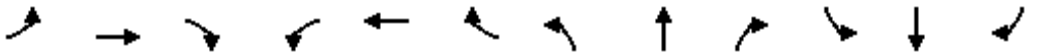
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	29.2	40.0		30.8	9.4	59.8		30.8				
Change Period (Y+Rc), s	5.0	* 5		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	23.0	* 35		29.0	8.0	46.0		25.0				
Max Q Clear Time (g_c+I1), s	12.5	37.0		25.7	6.2	11.8		28.8				
Green Ext Time (p_c), s	0.2	0.0		0.8	0.0	5.8		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		53.1	
HCM 6th LOS		D	

Notes

User approved pedestrian interval to be less than phase max green.

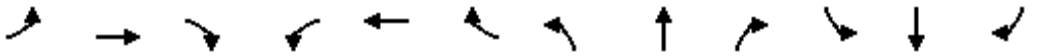
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	480	0	1212	0	1569	318	0	1658	352
Future Volume (vph)	0	0	0	480	0	1212	0	1569	318	0	1658	352
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.6		4.6		4.4	4.4		4.4	4.4
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.94		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3467		2814		5136	1498		5136	1559
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3467		2814		5136	1498		5136	1559
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	500	0	1262	0	1634	331	0	1727	367
RTOR Reduction (vph)	0	0	0	0	0	8	0	0	174	0	0	94
Lane Group Flow (vph)	0	0	0	500	0	1255	0	1634	157	0	1727	273
Confl. Peds. (#/hr)							8		13	13		8
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				29.3		69.9		71.1	71.1		111.7	111.7
Effective Green, g (s)				29.3		66.3		71.1	71.1		111.7	111.7
Actuated g/C Ratio				0.20		0.44		0.47	0.47		0.74	0.74
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				677		1243		2434	710		3824	1160
v/s Ratio Prot				0.14		c0.45		c0.32			0.34	
v/s Ratio Perm									0.10			0.18
v/c Ratio				0.74		1.01		0.67	0.22		0.45	0.24
Uniform Delay, d1				56.7		41.9		30.4	23.2		7.4	5.9
Progression Factor				1.00		1.00		0.86	1.58		1.00	1.00
Incremental Delay, d2				3.6		27.8		1.2	0.6		0.4	0.5
Delay (s)				60.4		69.7		27.2	37.1		7.8	6.4
Level of Service				E		E		C	D		A	A
Approach Delay (s)		0.0			67.1			28.9			7.5	
Approach LOS		A			E			C			A	

Intersection Summary			
HCM 2000 Control Delay	32.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	278	0	376	0	0	0	0	1602	506	0	1438	704
Future Volume (vph)	278	0	376	0	0	0	0	1602	506	0	1438	704
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.89	0.85					0.96			1.00	0.85
Flt Protected	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1698	1498	1519					4753			5136	1536
Flt Permitted	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1698	1498	1519					4753			5136	1536
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	293	0	396	0	0	0	0	1686	533	0	1514	741
RTOR Reduction (vph)	0	59	59	0	0	0	0	0	0	0	0	161
Lane Group Flow (vph)	240	168	163	0	0	0	0	2219	0	0	1514	580
Confl. Peds. (#/hr)	4					4	5		14	14		5
Confl. Bikes (#/hr)												2
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	23.5	23.5	23.5					117.5			117.5	117.5
Effective Green, g (s)	23.5	23.5	23.5					117.5			117.5	117.5
Actuated g/C Ratio	0.16	0.16	0.16					0.78			0.78	0.78
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	266	234	237					3723			4023	1203
v/s Ratio Prot	c0.14	0.11						c0.47			0.29	
v/s Ratio Perm			0.11									0.38
v/c Ratio	0.90	0.72	0.69					0.60			0.38	0.48
Uniform Delay, d1	62.1	60.1	59.8					6.6			5.0	5.7
Progression Factor	1.00	1.00	1.00					1.50			1.44	5.78
Incremental Delay, d2	30.3	8.4	6.5					0.6			0.2	1.2
Delay (s)	92.4	68.5	66.2					10.5			7.4	33.9
Level of Service	F	E	E					B			A	C
Approach Delay (s)		76.1			0.0			10.5			16.2	
Approach LOS		E			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	181	286	214	299	428	184	10	313	1301	124	58	267
Future Volume (veh/h)	181	286	214	299	428	184	10	313	1301	124	58	267
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		0.96		1.00		0.98		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885		1885	1885	1885		1885
Adj Flow Rate, veh/h	193	304	99	318	455	161		333	1384	78		284
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		0.94	0.94	0.94		0.94
Percent Heavy Veh, %	1	1	1	1	1	1		1	1	1		1
Cap, veh/h	215	853	363	361	572	200		960	1396	426		972
Arrive On Green	0.12	0.24	0.24	0.10	0.22	0.22		0.28	0.27	0.27		0.28
Sat Flow, veh/h	1795	3582	1524	3483	2574	902		3483	5147	1569		3483
Grp Volume(v), veh/h	193	304	99	318	315	301		333	1384	78		284
Grp Sat Flow(s),veh/h/ln	1795	1791	1524	1742	1791	1684		1742	1716	1569		1742
Q Serve(g_s), s	15.9	10.6	4.5	13.5	24.9	25.4		11.5	40.2	4.5		9.6
Cycle Q Clear(g_c), s	15.9	10.6	4.5	13.5	24.9	25.4		11.5	40.2	4.5		9.6
Prop In Lane	1.00		1.00	1.00		0.54		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	215	853	363	361	398	374		960	1396	426		972
V/C Ratio(X)	0.90	0.36	0.27	0.88	0.79	0.80		0.35	0.99	0.18		0.29
Avail Cap(c_a), veh/h	455	931	396	488	430	404		960	1396	426		972
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	0.93	0.93	0.93	0.09	0.09	0.09		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	65.1	47.6	14.8	66.3	55.1	55.3		43.5	54.5	26.0		42.5
Incr Delay (d2), s/veh	5.0	0.1	0.1	1.2	0.8	0.9		0.1	22.1	0.9		0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	7.6	4.8	2.9	6.0	11.3	10.8		5.0	20.0	2.3		4.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.1	47.7	14.9	67.5	55.9	56.2		43.6	76.5	27.0		42.5
LnGrp LOS	E	D	B	E	E	E		D	E	C		D
Approach Vol, veh/h		596			934				1795			
Approach Delay, s/veh		49.5			59.9				68.3			
Approach LOS		D			E				E			

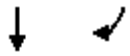
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	44.8	45.3	21.4	38.4	45.3	44.8	19.0	40.8
Change Period (Y+Rc), s	3.5	4.6	3.5	* 5.1	3.5	4.1	3.5	5.1
Max Green Setting (Gmax), s	20.0	40.7	38.0	* 36	19.0	40.7	21.0	39.0
Max Q Clear Time (g_c+I1), s	13.5	37.1	17.9	27.4	11.6	42.2	15.5	12.6
Green Ext Time (p_c), s	0.0	1.0	0.0	0.5	0.0	0.0	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	60.2
HCM 6th LOS	E

Notes

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1176	195
Future Volume (veh/h)	1176	195
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		0.98
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1885	1885
Adj Flow Rate, veh/h	1251	153
Peak Hour Factor	0.94	0.94
Percent Heavy Veh, %	1	1
Cap, veh/h	1396	426
Arrive On Green	0.27	0.27
Sat Flow, veh/h	5147	1569
Grp Volume(v), veh/h	1251	153
Grp Sat Flow(s),veh/h/ln	1716	1569
Q Serve(g_s), s	35.1	9.0
Cycle Q Clear(g_c), s	35.1	9.0
Prop In Lane		1.00
Lane Grp Cap(c), veh/h	1396	426
V/C Ratio(X)	0.90	0.36
Avail Cap(c_a), veh/h	1396	426
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	52.6	25.6
Incr Delay (d2), s/veh	9.3	2.4
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.2	3.7
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	61.9	28.0
LnGrp LOS	E	C
Approach Vol, veh/h	1688	
Approach Delay, s/veh	55.5	
Approach LOS	E	
Timer - Assigned Phs		

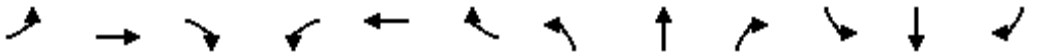
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	77	67	48	358	152	367	96	205	1633	329	49	184
Future Volume (veh/h)	77	67	48	358	152	367	96	205	1633	329	49	184
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.98		0.97		1.00		1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885		1885	1885	1885		1885
Adj Flow Rate, veh/h	81	71	24	268	312	138		216	1719	234		194
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	1	1	1	1	1	1		1	1	1		1
Cap, veh/h	146	308	104	315	476	391		243	2834	876		220
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25		0.14	0.55	0.55		0.12
Sat Flow, veh/h	389	1219	412	1291	1885	1545		1795	5147	1591		1795
Grp Volume(v), veh/h	81	0	95	268	312	138		216	1719	234		194
Grp Sat Flow(s),veh/h/ln	389	0	1631	1291	1885	1545		1795	1716	1591		1795
Q Serve(g_s), s	12.7	0.0	6.9	31.0	22.2	11.0		17.7	33.8	11.6		15.9
Cycle Q Clear(g_c), s	34.9	0.0	6.9	37.9	22.2	11.0		17.7	33.8	11.6		15.9
Prop In Lane	1.00		0.25	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	146	0	412	315	476	391		243	2834	876		220
V/C Ratio(X)	0.55	0.00	0.23	0.85	0.65	0.35		0.89	0.61	0.27		0.88
Avail Cap(c_a), veh/h	247	0	587	315	476	391		431	2834	876		395
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	65.8	0.0	44.5	59.6	50.2	46.0		63.8	22.7	17.8		64.7
Incr Delay (d2), s/veh	3.2	0.0	0.3	19.6	3.2	0.5		10.8	1.0	0.7		10.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	3.2	0.0	2.9	11.9	11.0	4.4		8.9	13.9	4.5		8.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	69.0	0.0	44.8	79.2	53.4	46.5		74.5	23.7	18.5		75.6
LnGrp LOS	E	A	D	E	D	D		E	C	B		E
Approach Vol, veh/h		176			718				2169			
Approach Delay, s/veh		55.9			61.7				28.2			
Approach LOS		E			E				C			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.3	85.1		41.6	21.4	87.0		41.6				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	36.0	48.9		36.0	33.0	27.6		54.0				
Max Q Clear Time (g_c+I1), s	19.7	20.9		39.9	17.9	35.8		36.9				
Green Ext Time (p_c), s	0.5	8.9		0.0	0.5	0.0		1.0				

Intersection Summary		
HCM 6th Ctrl Delay		35.1
HCM 6th LOS		D

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	969	101
Future Volume (veh/h)	969	101
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		1.00
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1885	1885
Adj Flow Rate, veh/h	1020	100
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	1	1
Cap, veh/h	2563	251
Arrive On Green	0.54	0.54
Sat Flow, veh/h	4764	466
Grp Volume(v), veh/h	734	386
Grp Sat Flow(s),veh/h/ln	1716	1799
Q Serve(g_s), s	18.9	18.9
Cycle Q Clear(g_c), s	18.9	18.9
Prop In Lane		0.26
Lane Grp Cap(c), veh/h	1846	968
V/C Ratio(X)	0.40	0.40
Avail Cap(c_a), veh/h	1846	968
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	20.4	20.4
Incr Delay (d2), s/veh	0.6	1.2
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.8	8.4
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	21.0	21.6
LnGrp LOS	C	C
Approach Vol, veh/h	1314	
Approach Delay, s/veh	29.2	
Approach LOS	C	
Timer - Assigned Phs		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	147	505	0	0	987	619	268	501	295	0	0	0
Future Volume (veh/h)	147	505	0	0	987	619	268	501	295	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1885	1885	1885			
Adj Flow Rate, veh/h	160	549	0	0	1073	0	291	545	321			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	1	1	1			
Cap, veh/h	226	2070	0	0	1677		559	586	497			
Arrive On Green	0.13	1.00	0.00	0.00	0.47	0.00	0.31	0.31	0.31			
Sat Flow, veh/h	3483	3676	0	0	3676	1598	1795	1885	1596			
Grp Volume(v), veh/h	160	549	0	0	1073	0	291	545	321			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1791	1598	1795	1885	1596			
Q Serve(g_s), s	4.0	0.0	0.0	0.0	20.5	0.0	12.0	25.2	15.6			
Cycle Q Clear(g_c), s	4.0	0.0	0.0	0.0	20.5	0.0	12.0	25.2	15.6			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	226	2070	0	0	1677		559	586	497			
V/C Ratio(X)	0.71	0.27	0.00	0.00	0.64		0.52	0.93	0.65			
Avail Cap(c_a), veh/h	232	2070	0	0	1677		579	607	514			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.96	0.96	0.00	0.00	0.56	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	38.3	0.0	0.0	0.0	18.2	0.0	25.5	30.0	26.7			
Incr Delay (d2), s/veh	7.4	0.3	0.0	0.0	1.1	0.0	0.3	20.1	2.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.8	0.1	0.0	0.0	8.0	0.0	5.0	14.1	6.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.8	0.3	0.0	0.0	19.2	0.0	25.8	50.1	28.8			
LnGrp LOS	D	A	A	A	B		C	D	C			
Approach Vol, veh/h		709			1073	A		1157				
Approach Delay, s/veh		10.6			19.2			38.1				
Approach LOS		B			B			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		57.0			9.9	47.1		33.0				
Change Period (Y+Rc), s		5.0			4.0	5.0		5.0				
Max Green Setting (Gmax), s		51.0			6.0	41.0		29.0				
Max Q Clear Time (g_c+I1), s		2.0			6.0	22.5		27.2				
Green Ext Time (p_c), s		5.7			0.0	9.6		0.8				

Intersection Summary	
HCM 6th Ctrl Delay	24.5
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	0
Future Volume (veh/h)	0
Initial Q (Qb), veh	
Ped-Bike Adj(A_pbT)	
Parking Bus, Adj	
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	
Adj Flow Rate, veh/h	
Peak Hour Factor	
Percent Heavy Veh, %	
Cap, veh/h	
Arrive On Green	
Sat Flow, veh/h	
Grp Volume(v), veh/h	
Grp Sat Flow(s),veh/h/ln	
Q Serve(g_s), s	
Cycle Q Clear(g_c), s	
Prop In Lane	
Lane Grp Cap(c), veh/h	
V/C Ratio(X)	
Avail Cap(c_a), veh/h	
HCM Platoon Ratio	
Upstream Filter(I)	
Uniform Delay (d), s/veh	
Incr Delay (d2), s/veh	
Initial Q Delay(d3),s/veh	
%ile BackOfQ(50%),veh/ln	
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	
LnGrp LOS	
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	
Timer - Assigned Phs	

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2: Train & Scott St Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.1	0.1	0.1
Total Del/Veh (s)	2.0	7.7	3.9	5.3
Vehicles Entered	122	173	9	304
Vehicles Exited	122	173	9	304
Hourly Exit Rate	122	173	9	304
Input Volume	126	170	9	305
% of Volume	97	102	97	100
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)		0.1	0.1	0.0	0.0	0.0	0.2	0.3	0.2	0.2	0.3	0.2
Total Del/Veh (s)		9.2	3.2	4.1	1.0	2.8	8.1	9.1	6.8	8.1	7.5	6.1
Vehicles Entered	0	5	7	138	1	28	7	129	81	35	197	5
Vehicles Exited	0	5	7	138	1	28	7	129	82	34	198	4
Hourly Exit Rate	0	5	7	138	1	28	7	129	82	34	198	4
Input Volume	1	5	7	139	1	25	9	136	82	38	201	4
% of Volume	0	100	100	99	133	113	76	95	100	90	98	100
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	6.8
Vehicles Entered	633
Vehicles Exited	633
Hourly Exit Rate	633
Input Volume	648
% of Volume	98
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.2	0.3	0.3	0.3	0.3
Total Del/Veh (s)	5.1	0.6	3.8	5.8	6.2	7.8	5.8	6.3
Vehicles Entered	44	4	76	63	154	236	103	680
Vehicles Exited	44	4	76	63	154	237	104	682
Hourly Exit Rate	44	4	76	63	154	237	104	682
Input Volume	49	4	76	57	156	241	107	690
% of Volume	89	94	100	111	99	98	97	99
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	11.7
Vehicles Entered	1042
Vehicles Exited	1041
Hourly Exit Rate	1041
Input Volume	2985
% of Volume	35
Denied Entry Before	0
Denied Entry After	0

Intersection: 2: Train & Scott St

Movement	EB	WB	SB
Directions Served	T	T	T
Maximum Queue (ft)	82	145	28
Average Queue (ft)	14	38	2
95th Queue (ft)	53	102	15
Link Distance (ft)	8	138	482
Upstream Blk Time (%)	5	1	
Queuing Penalty (veh)	7	1	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Dollar Ave/Herman Ave & Scott St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	39	66	143	152
Average Queue (ft)	10	35	52	72
95th Queue (ft)	35	47	99	118
Link Distance (ft)	516	8	947	1729
Upstream Blk Time (%)		13		
Queuing Penalty (veh)		21		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

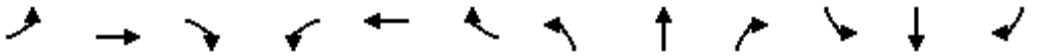
Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	78	115	134
Average Queue (ft)	40	55	74
95th Queue (ft)	64	88	113
Link Distance (ft)	186	939	1415
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 29

2024 No Project AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	54	465	154	4	31	131	0	0	375	34
Future Volume (vph)	0	0	54	465	154	4	31	131	0	0	375	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.6	4.0	4.0			4.6			4.6	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.99	
Flt Protected			1.00	0.95	0.98			0.99			1.00	
Satd. Flow (prot)			1580	1649	1690			3438			3411	
Flt Permitted			1.00	0.95	0.98			0.99			1.00	
Satd. Flow (perm)			1580	1649	1690			3438			3411	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	0	61	528	175	5	35	149	0	0	426	39
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	0	61	348	360	0	0	184	0	0	458	0
Confl. Peds. (#/hr)							10					10
Confl. Bikes (#/hr)									5			5
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	2%	4%	4%	4%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			11.6	52.2	52.2			11.6			23.0	
Effective Green, g (s)			11.6	52.2	52.2			11.6			23.0	
Actuated g/C Ratio			0.12	0.52	0.52			0.12			0.23	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			183	860	882			398			784	
v/s Ratio Prot			0.04					c0.05			c0.13	
v/s Ratio Perm				0.21	0.21							
v/c Ratio			0.33	0.40	0.41			0.46			0.58	
Uniform Delay, d1			40.6	14.5	14.5			41.3			34.2	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			1.5	1.4	1.4			1.2			3.2	
Delay (s)			42.1	15.9	15.9			42.4			37.4	
Level of Service			D	B	B			D			D	
Approach Delay (s)		42.1			15.9			42.4			37.4	
Approach LOS		D			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/24/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	543	283	26	129	146	4	386	214
Future Volume (veh/h)	543	283	26	129	146	4	386	214
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.95
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1590	1710		1590	1590		1590	1590
Adj Flow Rate, veh/h	390	402		134	152		402	36
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	9	0		9	9		9	9
Cap, veh/h	454	434		1175	1856		509	217
Arrive On Green	0.30	0.30		0.40	0.61		0.17	0.17
Sat Flow, veh/h	1514	1449		2938	3100		3100	1286
Grp Volume(v), veh/h	390	402		134	152		402	36
Grp Sat Flow(s),veh/h/ln	1514	1449		1469	1510		1510	1286
Q Serve(g_s), s	24.3	26.9		2.9	2.0		12.8	2.4
Cycle Q Clear(g_c), s	24.3	26.9		2.9	2.0		12.8	2.4
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	454	434		1175	1856		509	217
V/C Ratio(X)	0.86	0.93		0.11	0.08		0.79	0.17
Avail Cap(c_a), veh/h	500	478		1175	1856		1190	507
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.92	0.92		0.71	0.71		0.77	0.77
Uniform Delay (d), s/veh	33.0	33.9		18.9	7.8		39.9	35.6
Incr Delay (d2), s/veh	11.3	20.8		0.0	0.1		9.3	1.3
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	10.2	11.8		1.0	0.6		5.3	0.8
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	44.3	54.7		18.9	7.9		49.2	36.8
LnGrp LOS	D	D		B	A		D	D
Approach Vol, veh/h	792				286		438	
Approach Delay, s/veh	49.6				13.0		48.1	
Approach LOS	D				B		D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	44.6	21.5				66.0		34.0
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	13.0	* 39				48.4		33.0
Max Q Clear Time (g_c+I1), s	4.9	14.8				4.0		28.9
Green Ext Time (p_c), s	0.2	1.7				0.6		1.1

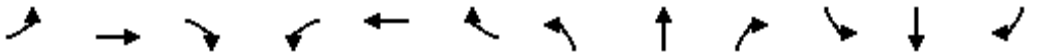
Intersection Summary	
HCM 6th Ctrl Delay	42.3
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

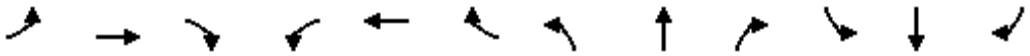
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	187	216	83	202	116	62	35	350	297	403	392	124
Future Volume (vph)	187	216	83	202	116	62	35	350	297	403	392	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.98		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (prot)		2999		2814	1527	1298	1464	2927	1309	1421	2954	1264
Flt Permitted		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (perm)		2999		2814	1527	1298	1464	2927	1309	1421	2954	1264
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	197	227	87	213	122	65	37	368	313	424	413	131
RTOR Reduction (vph)	0	17	0	0	0	58	0	0	0	0	0	86
Lane Group Flow (vph)	0	494	0	213	122	7	37	368	313	280	557	45
Confl. Peds. (#/hr)			65									25
Heavy Vehicles (%)	2%	2%	2%	12%	12%	12%	11%	11%	11%	4%	4%	4%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		22.8		11.0	11.0	11.0	16.8	16.8	73.3	35.7	35.7	35.7
Effective Green, g (s)		22.8		11.0	11.0	11.0	16.8	16.8	73.3	35.7	35.7	35.7
Actuated g/C Ratio		0.22		0.10	0.10	0.10	0.16	0.16	0.70	0.34	0.34	0.34
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		651		294	159	135	234	468	913	483	1004	429
v/s Ratio Prot		c0.16		0.08	c0.08		0.03	c0.13	0.24	c0.20	0.19	
v/s Ratio Perm						0.01						0.04
v/c Ratio		0.76		0.72	0.77	0.05	0.16	0.79	0.34	0.58	0.55	0.10
Uniform Delay, d1		38.5		45.5	45.8	42.3	38.0	42.4	6.3	28.5	28.2	23.7
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		4.5		8.6	19.6	0.2	0.2	8.2	0.2	5.0	2.2	0.5
Delay (s)		43.0		54.1	65.4	42.5	38.2	50.6	6.5	33.5	30.4	24.2
Level of Service		D		D	E	D	D	D	A	C	C	C
Approach Delay (s)		43.0			55.6			30.7			30.5	
Approach LOS		D			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

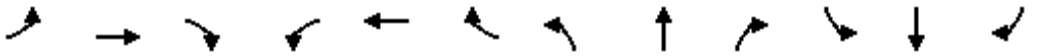
! Phase conflict between lane groups.
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	358	41	241	78	12	10	122	442	42	237	12
Future Volume (vph)	28	358	41	241	78	12	10	122	442	42	237	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		3.5	3.5			3.0	3.0		3.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		1.00		1.00	0.99			1.00	1.00		1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.99	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2764		1413	1449			1481	2224		1465	
Flt Permitted		1.00		0.95	1.00			0.97	1.00		0.94	
Satd. Flow (perm)		2764		1413	1449			1448	2224		1393	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	30	385	44	259	84	13	11	131	475	45	255	13
RTOR Reduction (vph)	0	10	0	0	8	0	0	0	158	0	2	0
Lane Group Flow (vph)	0	449	0	259	89	0	0	142	317	0	311	0
Confl. Peds. (#/hr)			15			10			10			20
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		26.6		16.7	16.7			19.7	39.9		19.7	
Effective Green, g (s)		26.6		16.7	16.7			19.7	36.4		19.7	
Actuated g/C Ratio		0.36		0.23	0.23			0.27	0.50		0.27	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		1007		323	331			390	1108		375	
v/s Ratio Prot		c0.16		c0.18	0.06				0.14			
v/s Ratio Perm								0.10			c0.22	
v/c Ratio		0.45		0.80	0.27			0.36	0.29		0.83	
Uniform Delay, d1		17.6		26.6	23.1			21.6	10.7		25.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.4		12.6	0.2			0.2	0.1		13.4	
Delay (s)		19.0		39.2	23.3			21.8	10.8		38.4	
Level of Service		B		D	C			C	B		D	
Approach Delay (s)		19.0			34.9			13.3			38.4	
Approach LOS		B			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	126	187	151	315	172	173	165	40	415	208	647	101
Future Volume (veh/h)	126	187	151	315	172	173	165	40	415	208	647	101
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1441	1441	1441	1618	1618	1618	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	110	229	0	332	181	0	174	42	0	219	681	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	31	31	31	19	19	19	7	7	7	6	6	6
Cap, veh/h	155	326		488	256		204	836		522	1503	
Arrive On Green	0.11	0.11	0.00	0.05	0.05	0.00	0.12	0.25	0.00	0.30	0.44	0.00
Sat Flow, veh/h	1372	2881	1221	3083	1618	1372	1711	3503	0	1725	3441	1535
Grp Volume(v), veh/h	110	229	0	332	181	0	174	42	0	219	681	0
Grp Sat Flow(s),veh/h/ln	1372	1441	1221	1541	1618	1372	1711	1706	0	1725	1721	1535
Q Serve(g_s), s	8.1	8.0	0.0	11.1	11.6	0.0	10.5	1.0	0.0	10.7	14.6	0.0
Cycle Q Clear(g_c), s	8.1	8.0	0.0	11.1	11.6	0.0	10.5	1.0	0.0	10.7	14.6	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	155	326		488	256		204	836		522	1503	
V/C Ratio(X)	0.71	0.70		0.68	0.71		0.85	0.05		0.42	0.45	
Avail Cap(c_a), veh/h	289	606		611	321		293	836		522	1503	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.93	0.93	0.00	0.87	0.87	0.00	1.00	1.00	0.00	0.69	0.69	0.00
Uniform Delay (d), s/veh	44.9	44.9	0.0	47.1	47.4	0.0	45.3	30.3	0.0	29.3	20.8	0.0
Incr Delay (d2), s/veh	2.1	1.0	0.0	1.9	4.5	0.0	10.9	0.0	0.0	0.1	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	2.9	0.0	4.7	5.4	0.0	5.0	0.4	0.0	4.3	5.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.0	45.8	0.0	49.1	51.9	0.0	56.2	30.3	0.0	29.4	21.5	0.0
LnGrp LOS	D	D		D	D		E	C		C	C	
Approach Vol, veh/h		339	A		513	A		216	A		900	A
Approach Delay, s/veh		46.2			50.0			51.2			23.4	
Approach LOS		D			D			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	16.5	50.8		16.5	36.7	30.6		21.2				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	18.0	26.0		22.1	19.1	* 25		20.8				
Max Q Clear Time (g_c+I1), s	12.5	16.6		10.1	12.7	3.0		13.6				
Green Ext Time (p_c), s	0.2	3.4		1.0	0.2	0.1		1.6				

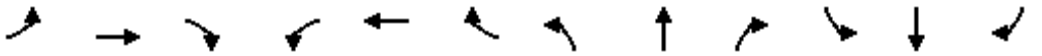
Intersection Summary			
HCM 6th Ctrl Delay		37.3	
HCM 6th LOS		D	

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	102	331	368	29	160	19	330	481	352	24	123	197
Future Volume (veh/h)	102	331	368	29	160	19	330	481	352	24	123	197
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.95	1.00		1.00	1.00		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1722	1722	1722	1574	1574	1574	1811	1811	1811	1663	1663	1663
Adj Flow Rate, veh/h	110	356	116	31	172	16	355	517	0	26	132	24
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	12	12	12	22	22	22	6	6	6	16	16	16
Cap, veh/h	227	419	347	85	220	20	1380	1419		183	192	150
Arrive On Green	0.04	0.08	0.08	0.06	0.16	0.16	0.43	0.43	0.00	0.12	0.12	0.12
Sat Flow, veh/h	1640	1722	1426	1499	1411	131	3346	3532	0	1584	1663	1300
Grp Volume(v), veh/h	110	356	116	31	0	188	355	517	0	26	132	24
Grp Sat Flow(s),veh/h/ln	1640	1722	1426	1499	0	1543	1673	1721	0	1584	1663	1300
Q Serve(g_s), s	6.9	21.5	8.1	2.1	0.0	12.3	7.2	10.7	0.0	1.6	8.0	1.7
Cycle Q Clear(g_c), s	6.9	21.5	8.1	2.1	0.0	12.3	7.2	10.7	0.0	1.6	8.0	1.7
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	227	419	347	85	0	240	1380	1419		183	192	150
V/C Ratio(X)	0.49	0.85	0.33	0.36	0.00	0.78	0.26	0.36		0.14	0.69	0.16
Avail Cap(c_a), veh/h	206	426	353	144	0	363	1423	1463		353	371	290
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.89	0.89	0.89	1.00	0.00	1.00	0.72	0.72	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.5	48.0	40.3	47.7	0.0	42.6	20.3	21.3	0.0	41.8	44.6	41.8
Incr Delay (d2), s/veh	1.0	13.2	0.4	1.0	0.0	3.0	0.3	0.5	0.0	0.1	1.6	0.2
Initial Q Delay(d3),s/veh	0.0	46.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	18.4	3.0	0.8	0.0	4.9	2.8	4.4	0.0	0.6	3.4	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.4	107.6	40.6	48.7	0.0	45.6	20.6	21.9	0.0	41.9	46.2	42.0
LnGrp LOS	D	F	D	D	A	D	C	C		D	D	D
Approach Vol, veh/h		582			219			872	A		182	
Approach Delay, s/veh		82.9			46.0			21.4			45.1	
Approach LOS		F			D			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	28.8		49.3	17.8	20.9		17.0				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.6	* 4.6		4.9				
Max Green Setting (Gmax), s	10.1	26.0		27.4	11.4	* 25		23.4				
Max Q Clear Time (g_c+I1), s	4.1	23.5		12.7	8.9	14.3		10.0				
Green Ext Time (p_c), s	0.0	0.6		2.9	0.0	0.4		0.4				

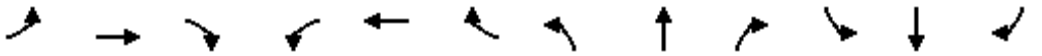
Intersection Summary			
HCM 6th Ctrl Delay		45.9	
HCM 6th LOS		D	

Notes

User approved volume balancing among the lanes for turning movement.

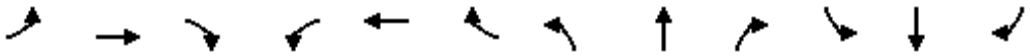
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	855	19	691	12	10	15	206	228	17	25	440	118
Future Volume (vph)	855	19	691	12	10	15	206	228	17	25	440	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	0.95	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1633	1641	2707		1697	1482	1656	3277		1626	3252	1455
Flt Permitted	0.95	0.95	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1633	1641	2707		1697	1482	1656	3277		1626	3252	1455
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	900	20	727	13	11	16	217	240	18	26	463	124
RTOR Reduction (vph)	0	0	515	0	0	15	0	4	0	0	0	93
Lane Group Flow (vph)	459	461	212	0	24	1	217	254	0	26	463	31
Heavy Vehicles (%)	5%	5%	5%	9%	9%	9%	9%	9%	9%	11%	11%	11%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	20.9	20.9	20.9		3.8	3.8	14.3	29.4		2.7	17.8	17.8
Effective Green, g (s)	20.9	20.9	20.9		3.8	3.8	14.3	29.4		2.7	17.8	17.8
Actuated g/C Ratio	0.29	0.29	0.29		0.05	0.05	0.20	0.41		0.04	0.25	0.25
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	476	479	790		90	78	330	1345		61	808	361
v/s Ratio Prot	c0.28	0.28			c0.01		c0.13	0.08		0.02	c0.14	
v/s Ratio Perm			0.08			0.00						0.02
v/c Ratio	0.96	0.96	0.27		0.27	0.01	0.66	0.19		0.43	0.57	0.09
Uniform Delay, d1	25.0	25.0	19.5		32.6	32.1	26.4	13.5		33.7	23.6	20.7
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	32.0	31.5	0.2		1.6	0.1	4.7	0.1		4.7	1.0	0.1
Delay (s)	57.0	56.4	19.7		34.2	32.2	31.1	13.5		38.4	24.6	20.8
Level of Service	E	E	B		C	C	C	B		D	C	C
Approach Delay (s)		40.3			33.4			21.6			24.4	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	33.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	71.6	Sum of lost time (s)	14.8
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



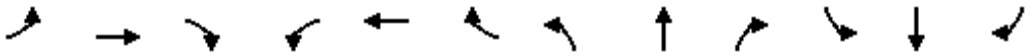
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	745	294	50	280	200	28	15	169	367	315	21
Future Volume (veh/h)	53	745	294	50	280	200	28	15	169	367	315	21
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	58	819	313	55	308	91	31	16	0	403	346	22
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	90	629	240	88	911	768	54	28		453	442	28
Arrive On Green	0.05	0.49	0.49	0.05	0.49	0.49	0.05	0.05	0.00	0.25	0.25	0.25
Sat Flow, veh/h	1781	1287	492	1781	1870	1577	1194	616	1585	1781	1739	111
Grp Volume(v), veh/h	58	0	1132	55	308	91	47	0	0	403	0	368
Grp Sat Flow(s),veh/h/ln	1781	0	1779	1781	1870	1577	1811	0	1585	1781	0	1850
Q Serve(g_s), s	2.9	0.0	45.0	2.8	9.3	2.9	2.3	0.0	0.0	20.1	0.0	17.1
Cycle Q Clear(g_c), s	2.9	0.0	45.0	2.8	9.3	2.9	2.3	0.0	0.0	20.1	0.0	17.1
Prop In Lane	1.00		0.28	1.00		1.00	0.66		1.00	1.00		0.06
Lane Grp Cap(c), veh/h	90	0	869	88	911	768	82	0		453	0	470
V/C Ratio(X)	0.65	0.00	1.30	0.63	0.34	0.12	0.57	0.00		0.89	0.00	0.78
Avail Cap(c_a), veh/h	387	0	869	387	913	770	432	0		541	0	562
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.9	0.0	23.6	43.0	14.5	12.9	43.1	0.0	0.0	33.1	0.0	32.0
Incr Delay (d2), s/veh	2.9	0.0	144.8	2.7	0.3	0.1	2.3	0.0	0.0	13.5	0.0	4.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	52.3	1.3	3.7	1.0	1.1	0.0	0.0	10.3	0.0	8.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.8	0.0	168.3	45.7	14.8	13.0	45.4	0.0	0.0	46.6	0.0	36.8
LnGrp LOS	D	A	F	D	B	B	D	A		D	A	D
Approach Vol, veh/h		1190			454			47	A		771	
Approach Delay, s/veh		162.4			18.2			45.4			41.9	
Approach LOS		F			B			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	49.4		26.9	8.0	49.5		7.7				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	20.0	45.0		28.0	20.0	45.0		22.0				
Max Q Clear Time (g_c+I1), s	4.9	11.3		22.1	4.8	47.0		4.3				
Green Ext Time (p_c), s	0.0	3.2		1.3	0.0	0.0		0.1				

Intersection Summary			
HCM 6th Ctrl Delay		95.8	
HCM 6th LOS		F	

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

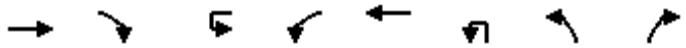


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	1081	188	108	385	2	134	5	245	0	3	2
Future Volume (veh/h)	3	1081	188	108	385	2	134	5	245	0	3	2
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	3	1188	167	119	423	2	157	0	20	0	3	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	4	1624	695	325	680	3	351	0	156	0	9	3
Arrive On Green	0.45	0.45	0.45	0.18	0.18	0.18	0.10	0.00	0.10	0.00	0.01	0.01
Sat Flow, veh/h	9	3638	1557	1781	3720	18	3563	0	1585	0	1342	447
Grp Volume(v), veh/h	639	552	167	119	213	212	157	0	20	0	0	4
Grp Sat Flow(s),veh/h/ln	1870	1777	1557	1781	1870	1867	1781	0	1585	0	0	1790
Q Serve(g_s), s	16.4	14.3	3.8	3.3	6.0	6.0	2.4	0.0	0.7	0.0	0.0	0.1
Cycle Q Clear(g_c), s	16.4	14.3	3.8	3.3	6.0	6.0	2.4	0.0	0.7	0.0	0.0	0.1
Prop In Lane	0.00		1.00	1.00		0.01	1.00		1.00	0.00		0.25
Lane Grp Cap(c), veh/h	835	793	695	325	342	341	351	0	156	0	0	12
V/C Ratio(X)	0.77	0.70	0.24	0.37	0.62	0.62	0.45	0.00	0.13	0.00	0.00	0.35
Avail Cap(c_a), veh/h	1341	1274	1117	1122	1178	1176	1496	0	665	0	0	626
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	13.3	12.7	9.8	20.5	21.5	21.5	24.3	0.0	23.5	0.0	0.0	28.3
Incr Delay (d2), s/veh	1.1	0.8	0.1	0.5	1.4	1.4	0.3	0.0	0.1	0.0	0.0	6.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	4.5	1.0	1.3	2.4	2.4	0.9	0.0	0.2	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.4	13.5	9.9	21.0	22.9	22.9	24.6	0.0	23.7	0.0	0.0	34.7
LnGrp LOS	B	B	A	C	C	C	C	A	C	A	A	C
Approach Vol, veh/h		1358			544			177			4	
Approach Delay, s/veh		13.5			22.5			24.5			34.7	
Approach LOS		B			C			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		14.5		9.1		29.6		3.9				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		8.0		4.4		18.4		2.1				
Green Ext Time (p_c), s		2.1		0.3		6.9		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			16.8									
HCM 6th LOS			B									

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



Movement	EBT	EBR	WBU	WBL	WBT	NBU	NBL	NBR
Lane Configurations								
Traffic Volume (veh/h)	953	333	2	84	380	4	123	159
Future Volume (veh/h)	953	333	2	84	380	4	123	159
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)		0.97		1.00			1.00	1.00
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870		1870	1870
Adj Flow Rate, veh/h	993	242		88	396		128	26
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	2	2		2	2		2	2
Cap, veh/h	2048	888		123	2635		296	136
Arrive On Green	0.58	0.58		0.07	0.74		0.09	0.09
Sat Flow, veh/h	3647	1542		1781	3647		3456	1585
Grp Volume(v), veh/h	993	242		88	396		128	26
Grp Sat Flow(s),veh/h/ln	1777	1542		1781	1777		1728	1585
Q Serve(g_s), s	8.6	1.6		2.5	1.7		1.8	0.8
Cycle Q Clear(g_c), s	8.6	1.6		2.5	1.7		1.8	0.8
Prop In Lane		1.00		1.00			1.00	1.00
Lane Grp Cap(c), veh/h	2048	888		123	2635		296	136
V/C Ratio(X)	0.48	0.27		0.71	0.15		0.43	0.19
Avail Cap(c_a), veh/h	4164	1806		1198	6826		2456	1127
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	6.5	0.8		23.7	2.0		22.6	22.1
Incr Delay (d2), s/veh	0.3	0.2		2.9	0.0		1.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.8		1.0	0.1		0.7	0.3
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	6.7	1.1		26.6	2.0		23.6	22.8
LnGrp LOS	A	A		C	A		C	C
Approach Vol, veh/h	1235				484		154	
Approach Delay, s/veh	5.6				6.5		23.5	
Approach LOS	A				A		C	

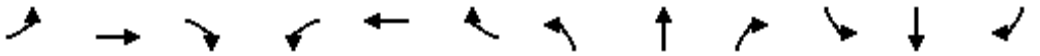
Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	8.6	35.0				43.6		8.5
Change Period (Y+Rc), s	5.0	* 5				5.0		4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0		37.0
Max Q Clear Time (g_c+I1), s	4.5	10.6				3.7		3.8
Green Ext Time (p_c), s	0.1	15.2				4.0		0.5

Intersection Summary	
HCM 6th Ctrl Delay	7.3
HCM 6th LOS	A

Notes

User approved ignoring U-Turning movement.

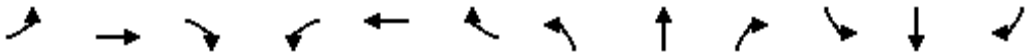
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	457	51	0	321	0	0	184	8	87	130	129
Future Volume (vph)	89	457	51	0	321	0	0	184	8	87	130	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7			2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95			0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00			1.00		1.00	1.00	
Frt	1.00	0.99			1.00			0.99		1.00	0.93	
Flt Protected	0.95	1.00			1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1719	3153			3209			1796		1719	3133	
Flt Permitted	0.95	1.00			1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1719	3153			3209			1796		1719	3133	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	97	497	55	0	349	0	0	200	9	95	141	140
RTOR Reduction (vph)	0	4	0	0	0	0	0	2	0	0	87	0
Lane Group Flow (vph)	97	548	0	0	349	0	0	207	0	95	194	0
Confl. Peds. (#/hr)	20		15						10	10		20
Confl. Bikes (#/hr)			5						5			5
Heavy Vehicles (%)	5%	5%	5%	2%	5%	2%	2%	5%	5%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	7.0	33.5			22.8			14.1		7.0	24.8	
Effective Green, g (s)	7.0	34.5			23.8			14.1		7.0	24.8	
Actuated g/C Ratio	0.11	0.53			0.36			0.21		0.11	0.38	
Clearance Time (s)	3.7	3.7			3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0			3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	183	1655			1162			385		183	1182	
v/s Ratio Prot	c0.06	c0.17			0.11			c0.12		c0.06	0.06	
v/s Ratio Perm												
v/c Ratio	0.53	0.33			0.30			0.54		0.52	0.16	
Uniform Delay, d1	27.8	9.0			15.0			22.9		27.8	13.6	
Progression Factor	1.00	1.00			0.44			1.00		1.00	1.00	
Incremental Delay, d2	1.5	0.1			0.1			1.5		1.0	0.1	
Delay (s)	29.3	9.1			6.7			24.4		28.8	13.6	
Level of Service	C	A			A			C		C	B	
Approach Delay (s)		12.1			6.7			24.4			17.5	
Approach LOS		B			A			C			B	

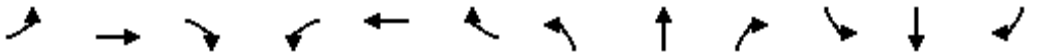
Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	65.7	Sum of lost time (s)	14.8
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	413	0	68	306	120	5	115	134	0	27	72
Future Volume (vph)	140	413	0	68	306	120	5	115	134	0	27	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.96			1.00	0.85		0.89	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1687	3374		1687	3201			1772	1473		1563	
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (perm)	1687	3374		1687	3201			1764	1473		1563	
Peak-hour factor, PHF	0.91	0.91	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.91	0.91
Adj. Flow (vph)	154	454	0	75	336	132	5	126	147	0	30	79
RTOR Reduction (vph)	0	0	0	0	32	0	0	0	92	0	48	0
Lane Group Flow (vph)	154	454	0	75	436	0	0	131	55	0	61	0
Confl. Peds. (#/hr)	10			10		10	5		10			5
Confl. Bikes (#/hr)									10			5
Heavy Vehicles (%)	7%	7%	2%	7%	7%	7%	7%	7%	7%	2%	7%	7%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	12.2	23.3		6.5	17.6			24.8	24.8		24.8	
Effective Green, g (s)	12.2	23.3		6.5	18.6			25.8	24.8		25.8	
Actuated g/C Ratio	0.19	0.35		0.10	0.28			0.39	0.38		0.39	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	313	1196		166	906			692	556		613	
v/s Ratio Prot	c0.09	0.13		0.04	c0.14						0.04	
v/s Ratio Perm								c0.07	0.04			
v/c Ratio	0.49	0.38		0.45	0.48			0.19	0.10		0.10	
Uniform Delay, d1	24.0	15.8		27.9	19.5			13.1	13.2		12.6	
Progression Factor	0.88	0.75		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.4	0.2		0.7	0.4			0.1	0.1		0.1	
Delay (s)	21.6	12.1		28.6	19.9			13.2	13.3		12.7	
Level of Service	C	B		C	B			B	B		B	
Approach Delay (s)		14.5			21.1			13.3			12.7	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	65.7	Sum of lost time (s)	14.8
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	870	360	209	399	0	0	0	0	338	347	171
Future Volume (veh/h)	0	870	360	209	399	0	0	0	0	338	347	171
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1885	1885	1885	1885	0				1885	1885	1885
Adj Flow Rate, veh/h	0	916	0	220	420	0				237	531	59
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	1	1	1	1	0				1	1	1
Cap, veh/h	0	2173		822	2556	0				326	686	291
Arrive On Green	0.00	0.42	0.00	0.47	1.00	0.00				0.18	0.18	0.18
Sat Flow, veh/h	0	5316	1598	3483	3676	0				1795	3770	1598
Grp Volume(v), veh/h	0	916	0	220	420	0				237	531	59
Grp Sat Flow(s),veh/h/ln	0	1716	1598	1742	1791	0				1795	1885	1598
Q Serve(g_s), s	0.0	11.3	0.0	3.4	0.0	0.0				11.2	12.1	2.8
Cycle Q Clear(g_c), s	0.0	11.3	0.0	3.4	0.0	0.0				11.2	12.1	2.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2173		822	2556	0				326	686	291
V/C Ratio(X)	0.00	0.42		0.27	0.16	0.00				0.73	0.77	0.20
Avail Cap(c_a), veh/h	0	2173		822	2556	0				531	1114	472
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.96	0.96	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	18.3	0.0	19.1	0.0	0.0				34.7	35.1	31.3
Incr Delay (d2), s/veh	0.0	0.6	0.0	0.1	0.1	0.0				1.2	0.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.2	0.0	1.3	0.0	0.0				4.8	5.4	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	18.9	0.0	19.1	0.1	0.0				35.9	35.8	31.4
LnGrp LOS	A	B		B	A	A				D	D	C
Approach Vol, veh/h		916	A		640						827	
Approach Delay, s/veh		18.9			6.7						35.5	
Approach LOS		B			A						D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	26.2	43.0		20.8		69.2
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	12.5	* 38		26.6		54.0
Max Q Clear Time (g_c+I1), s	5.4	13.3		14.1		2.0
Green Ext Time (p_c), s	0.2	8.9		2.3		4.4

Intersection Summary	
HCM 6th Ctrl Delay	21.4
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	12.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	20	20	19	143	0	65	5	0	209	143	150	183
Future Vol, veh/h	20	20	19	143	0	65	5	0	209	143	150	183
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	22	22	21	155	0	71	5	0	227	155	163	199
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	10.7	14.4	13.1	10.5
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	34%	69%	100%	0%	0%
Vol Thru, %	100%	42%	34%	0%	0%	100%	100%
Vol Right, %	0%	58%	32%	31%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	110	248	59	208	150	92	92
LT Vol	0	0	20	143	150	0	0
Through Vol	110	105	20	0	0	92	92
RT Vol	0	143	19	65	0	0	0
Lane Flow Rate	119	269	64	226	163	99	99
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.216	0.457	0.124	0.423	0.303	0.17	0.121
Departure Headway (Hd)	6.533	6.121	6.943	6.739	6.68	6.171	4.374
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	548	586	514	534	536	580	814
Service Time	4.296	3.884	4.719	4.499	4.439	3.93	2.132
HCM Lane V/C Ratio	0.217	0.459	0.125	0.423	0.304	0.171	0.122
HCM Control Delay	11.1	14	10.7	14.4	12.3	10.2	7.7
HCM Lane LOS	B	B	B	B	B	B	A
HCM 95th-tile Q	0.8	2.4	0.4	2.1	1.3	0.6	0.4

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.92
Heavy Vehicles, %	4
Mvmt Flow	0
Number of Lanes	0

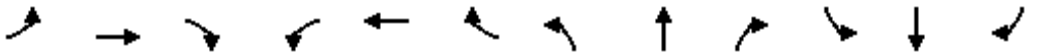
Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	0	460	318	5	150	382	0	0	0	0	2	242
Future Volume (vph)	0	460	318	5	150	382	0	0	0	0	2	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0						4.5
Lane Util. Factor		0.95			0.91	0.91						0.95
Frpb, ped/bikes		0.99			1.00	1.00						1.00
Flpb, ped/bikes		1.00			1.00	1.00						1.00
Frt		0.94			1.00	1.00						1.00
Flt Protected		1.00			0.95	1.00						0.95
Satd. Flow (prot)		3135			1535	3226						1603
Flt Permitted		1.00			0.95	1.00						0.95
Satd. Flow (perm)		3135			1535	3226						1603
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	479	331	5	156	398	0	0	0	0	2	252
RTOR Reduction (vph)	0	136	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	674	0	0	145	414	0	0	0	0	0	128
Confl. Peds. (#/hr)	5		5		5		5					
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type		NA		Split	Split	NA					Split	Split
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		20.2			20.3	20.3						10.7
Effective Green, g (s)		20.2			20.3	20.3						10.7
Actuated g/C Ratio		0.31			0.31	0.31						0.16
Clearance Time (s)		5.0			5.0	5.0						4.5
Vehicle Extension (s)		3.0			3.0	3.0						3.0
Lane Grp Cap (vph)		963			474	996						261
v/s Ratio Prot		c0.22			0.09	c0.13						c0.08
v/s Ratio Perm												
v/c Ratio		0.70			0.31	0.42						0.49
Uniform Delay, d1		20.1			17.3	18.0						25.0
Progression Factor		1.00			1.00	1.00						1.00
Incremental Delay, d2		2.3			0.4	0.3						1.5
Delay (s)		22.4			17.7	18.3						26.5
Level of Service		C			B	B						C
Approach Delay (s)		22.4				18.1			0.0			
Approach LOS		C				B			A			

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	65.7	Sum of lost time (s)	14.5
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

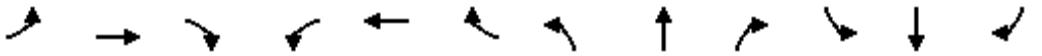
Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	2	154
Future Volume (vph)	2	154
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.5	5.0
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	1.00
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	0.95	1.00
Satd. Flow (prot)	1608	1509
Flt Permitted	0.95	1.00
Satd. Flow (perm)	1608	1509
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	2	160
RTOR Reduction (vph)	0	85
Lane Group Flow (vph)	128	75
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	7%	7%
Turn Type	NA	custom
Protected Phases	4	5
Permitted Phases		4
Actuated Green, G (s)	10.7	30.9
Effective Green, g (s)	10.7	30.9
Actuated g/C Ratio	0.16	0.47
Clearance Time (s)	4.5	5.0
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	261	709
v/s Ratio Prot	0.08	0.03
v/s Ratio Perm		0.02
v/c Ratio	0.49	0.11
Uniform Delay, d1	25.0	9.7
Progression Factor	1.00	1.00
Incremental Delay, d2	1.5	0.1
Delay (s)	26.5	9.8
Level of Service	C	A
Approach Delay (s)	20.0	
Approach LOS	C	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	213	508	0	0	218	116	263	0	286	72	0	52
Future Volume (vph)	213	508	0	0	218	116	263	0	286	72	0	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00	0.98	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3242	1759			3343	1468		1671	1472	1671		1495
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3242	1759			3343	1468		1671	1472	1671		1495
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	248	591	0	0	253	135	306	0	333	84	0	60
RTOR Reduction (vph)	0	0	0	0	0	103	0	0	209	0	0	55
Lane Group Flow (vph)	248	591	0	0	253	32	0	306	124	84	0	5
Confl. Peds. (#/hr)	10		5	5		10			5	5		
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	11.6	31.4			15.3	15.3		16.1	16.1	5.8		5.8
Effective Green, g (s)	11.6	31.4			15.3	15.3		16.1	16.1	5.8		5.8
Actuated g/C Ratio	0.18	0.48			0.24	0.24		0.25	0.25	0.09		0.09
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	580	852			789	346		415	365	149		133
v/s Ratio Prot	0.08	c0.34			0.08					c0.05		0.00
v/s Ratio Perm						0.02		0.18	0.08			
v/c Ratio	0.43	0.69			0.32	0.09		0.74	0.34	0.56		0.04
Uniform Delay, d1	23.6	13.0			20.5	19.3		22.4	20.0	28.3		27.0
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	0.5	2.0			0.1	0.0		5.8	0.2	2.9		0.0
Delay (s)	24.2	15.0			20.5	19.4		28.2	20.2	31.2		27.0
Level of Service	C	B			C	B		C	C	C		C
Approach Delay (s)		17.7			20.1			24.0			29.4	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	64.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



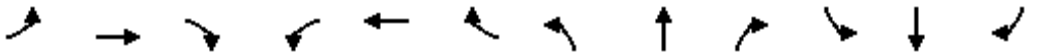
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	368	973	63	24	541	98	140	103	38	124	68	89
Future Volume (veh/h)	368	973	63	24	541	98	140	103	38	124	68	89
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	0.99		0.97	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1930
Adj Flow Rate, veh/h	383	1014	62	25	564	87	146	107	40	129	71	93
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	373	1612	99	79	984	151	198	355	133	256	127	795
Arrive On Green	0.07	0.16	0.16	0.04	0.32	0.32	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1767	3373	206	1767	3055	470	1205	1277	477	683	458	1618
Grp Volume(v), veh/h	383	530	546	25	325	326	146	0	147	200	0	93
Grp Sat Flow(s),veh/h/ln	1767	1763	1817	1767	1763	1762	1205	0	1754	1141	0	1618
Q Serve(g_s), s	19.0	25.3	25.3	1.2	13.8	13.9	8.8	0.0	5.9	10.2	0.0	2.8
Cycle Q Clear(g_c), s	19.0	25.3	25.3	1.2	13.8	13.9	25.0	0.0	5.9	16.2	0.0	2.8
Prop In Lane	1.00		0.11	1.00		0.27	1.00		0.27	0.64		1.00
Lane Grp Cap(c), veh/h	373	842	868	79	568	568	198	0	487	383	0	795
V/C Ratio(X)	1.03	0.63	0.63	0.32	0.57	0.57	0.74	0.00	0.30	0.52	0.00	0.12
Avail Cap(c_a), veh/h	373	842	868	98	568	568	198	0	487	383	0	795
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.83	0.83	0.81	0.81	0.81	1.00	0.00	1.00	0.93	0.00	0.93
Uniform Delay (d), s/veh	41.9	30.4	30.5	41.7	25.3	25.4	41.4	0.0	25.6	30.8	0.0	12.5
Incr Delay (d2), s/veh	49.4	3.0	2.9	0.7	3.4	3.4	11.8	0.0	0.1	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.0	12.4	12.8	0.5	6.0	6.1	3.9	0.0	2.5	3.9	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	91.3	33.4	33.3	42.4	28.7	28.8	53.2	0.0	25.7	31.4	0.0	12.5
LnGrp LOS	F	C	C	D	C	C	D	A	C	C	A	B
Approach Vol, veh/h		1459			676			293			293	
Approach Delay, s/veh		48.6			29.2			39.4			25.4	
Approach LOS		D			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	38.0		29.0	13.0	48.0		29.0				
Change Period (Y+Rc), s	4.0	9.0		4.0	9.0	* 5		4.0				
Max Green Setting (Gmax), s	19.0	29.0		25.0	5.0	* 43		25.0				
Max Q Clear Time (g_c+I1), s	21.0	15.9		18.2	3.2	27.3		27.0				
Green Ext Time (p_c), s	0.0	4.4		0.6	0.0	8.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		40.3	
HCM 6th LOS		D	

Notes

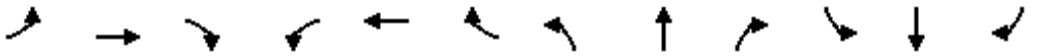
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	500	0	706	0	829	321	0	2190	246
Future Volume (vph)	0	0	0	500	0	706	0	829	321	0	2190	246
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.6		4.6		4.4	4.4		4.4	4.4
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.94		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3400		2760		5036	1474		5036	1521
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3400		2760		5036	1474		5036	1521
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	515	0	728	0	855	331	0	2258	254
RTOR Reduction (vph)	0	0	0	0	0	100	0	0	135	0	0	64
Lane Group Flow (vph)	0	0	0	515	0	628	0	855	196	0	2258	190
Confl. Peds. (#/hr)							15		15	15		15
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				21.3		39.9		71.1	71.1		89.7	89.7
Effective Green, g (s)				21.3		36.3		71.1	71.1		89.7	89.7
Actuated g/C Ratio				0.18		0.30		0.59	0.59		0.75	0.75
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				603		834		2983	873		3764	1136
v/s Ratio Prot				c0.15		c0.23		0.17			c0.45	
v/s Ratio Perm									0.13			0.12
v/c Ratio				0.85		0.75		0.29	0.22		0.60	0.17
Uniform Delay, d1				47.8		37.8		12.0	11.5		6.9	4.4
Progression Factor				1.00		1.00		0.75	0.53		1.00	1.00
Incremental Delay, d2				10.9		3.5		0.2	0.6		0.7	0.3
Delay (s)				58.8		41.3		9.3	6.6		7.6	4.7
Level of Service				E		D		A	A		A	A
Approach Delay (s)		0.0			48.5			8.5			7.4	
Approach LOS		A			D			A			A	

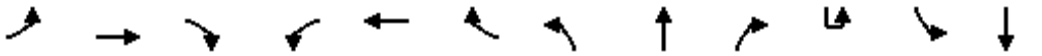
Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	0	139	0	0	0	0	1020	573	0	1585	1072
Future Volume (vph)	125	0	139	0	0	0	0	1020	573	0	1585	1072
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.91	0.85					0.95			1.00	0.85
Flt Protected	0.95	0.98	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1665	1494	1490					4558			5036	1491
Flt Permitted	0.95	0.98	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1665	1494	1490					4558			5036	1491
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	133	0	148	0	0	0	0	1085	610	0	1686	1140
RTOR Reduction (vph)	0	33	33	0	0	0	0	0	0	0	0	171
Lane Group Flow (vph)	98	60	57	0	0	0	0	1695	0	0	1686	969
Confl. Peds. (#/hr)	10					10	10		15	15		10
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	9.8	9.8	9.8					101.2			101.2	101.2
Effective Green, g (s)	9.8	9.8	9.8					101.2			101.2	101.2
Actuated g/C Ratio	0.08	0.08	0.08					0.84			0.84	0.84
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	135	122	121					3843			4247	1257
v/s Ratio Prot	c0.06	0.04						0.37			0.33	
v/s Ratio Perm			0.04									c0.65
v/c Ratio	0.73	0.49	0.47					0.44			0.40	0.77
Uniform Delay, d1	53.8	52.7	52.6					2.3			2.2	4.2
Progression Factor	1.00	1.00	1.00					1.30			0.74	9.25
Incremental Delay, d2	15.1	1.1	1.1					0.3			0.2	3.9
Delay (s)	68.9	53.8	53.7					3.4			1.9	42.8
Level of Service	E	D	D					A			A	D
Approach Delay (s)		59.0			0.0			3.4			18.4	
Approach LOS		E			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	219	454	186	202	255	120	226	1100	143	11	212	930
Future Volume (vph)	219	454	186	202	255	120	226	1100	143	11	212	930
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.97	0.91	1.00		0.97	0.91
Frpb, ped/bikes	1.00	1.00	0.95	1.00	0.99		1.00	1.00	0.96		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85		1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1752	3505	1489	3400	3297		3400	5036	1505		3400	5036
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1752	3505	1489	3400	3297		3400	5036	1505		3400	5036
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	231	478	196	213	268	126	238	1158	151	12	223	979
RTOR Reduction (vph)	0	0	80	0	53	0	0	0	65	0	0	0
Lane Group Flow (vph)	231	478	116	213	341	0	238	1158	86	0	235	979
Confl. Peds. (#/hr)	20		35	35		20	15		20		20	
Confl. Bikes (#/hr)			5			5						
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	3	8		7	4		1	6		5	5	2
Permitted Phases			8						6			
Actuated Green, G (s)	17.6	30.8	30.8	10.0	24.6		10.7	51.8	51.8		11.2	51.8
Effective Green, g (s)	17.6	30.8	30.8	10.0	24.6		10.7	51.8	51.8		11.2	51.8
Actuated g/C Ratio	0.15	0.26	0.26	0.08	0.21		0.09	0.43	0.43		0.09	0.43
Clearance Time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)	256	899	382	283	675		303	2173	649		317	2173
v/s Ratio Prot	c0.13	c0.14		0.06	0.10		c0.07	c0.23			0.07	0.19
v/s Ratio Perm			0.08						0.06			
v/c Ratio	0.90	0.53	0.30	0.75	0.50		0.79	0.53	0.13		0.74	0.45
Uniform Delay, d1	50.4	38.4	35.9	53.8	42.3		53.5	25.2	20.6		53.0	24.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.04	1.07
Incremental Delay, d2	31.2	0.3	0.2	9.6	0.2		11.6	0.9	0.4		7.5	0.6
Delay (s)	81.5	38.7	36.1	63.4	42.5		65.2	26.1	21.0		62.7	26.4
Level of Service	F	D	D	E	D		E	C	C		E	C
Approach Delay (s)		49.1			49.8			31.6				32.7
Approach LOS		D			D			C				C

Intersection Summary			
HCM 2000 Control Delay	38.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.7
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	130
Future Volume (vph)	130
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.6
Lane Util. Factor	1.00
Frpb, ped/bikes	0.97
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1516
Flt Permitted	1.00
Satd. Flow (perm)	1516
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	137
RTOR Reduction (vph)	65
Lane Group Flow (vph)	72
Confl. Peds. (#/hr)	15
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	3%
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	51.8
Effective Green, g (s)	51.8
Actuated g/C Ratio	0.43
Clearance Time (s)	4.6
Vehicle Extension (s)	0.2
Lane Grp Cap (vph)	654
v/s Ratio Prot	
v/s Ratio Perm	0.05
v/c Ratio	0.11
Uniform Delay, d1	20.3
Progression Factor	1.31
Incremental Delay, d2	0.3
Delay (s)	26.9
Level of Service	C
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	53	119	54	239	73	244	25	55	706	263	22	463
Future Volume (veh/h)	53	119	54	239	73	244	25	55	706	263	22	463
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.96	0.98		0.98		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856		1856	1856	1856		1856
Adj Flow Rate, veh/h	56	125	29	164	199	55		58	743	36		487
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	3	3	3	3	3	3		3	3	3		3
Cap, veh/h	130	317	80	226	372	308		75	2088	644		521
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20		0.04	0.41	0.41		0.29
Sat Flow, veh/h	408	1581	400	1204	1856	1537		1767	5066	1561		1767
Grp Volume(v), veh/h	94	0	116	164	199	55		58	743	36		487
Grp Sat Flow(s),veh/h/ln	792	0	1597	1204	1856	1537		1767	1689	1561		1767
Q Serve(g_s), s	6.2	0.0	7.5	16.3	11.5	3.6		3.9	12.1	1.7		32.2
Cycle Q Clear(g_c), s	17.7	0.0	7.5	23.8	11.5	3.6		3.9	12.1	1.7		32.2
Prop In Lane	0.59		0.25	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	207	0	320	226	372	308		75	2088	644		521
V/C Ratio(X)	0.46	0.00	0.36	0.73	0.54	0.18		0.77	0.36	0.06		0.93
Avail Cap(c_a), veh/h	352	0	496	226	372	308		265	2088	644		648
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	47.8	0.0	41.4	51.6	43.0	39.8		56.9	24.3	21.2		41.2
Incr Delay (d2), s/veh	1.6	0.0	0.7	11.0	1.5	0.3		15.2	0.5	0.2		18.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	2.8	0.0	3.1	5.6	5.5	1.4		2.1	4.9	0.6		16.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.4	0.0	42.1	62.7	44.5	40.1		72.0	24.8	21.4		59.6
LnGrp LOS	D	A	D	E	D	D		E	C	C		E
Approach Vol, veh/h		210			418				837			
Approach Delay, s/veh		45.3			51.0				27.9			
Approach LOS		D			D				C			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	84.2		27.7	38.4	53.9		27.7				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	18.0	53.6		19.0	44.0	27.6		37.3				
Max Q Clear Time (g_c+I1), s	5.9	16.6		25.8	34.2	14.1		19.7				
Green Ext Time (p_c), s	0.1	12.8		0.0	1.2	4.4		1.2				

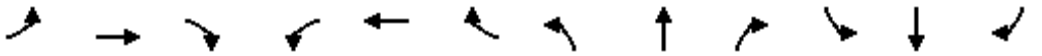
Intersection Summary		
HCM 6th Ctrl Delay		29.1
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1270	47
Future Volume (veh/h)	1270	47
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		1.00
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1856	1856
Adj Flow Rate, veh/h	1337	47
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	3	3
Cap, veh/h	3339	117
Arrive On Green	0.66	0.66
Sat Flow, veh/h	5023	177
Grp Volume(v), veh/h	899	485
Grp Sat Flow(s),veh/h/ln	1689	1823
Q Serve(g_s), s	14.6	14.6
Cycle Q Clear(g_c), s	14.6	14.6
Prop In Lane		0.10
Lane Grp Cap(c), veh/h	2244	1211
V/C Ratio(X)	0.40	0.40
Avail Cap(c_a), veh/h	2244	1211
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	9.2	9.2
Incr Delay (d2), s/veh	0.5	1.0
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	5.8
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	9.7	10.2
LnGrp LOS	A	B
Approach Vol, veh/h	1871	
Approach Delay, s/veh	22.8	
Approach LOS	C	
Timer - Assigned Phs		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	318	902	0	0	495	266	118	228	478	0	0	0
Future Volume (veh/h)	318	902	0	0	495	266	118	228	478	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	328	930	0	0	510	0	122	355	364			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	678	2237	0	0	1343		462	485	411			
Arrive On Green	0.39	1.00	0.00	0.00	0.12	0.00	0.26	0.26	0.26			
Sat Flow, veh/h	3456	3647	0	0	3647	1585	1781	1870	1585			
Grp Volume(v), veh/h	328	930	0	0	510	0	122	355	364			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1777	1585	1781	1870	1585			
Q Serve(g_s), s	6.4	0.0	0.0	0.0	11.9	0.0	4.9	15.6	19.9			
Cycle Q Clear(g_c), s	6.4	0.0	0.0	0.0	11.9	0.0	4.9	15.6	19.9			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	678	2237	0	0	1343		462	485	411			
V/C Ratio(X)	0.48	0.42	0.00	0.00	0.38		0.26	0.73	0.89			
Avail Cap(c_a), veh/h	678	2237	0	0	1343		574	603	511			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.91	0.91	0.00	0.00	0.89	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	23.9	0.0	0.0	0.0	29.7	0.0	26.5	30.5	32.0			
Incr Delay (d2), s/veh	0.2	0.5	0.0	0.0	0.7	0.0	0.1	2.4	12.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.3	0.2	0.0	0.0	5.7	0.0	2.0	7.1	8.7			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.1	0.5	0.0	0.0	30.4	0.0	26.6	32.9	44.8			
LnGrp LOS	C	A	A	A	C		C	C	D			
Approach Vol, veh/h		1258			510	A		841				
Approach Delay, s/veh		6.7			30.4			37.1				
Approach LOS		A			C			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		61.7			22.7	39.0		28.3				
Change Period (Y+Rc), s		5.0			5.0	* 5		5.0				
Max Green Setting (Gmax), s		44.0			13.0	* 34		29.0				
Max Q Clear Time (g_c+I1), s		2.0			8.4	13.9		21.9				
Green Ext Time (p_c), s		11.1			0.3	4.4		1.5				

Intersection Summary	
HCM 6th Ctrl Delay	21.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

4: Scott St Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0
Total Del/Veh (s)	2.6	6.6	3.7	4.0
Vehicles Entered	169	94	10	273
Vehicles Exited	169	94	10	273
Hourly Exit Rate	169	94	10	273
Input Volume	170	91	10	271
% of Volume	100	103	98	101
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.3	0.3	0.2	0.2	0.2	0.3
Total Del/Veh (s)	4.6	8.9	3.0	3.8	3.2	2.7	8.7	10.6	8.6	9.5	6.5	6.0
Vehicles Entered	6	6	15	48	9	31	5	145	116	47	133	4
Vehicles Exited	6	6	15	48	9	30	5	145	116	47	132	4
Hourly Exit Rate	6	6	15	48	9	30	5	145	116	47	132	4
Input Volume	6	6	14	48	6	32	5	156	119	44	131	3
% of Volume	96	96	105	99	150	94	100	93	97	106	101	133
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	7.6
Vehicles Entered	565
Vehicles Exited	563
Hourly Exit Rate	563
Input Volume	571
% of Volume	99
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	0.3	0.2	0.2	0.2
Total Del/Veh (s)	5.8	1.0	4.1	6.4	7.1	6.6	4.3	6.2
Vehicles Entered	93	15	68	53	237	139	36	641
Vehicles Exited	93	15	68	53	238	137	36	640
Hourly Exit Rate	93	15	68	53	238	137	36	640
Input Volume	95	17	66	52	248	142	34	654
% of Volume	98	87	103	101	96	97	106	98
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	11.8
Vehicles Entered	964
Vehicles Exited	966
Hourly Exit Rate	966
Input Volume	2712
% of Volume	36
Denied Entry Before	0
Denied Entry After	0

Intersection: 4: Scott St

Movement	EB	WB	SB
Directions Served	T	T	T
Maximum Queue (ft)	86	86	32
Average Queue (ft)	40	18	6
95th Queue (ft)	86	61	27
Link Distance (ft)	5	142	1849
Upstream Blk Time (%)	10	0	
Queuing Penalty (veh)	17	0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Dollar Ave/Herman Ave & Scott St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	33	53	187	124
Average Queue (ft)	19	30	65	65
95th Queue (ft)	42	45	129	104
Link Distance (ft)	525	5	1137	1856
Upstream Blk Time (%)		5		
Queuing Penalty (veh)		5		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

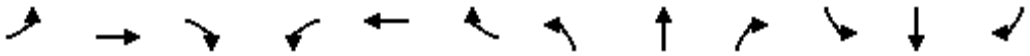
Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	109	141	107
Average Queue (ft)	47	69	56
95th Queue (ft)	83	111	91
Link Distance (ft)	174	939	1430
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 22

2024 No Project PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	85	286	318	3	123	407	0	0	278	97
Future Volume (vph)	0	0	85	286	318	3	123	407	0	0	278	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.6	4.0	4.0			4.6			4.6	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			0.99	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.96	
Flt Protected			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)			1565	1633	1741			3488			3267	
Flt Permitted			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (perm)			1565	1633	1741			3488			3267	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	93	314	349	3	135	447	0	0	305	107
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	81	0
Lane Group Flow (vph)	0	0	93	283	383	0	0	582	0	0	331	0
Confl. Peds. (#/hr)												15
Heavy Vehicles (%)	0%	0%	5%	5%	3%	0%	0%	3%	0%	0%	5%	5%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			12.8	13.4	13.4			12.8			10.6	
Effective Green, g (s)			12.8	13.4	13.4			12.8			10.6	
Actuated g/C Ratio			0.26	0.27	0.27			0.26			0.21	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			400	437	466			892			692	
v/s Ratio Prot			0.06					c0.17			c0.10	
v/s Ratio Perm				0.17	0.22							
v/c Ratio			0.23	0.65	0.82			0.65			0.48	
Uniform Delay, d1			14.7	16.2	17.2			16.6			17.3	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			0.4	7.2	15.0			1.9			0.5	
Delay (s)			15.1	23.4	32.2			18.5			17.8	
Level of Service			B	C	C			B			B	
Approach Delay (s)		15.1			28.5			18.5			17.8	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/24/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	357	223	20	308	347	4	833	437
Future Volume (veh/h)	357	223	20	308	347	4	833	437
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.99
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1657	1710		1657	1657		1657	1657
Adj Flow Rate, veh/h	237	247		328	369		886	171
Peak Hour Factor	0.94	0.94		0.94	0.94		0.94	0.94
Percent Heavy Veh, %	4	0		4	4		4	4
Cap, veh/h	310	285		1074	2258		1009	447
Arrive On Green	0.20	0.20		0.35	0.72		0.32	0.32
Sat Flow, veh/h	1578	1449		3061	3230		3230	1393
Grp Volume(v), veh/h	237	247		328	369		886	171
Grp Sat Flow(s),veh/h/ln	1578	1449		1530	1574		1574	1393
Q Serve(g_s), s	14.2	16.5		7.8	3.8		26.6	9.5
Cycle Q Clear(g_c), s	14.2	16.5		7.8	3.8		26.6	9.5
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	310	285		1074	2258		1009	447
V/C Ratio(X)	0.76	0.87		0.31	0.16		0.88	0.38
Avail Cap(c_a), veh/h	521	478		1074	2258		1240	549
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.96	0.96		0.85	0.85		0.46	0.46
Uniform Delay (d), s/veh	38.0	38.9		23.6	4.5		32.1	26.3
Incr Delay (d2), s/veh	1.4	4.1		0.1	0.1		5.4	1.1
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	6.2		2.7	1.0		10.5	3.2
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	39.4	43.0		23.6	4.7		37.5	27.5
LnGrp LOS	D	D		C	A		D	C
Approach Vol, veh/h	484				697		1057	
Approach Delay, s/veh	41.3				13.6		35.9	
Approach LOS	D				B		D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	39.7	36.7				76.4		23.6
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	13.0	* 39				48.4		33.0
Max Q Clear Time (g_c+I1), s	9.8	28.6				5.8		18.5
Green Ext Time (p_c), s	0.3	3.4				1.5		1.1

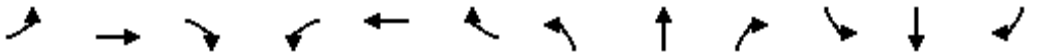
Intersection Summary	
HCM 6th Ctrl Delay	30.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



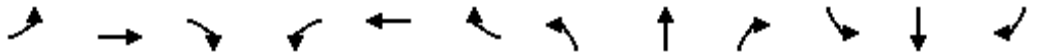
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	162	54	85	677	248	247	59	483	128	115	475	109
Future Volume (vph)	162	54	85	677	248	247	59	483	128	115	475	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.96		1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.95
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		2893		3060	1660	1383	1547	3094	1384	1408	2953	1309
Flt Permitted		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		2893		3060	1660	1383	1547	3094	1384	1408	2953	1309
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	167	56	88	698	256	255	61	498	132	119	490	112
RTOR Reduction (vph)	0	37	0	0	0	185	0	0	0	0	0	87
Lane Group Flow (vph)	0	274	0	698	256	70	61	498	132	79	530	25
Confl. Peds. (#/hr)			80									10
Confl. Bikes (#/hr)			5			10			5			
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	5%	5%	5%	5%	5%	5%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		20.4		33.0	33.0	33.0	21.5	21.5	90.7	26.4	26.4	26.4
Effective Green, g (s)		20.4		33.0	33.0	33.0	21.5	21.5	90.7	26.4	26.4	26.4
Actuated g/C Ratio		0.17		0.28	0.28	0.28	0.18	0.18	0.76	0.22	0.22	0.22
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		491		841	456	380	277	554	1046	309	649	287
v/s Ratio Prot		c0.09		c0.23	0.15		0.04	c0.16	0.10	0.06	c0.18	
v/s Ratio Perm						0.05						0.02
v/c Ratio		0.56		0.83	0.56	0.18	0.22	0.90	0.13	0.26	0.82	0.09
Uniform Delay, d1		45.7		40.9	37.3	33.2	42.1	48.2	4.0	38.7	44.5	37.2
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.8		6.8	1.6	0.2	0.3	17.2	0.0	2.0	10.9	0.6
Delay (s)		46.5		47.7	38.9	33.5	42.4	65.4	4.0	40.7	55.4	37.8
Level of Service		D		D	D	C	D	E	A	D	E	D
Approach Delay (s)		46.5			42.8			51.6			51.1	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	47.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	87.4%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	177	35	367	248	24	18	196	426	38	244	43
Future Volume (vph)	32	177	35	367	248	24	18	196	426	38	244	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		3.5	3.5			3.0	3.0		3.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	1.00		0.99	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2724		1413	1461			1481	2224		1438	
Flt Permitted		0.99		0.95	1.00			0.96	1.00		0.94	
Satd. Flow (perm)		2724		1413	1461			1423	2224		1363	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	34	190	38	395	267	26	19	211	458	41	262	46
RTOR Reduction (vph)	0	15	0	0	4	0	0	0	198	0	6	0
Lane Group Flow (vph)	0	247	0	395	289	0	0	230	260	0	343	0
Confl. Peds. (#/hr)			15			10			10			20
Confl. Bikes (#/hr)			5			5			5			10
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		28.9		27.3	27.3			23.8	54.6		23.8	
Effective Green, g (s)		28.9		27.3	27.3			23.8	51.1		23.8	
Actuated g/C Ratio		0.32		0.30	0.30			0.26	0.57		0.26	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		874		428	443			376	1262		360	
v/s Ratio Prot		c0.09		c0.28	0.20				0.12			
v/s Ratio Perm								0.16			c0.25	
v/c Ratio		0.28		0.92	0.65			0.61	0.21		0.95	
Uniform Delay, d1		22.8		30.3	27.2			29.0	9.5		32.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.8		25.0	2.6			2.1	0.0		34.9	
Delay (s)		23.6		55.4	29.8			31.1	9.6		67.4	
Level of Service		C		E	C			C	A		E	
Approach Delay (s)		23.6			44.5			16.8			67.4	
Approach LOS		C			D			B			E	

Intersection Summary			
HCM 2000 Control Delay	36.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	169	174	206	780	230	388	104	15	269	163	849	134
Future Volume (veh/h)	169	174	206	780	230	388	104	15	269	163	849	134
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1811	1811	1811	1811	1811	1678	1678	1678	1856	1856	1856
Adj Flow Rate, veh/h	202	149	0	821	242	0	109	16	0	172	894	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	6	6	6	15	15	15	3	3	3
Cap, veh/h	398	209		890	467		143	821		372	1363	
Arrive On Green	0.12	0.12	0.00	0.26	0.26	0.00	0.09	0.26	0.00	0.21	0.39	0.00
Sat Flow, veh/h	3450	1811	1535	3450	1811	1535	1598	3272	0	1767	3526	1572
Grp Volume(v), veh/h	202	149	0	821	242	0	109	16	0	172	894	0
Grp Sat Flow(s),veh/h/ln	1725	1811	1535	1725	1811	1535	1598	1594	0	1767	1763	1572
Q Serve(g_s), s	6.6	9.5	0.0	27.8	13.7	0.0	8.0	0.4	0.0	10.2	25.0	0.0
Cycle Q Clear(g_c), s	6.6	9.5	0.0	27.8	13.7	0.0	8.0	0.4	0.0	10.2	25.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	398	209		890	467		143	821		372	1363	
V/C Ratio(X)	0.51	0.71		0.92	0.52		0.76	0.02		0.46	0.66	
Avail Cap(c_a), veh/h	635	334		914	480		160	821		372	1363	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	0.00	0.35	0.35	0.00	1.00	1.00	0.00	0.68	0.68	0.00
Uniform Delay (d), s/veh	49.9	51.2	0.0	43.3	38.1	0.0	53.4	33.2	0.0	41.4	30.3	0.0
Incr Delay (d2), s/veh	0.3	1.6	0.0	6.0	0.3	0.0	14.9	0.0	0.0	2.8	1.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	4.4	0.0	12.6	6.2	0.0	3.8	0.2	0.0	4.7	10.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.2	52.7	0.0	49.4	38.4	0.0	68.3	33.3	0.0	44.2	32.0	0.0
LnGrp LOS	D	D		D	D		E	C		D	C	
Approach Vol, veh/h		351	A		1063	A		125	A		1066	A
Approach Delay, s/veh		51.3			46.9			63.8			33.9	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.7	51.3		18.4	30.2	35.8		35.6				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	12.0	36.0		22.1	17.1	* 31		31.8				
Max Q Clear Time (g_c+I1), s	10.0	27.0		11.5	12.2	2.4		29.8				
Green Ext Time (p_c), s	0.0	4.3		0.8	0.1	0.0		1.2				

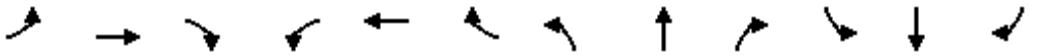
Intersection Summary		
HCM 6th Ctrl Delay		43.0
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	54	108	392	63	384	16	487	208	66	6	204	563
Future Volume (veh/h)	54	108	392	63	384	16	487	208	66	6	204	563
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		1.00	1.00		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1781	1781	1781	1811	1811	1811	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	57	134	128	67	409	13	518	221	0	6	217	413
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	8	8	8	6	6	6	9	9	9	4	4	4
Cap, veh/h	131	450	392	141	469	15	844	868		391	410	327
Arrive On Green	0.08	0.25	0.25	0.08	0.25	0.25	0.27	0.27	0.00	0.22	0.22	0.22
Sat Flow, veh/h	1697	1781	1482	1725	1743	55	3264	3445	0	1753	1841	1469
Grp Volume(v), veh/h	57	134	128	67	0	422	518	221	0	6	217	413
Grp Sat Flow(s),veh/h/ln	1697	1781	1482	1725	0	1799	1632	1678	0	1753	1841	1469
Q Serve(g_s), s	3.4	6.4	7.5	3.9	0.0	24.0	14.4	5.4	0.0	0.3	10.9	23.4
Cycle Q Clear(g_c), s	3.4	6.4	7.5	3.9	0.0	24.0	14.4	5.4	0.0	0.3	10.9	23.4
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	131	450	392	141	0	484	844	868		391	410	327
V/C Ratio(X)	0.44	0.30	0.33	0.48	0.00	0.87	0.61	0.25		0.02	0.53	1.26
Avail Cap(c_a), veh/h	179	492	409	182	0	497	897	922		391	410	327
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.78	0.78	0.78	1.00	0.00	1.00	0.93	0.93	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.3	32.9	31.1	46.1	0.0	36.7	34.3	30.9	0.0	31.8	35.9	40.8
Incr Delay (d2), s/veh	0.7	0.2	0.3	0.9	0.0	14.7	3.1	0.7	0.0	0.0	0.7	140.0
Initial Q Delay(d3),s/veh	0.0	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	5.3	2.6	1.7	0.0	12.1	6.1	2.3	0.0	0.1	4.9	21.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.9	41.7	31.4	47.0	0.0	51.3	37.4	31.5	0.0	31.8	36.6	180.8
LnGrp LOS	D	D	C	D	A	D	D	C		C	D	F
Approach Vol, veh/h		319			489			739	A		636	
Approach Delay, s/veh		38.5			50.7			35.6			130.2	
Approach LOS		D			D			D			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.6	30.7		33.4	12.1	31.2		28.3				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.0	4.6		4.9				
Max Green Setting (Gmax), s	11.1	29.0		23.4	11.1	29.0		23.4				
Max Q Clear Time (g_c+I1), s	5.9	9.5		16.4	5.4	26.0		25.4				
Green Ext Time (p_c), s	0.0	1.0		1.5	0.0	0.5		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		67.0
HCM 6th LOS		E

Notes

User approved volume balancing among the lanes for turning movement.

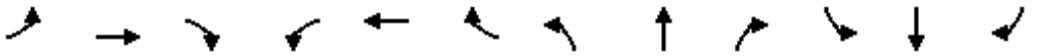
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	404	24	287	33	44	29	5	373	355	45	12	20
Future Volume (vph)	404	24	287	33	44	29	5	373	355	45	12	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00		1.00	0.95			1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	0.97		1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Frt	1.00	1.00	0.85		1.00	0.85		1.00	0.98			1.00
Flt Protected	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (prot)	1618	1630	2682		1755	1479		1703	3314			1703
Flt Permitted	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (perm)	1618	1630	2682		1755	1479		1703	3314			1703
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	421	25	299	34	46	30	5	389	370	47	12	21
RTOR Reduction (vph)	0	0	236	0	0	27	0	0	7	0	0	0
Lane Group Flow (vph)	215	231	63	0	80	3	0	394	410	0	0	34
Confl. Peds. (#/hr)	20					20				30		30
Confl. Bikes (#/hr)										5		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	Prot	NA		Prot	Prot
Protected Phases	4	4		3	3		5	5	2		1	1
Permitted Phases			4			3						
Actuated Green, G (s)	16.5	16.5	16.5		7.3	7.3		20.7	35.4			4.4
Effective Green, g (s)	16.5	16.5	16.5		7.3	7.3		20.7	35.4			4.4
Actuated g/C Ratio	0.21	0.21	0.21		0.09	0.09		0.26	0.45			0.06
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0			3.0
Lane Grp Cap (vph)	340	343	564		163	137		449	1496			95
v/s Ratio Prot	0.13	c0.14			c0.05			c0.23	0.12			0.02
v/s Ratio Perm			0.02			0.00						
v/c Ratio	0.63	0.67	0.11		0.49	0.02		0.88	0.27			0.36
Uniform Delay, d1	28.2	28.5	25.0		33.8	32.3		27.6	13.5			35.6
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Incremental Delay, d2	3.8	5.1	0.1		2.3	0.1		17.3	0.1			2.3
Delay (s)	32.0	33.6	25.1		36.1	32.4		44.9	13.6			37.9
Level of Service	C	C	C		D	C		D	B			D
Approach Delay (s)		29.7			35.1				28.8			
Approach LOS		C			D				C			

Intersection Summary			
HCM 2000 Control Delay	29.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	78.4	Sum of lost time (s)	14.8
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	518	182
Future Volume (vph)	518	182
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.1	4.1
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	0.97
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3406	1482
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3406	1482
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	540	190
RTOR Reduction (vph)	0	144
Lane Group Flow (vph)	540	46
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		5
Heavy Vehicles (%)	6%	6%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	19.1	19.1
Effective Green, g (s)	19.1	19.1
Actuated g/C Ratio	0.24	0.24
Clearance Time (s)	4.1	4.1
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	829	361
v/s Ratio Prot	c0.16	
v/s Ratio Perm		0.03
v/c Ratio	0.65	0.13
Uniform Delay, d1	26.7	23.1
Progression Factor	1.00	1.00
Incremental Delay, d2	1.8	0.2
Delay (s)	28.5	23.3
Level of Service	C	C
Approach Delay (s)	27.6	
Approach LOS	C	

Intersection Summary



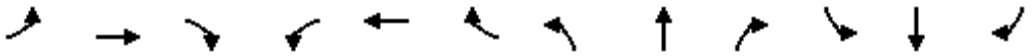
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	296	24	85	666	580	93	87	172	140	87	58
Future Volume (veh/h)	34	296	24	85	666	580	93	87	172	140	87	58
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	35	302	22	87	680	382	95	89	0	143	89	39
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	78	768	56	133	892	738	124	116		210	146	64
Arrive On Green	0.04	0.44	0.44	0.07	0.47	0.47	0.13	0.13	0.00	0.12	0.12	0.12
Sat Flow, veh/h	1795	1736	126	1795	1885	1559	949	889	1598	1795	1243	545
Grp Volume(v), veh/h	35	0	324	87	680	382	184	0	0	143	0	128
Grp Sat Flow(s),veh/h/ln	1795	0	1862	1795	1885	1559	1838	0	1598	1795	0	1787
Q Serve(g_s), s	1.2	0.0	7.5	3.0	18.9	10.9	6.2	0.0	0.0	4.9	0.0	4.3
Cycle Q Clear(g_c), s	1.2	0.0	7.5	3.0	18.9	10.9	6.2	0.0	0.0	4.9	0.0	4.3
Prop In Lane	1.00		0.07	1.00		1.00	0.52		1.00	1.00		0.30
Lane Grp Cap(c), veh/h	78	0	824	133	892	738	240	0		210	0	209
V/C Ratio(X)	0.45	0.00	0.39	0.65	0.76	0.52	0.77	0.00		0.68	0.00	0.61
Avail Cap(c_a), veh/h	564	0	1317	564	1333	1103	635	0		790	0	786
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.7	0.0	12.0	28.7	13.8	11.7	26.7	0.0	0.0	26.9	0.0	26.7
Incr Delay (d2), s/veh	1.5	0.0	0.4	2.0	2.0	0.8	1.9	0.0	0.0	1.4	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	2.8	1.3	6.9	3.2	2.6	0.0	0.0	2.1	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.2	0.0	12.4	30.7	15.9	12.5	28.7	0.0	0.0	28.4	0.0	27.8
LnGrp LOS	C	A	B	C	B	B	C	A		C	A	C
Approach Vol, veh/h		359			1149			184	A		271	
Approach Delay, s/veh		14.2			15.9			28.7			28.1	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	34.6		11.0	8.2	32.7		11.8				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	20.0	45.0		28.0	20.0	45.0		22.0				
Max Q Clear Time (g_c+I1), s	3.2	20.9		6.9	5.0	9.5		8.2				
Green Ext Time (p_c), s	0.0	9.2		0.7	0.1	3.1		0.5				

Intersection Summary			
HCM 6th Ctrl Delay		18.5	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	626	90	359	943	0	392	0	173	0	2	3
Future Volume (veh/h)	3	626	90	359	943	0	392	0	173	0	2	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	3	632	39	363	953	0	400	0	9	0	2	1
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	4	927	402	625	1311	0	560	0	247	0	6	3
Arrive On Green	0.25	0.25	0.25	0.35	0.35	0.00	0.16	0.00	0.16	0.00	0.00	0.00
Sat Flow, veh/h	17	3659	1588	1795	3770	0	3591	0	1582	0	1179	589
Grp Volume(v), veh/h	341	294	39	363	953	0	400	0	9	0	0	3
Grp Sat Flow(s),veh/h/ln	1884	1791	1588	1795	1885	0	1795	0	1582	0	0	1768
Q Serve(g_s), s	10.5	9.4	1.2	10.6	14.1	0.0	6.8	0.0	0.3	0.0	0.0	0.1
Cycle Q Clear(g_c), s	10.5	9.4	1.2	10.6	14.1	0.0	6.8	0.0	0.3	0.0	0.0	0.1
Prop In Lane	0.01		1.00	1.00		0.00	1.00		1.00	0.00		0.33
Lane Grp Cap(c), veh/h	478	454	402	625	1311	0	560	0	247	0	0	9
V/C Ratio(X)	0.71	0.65	0.10	0.58	0.73	0.00	0.71	0.00	0.04	0.00	0.00	0.35
Avail Cap(c_a), veh/h	1210	1150	1020	1012	2126	0	1350	0	595	0	0	554
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	21.7	21.3	18.2	17.0	18.2	0.0	25.6	0.0	22.9	0.0	0.0	31.7
Incr Delay (d2), s/veh	1.5	1.2	0.1	0.6	0.6	0.0	0.6	0.0	0.0	0.0	0.0	8.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	3.6	0.4	3.9	5.3	0.0	2.7	0.0	0.1	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.2	22.5	18.3	17.7	18.8	0.0	26.2	0.0	22.9	0.0	0.0	40.4
LnGrp LOS	C	C	B	B	B	A	C	A	C	A	A	D
Approach Vol, veh/h		674			1316			409			3	
Approach Delay, s/veh		22.6			18.5			26.2			40.4	
Approach LOS		C			B			C			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		26.3		13.5		20.3		3.8				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		16.1		8.8		12.5		2.1				
Green Ext Time (p_c), s		6.1		0.7		3.1		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		21.0
HCM 6th LOS		C

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

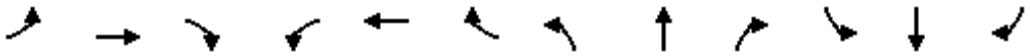
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	655	138	153	924	322	176
Future Volume (veh/h)	655	138	153	924	322	176
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	675	68	158	953	332	39
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1
Cap, veh/h	1813	805	202	2517	506	232
Arrive On Green	0.51	0.51	0.11	0.70	0.15	0.15
Sat Flow, veh/h	3676	1590	1795	3676	3483	1598
Grp Volume(v), veh/h	675	68	158	953	332	39
Grp Sat Flow(s),veh/h/ln	1791	1590	1795	1791	1742	1598
Q Serve(g_s), s	6.8	0.5	5.1	6.4	5.3	1.3
Cycle Q Clear(g_c), s	6.8	0.5	5.1	6.4	5.3	1.3
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1813	805	202	2517	506	232
V/C Ratio(X)	0.37	0.08	0.78	0.38	0.66	0.17
Avail Cap(c_a), veh/h	3686	1636	1060	6043	2174	997
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	8.9	1.2	25.6	3.6	23.9	22.2
Incr Delay (d2), s/veh	0.2	0.1	2.5	0.1	1.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.4	2.1	1.1	2.1	0.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	9.1	1.3	28.1	3.7	25.4	22.5
LnGrp LOS	A	A	C	A	C	C
Approach Vol, veh/h	743			1111	371	
Approach Delay, s/veh	8.4			7.2	25.1	
Approach LOS	A			A	C	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	11.7	35.0				46.7	12.6
Change Period (Y+Rc), s	5.0	* 5				5.0	4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0	37.0
Max Q Clear Time (g_c+I1), s	7.1	8.8				8.4	7.3
Green Ext Time (p_c), s	0.1	7.9				12.5	1.3

Intersection Summary	
HCM 6th Ctrl Delay	10.6
HCM 6th LOS	B

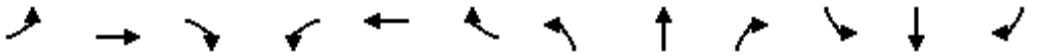
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



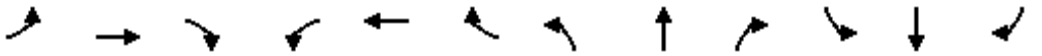
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	362	92	14	603	0	0	228	10	129	281	209
Future Volume (vph)	84	362	92	14	603	0	0	228	10	129	281	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7		3.7	2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00			0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1770	3184		1770	3303			1849		1770	3247	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1770	3184		1770	3303			1849		1770	3247	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	88	381	97	15	635	0	0	240	11	136	296	220
RTOR Reduction (vph)	0	14	0	0	0	0	0	2	0	0	107	0
Lane Group Flow (vph)	88	464	0	15	635	0	0	249	0	136	409	0
Confl. Peds. (#/hr)	45		15	15					20	20		35
Confl. Bikes (#/hr)			5									5
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	7.1	34.0		1.0	27.9			16.6		10.9	31.2	
Effective Green, g (s)	7.1	35.0		1.0	28.9			16.6		10.9	31.2	
Actuated g/C Ratio	0.09	0.45		0.01	0.37			0.21		0.14	0.40	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	162	1441		22	1234			397		249	1310	
v/s Ratio Prot	c0.05	c0.15		0.01	c0.19			c0.13		c0.08	0.13	
v/s Ratio Perm												
v/c Ratio	0.54	0.32		0.68	0.51			0.63		0.55	0.31	
Uniform Delay, d1	33.6	13.6		38.0	18.8			27.5		30.9	15.7	
Progression Factor	1.00	1.00		1.40	0.46			1.00		1.00	1.00	
Incremental Delay, d2	2.0	0.1		48.6	0.3			3.1		1.3	0.1	
Delay (s)	35.5	13.7		101.7	8.9			30.6		32.2	15.9	
Level of Service	D	B		F	A			C		C	B	
Approach Delay (s)		17.1			11.1			30.6			19.3	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	77.3	Sum of lost time (s)	14.8
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	94	373	0	145	607	59	8	51	129	0	103	210
Future Volume (vph)	94	373	0	145	607	59	8	51	129	0	103	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.99			1.00	0.85		0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)	1736	3471		1736	3417			1815	1517		1627	
Flt Permitted	0.95	1.00		0.95	1.00			0.96	1.00		1.00	
Satd. Flow (perm)	1736	3471		1736	3417			1757	1517		1627	
Peak-hour factor, PHF	0.97	0.97	0.92	0.97	0.97	0.97	0.97	0.97	0.97	0.92	0.97	0.97
Adj. Flow (vph)	97	385	0	149	626	61	8	53	133	0	106	216
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	79	0	85	0
Lane Group Flow (vph)	97	385	0	149	682	0	0	61	54	0	237	0
Confl. Peds. (#/hr)				10					15			
Confl. Bikes (#/hr)						5						5
Heavy Vehicles (%)	4%	4%	2%	4%	4%	4%	4%	4%	4%	2%	4%	4%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	7.2	23.4		11.6	27.8			31.2	31.2		31.2	
Effective Green, g (s)	7.2	23.4		11.6	28.8			32.2	31.2		32.2	
Actuated g/C Ratio	0.09	0.30		0.15	0.37			0.42	0.40		0.42	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	161	1050		260	1273			731	612		677	
v/s Ratio Prot	c0.06	0.11		c0.09	c0.20						c0.15	
v/s Ratio Perm								0.03	0.04			
v/c Ratio	0.60	0.37		0.57	0.54			0.08	0.09		0.35	
Uniform Delay, d1	33.7	21.1		30.5	19.0			13.6	14.3		15.4	
Progression Factor	1.20	0.89		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	4.2	0.2		1.9	0.4			0.0	0.1		0.3	
Delay (s)	44.7	19.0		32.4	19.4			13.7	14.3		15.7	
Level of Service	D	B		C	B			B	B		B	
Approach Delay (s)		24.2			21.8			14.1			15.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	77.3	Sum of lost time (s)	14.8
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	480	153	437	869	0	0	0	0	198	118	271
Future Volume (veh/h)	0	480	153	437	869	0	0	0	0	198	118	271
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	527	0	480	955	0				238	101	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1960		1293	2894	0				340	178	151
Arrive On Green	0.00	0.38	0.00	0.74	1.00	0.00				0.09	0.09	0.09
Sat Flow, veh/h	0	5358	1610	3510	3705	0				3619	1900	1610
Grp Volume(v), veh/h	0	527	0	480	955	0				238	101	31
Grp Sat Flow(s),veh/h/ln	0	1729	1610	1755	1805	0				1810	1900	1610
Q Serve(g_s), s	0.0	6.3	0.0	4.5	0.0	0.0				5.7	4.6	1.6
Cycle Q Clear(g_c), s	0.0	6.3	0.0	4.5	0.0	0.0				5.7	4.6	1.6
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1960		1293	2894	0				340	178	151
V/C Ratio(X)	0.00	0.27		0.37	0.33	0.00				0.70	0.57	0.21
Avail Cap(c_a), veh/h	0	1960		1293	2894	0				869	456	386
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.71	0.71	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	19.4	0.0	8.1	0.0	0.0				39.6	39.0	37.7
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.2	0.0				1.0	1.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.4	0.0	1.4	0.1	0.0				2.5	2.1	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	19.7	0.0	8.1	0.2	0.0				40.5	40.1	37.9
LnGrp LOS	A	B		A	A	A				D	D	D
Approach Vol, veh/h		527	A		1435						370	
Approach Delay, s/veh		19.7			2.9						40.2	
Approach LOS		B			A						D	

Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	38.2	39.0		12.8		77.2						
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0						
Max Green Setting (Gmax), s	21.5	* 34		21.6		59.0						
Max Q Clear Time (g_c+I1), s	6.5	8.3		7.7		2.0						
Green Ext Time (p_c), s	0.8	4.9		0.7		12.7						

Intersection Summary	
HCM 6th Ctrl Delay	12.6
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	22.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	29	17	20	177	0	202	9	0	380	96	141	492
Future Vol, veh/h	29	17	20	177	0	202	9	0	380	96	141	492
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	30	17	20	181	0	206	9	0	388	98	144	502
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	13.4	36.5	21.6	15
HCM LOS	B	E	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	44%	47%	100%	0%	0%
Vol Thru, %	100%	66%	26%	0%	0%	100%	100%
Vol Right, %	0%	34%	30%	53%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	199	286	66	379	141	246	246
LT Vol	0	0	29	177	141	0	0
Through Vol	199	190	17	0	0	246	246
RT Vol	0	96	20	202	0	0	0
Lane Flow Rate	203	292	67	387	144	251	251
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.462	0.644	0.165	0.818	0.319	0.52	0.396
Departure Headway (Hd)	8.182	7.938	8.823	7.617	7.979	7.463	5.675
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	439	452	405	476	449	482	630
Service Time	5.963	5.719	6.615	5.38	5.748	5.232	3.443
HCM Lane V/C Ratio	0.462	0.646	0.165	0.813	0.321	0.521	0.398
HCM Control Delay	17.9	24.1	13.4	36.5	14.5	18.1	12.2
HCM Lane LOS	C	C	B	E	B	C	B
HCM 95th-tile Q	2.4	4.4	0.6	7.8	1.4	2.9	1.9

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.98
Heavy Vehicles, %	2
Mvmt Flow	0
Number of Lanes	0

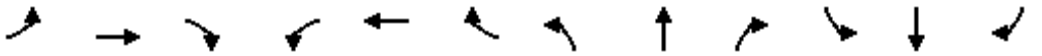
Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	405	345	27	418	689	0	0	0	0	170	0
Future Volume (vph)	0	405	345	27	418	689	0	0	0	0	170	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0					4.5	4.5
Lane Util. Factor		0.95			0.91	0.91					0.95	0.95
Frpb, ped/bikes		0.99			1.00	1.00					1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00					1.00	1.00
Frt		0.93			1.00	1.00					1.00	1.00
Flt Protected		1.00			0.95	0.99					0.95	0.95
Satd. Flow (prot)		3236			1595	3340					1665	1665
Flt Permitted		1.00			0.95	0.99					0.95	0.95
Satd. Flow (perm)		3236			1595	3340					1665	1665
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	426	363	28	440	725	0	0	0	0	179	0
RTOR Reduction (vph)	0	155	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	634	0	0	384	809	0	0	0	0	89	90
Confl. Peds. (#/hr)	10		5		5		10					
Confl. Bikes (#/hr)							10					
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type		NA		Split	Split	NA					Split	NA
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		20.5			24.6	24.6					7.4	7.4
Effective Green, g (s)		20.5			24.6	24.6					7.4	7.4
Actuated g/C Ratio		0.31			0.37	0.37					0.11	0.11
Clearance Time (s)		5.0			5.0	5.0					4.5	4.5
Vehicle Extension (s)		3.0			3.0	3.0					3.0	3.0
Lane Grp Cap (vph)		990			585	1226					183	183
v/s Ratio Prot		c0.20			0.24	c0.24					0.05	0.05
v/s Ratio Perm												
v/c Ratio		0.64			0.66	0.66					0.49	0.49
Uniform Delay, d1		20.1			17.7	17.7					28.0	28.0
Progression Factor		1.00			1.00	1.00					1.00	1.00
Incremental Delay, d2		1.4			2.7	1.3					2.0	2.1
Delay (s)		21.4			20.3	19.0					30.0	30.1
Level of Service		C			C	B					C	C
Approach Delay (s)		21.4				19.4			0.0			20.2
Approach LOS		C				B			A			C

Intersection Summary			
HCM 2000 Control Delay	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

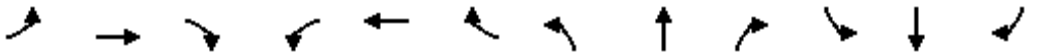
Movement	SBR
Lane Configurations	
Traffic Volume (vph)	324
Future Volume (vph)	324
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.0
Lane Util. Factor	1.00
Frpb, ped/bikes	1.00
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	341
RTOR Reduction (vph)	15
Lane Group Flow (vph)	326
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	3%
Turn Type	custom
Protected Phases	5
Permitted Phases	4
Actuated Green, G (s)	27.9
Effective Green, g (s)	27.9
Actuated g/C Ratio	0.42
Clearance Time (s)	5.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	652
v/s Ratio Prot	c0.15
v/s Ratio Perm	0.06
v/c Ratio	0.50
Uniform Delay, d1	14.4
Progression Factor	1.00
Incremental Delay, d2	0.6
Delay (s)	15.0
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	204	388	0	0	698	362	366	0	348	104	0	73
Future Volume (vph)	204	388	0	0	698	362	366	0	348	104	0	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.97		1.00	1.00	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3367	1827			3471	1509		1736	1553	1736		1553
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3367	1827			3471	1509		1736	1553	1736		1553
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	219	417	0	0	751	389	394	0	374	112	0	78
RTOR Reduction (vph)	0	0	0	0	0	284	0	0	255	0	0	69
Lane Group Flow (vph)	219	417	0	0	751	105	0	394	119	112	0	9
Confl. Peds. (#/hr)	10		5	5		10						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	11.3	37.4			21.6	21.6		22.4	22.4	9.1		9.1
Effective Green, g (s)	11.3	37.4			21.6	21.6		22.4	22.4	9.1		9.1
Actuated g/C Ratio	0.14	0.47			0.27	0.27		0.28	0.28	0.11		0.11
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	473	849			932	405		483	432	196		175
v/s Ratio Prot	0.07	c0.23			c0.22					c0.06		0.01
v/s Ratio Perm						0.07		0.23	0.08			
v/c Ratio	0.46	0.49			0.81	0.26		0.82	0.28	0.57		0.05
Uniform Delay, d1	31.8	14.9			27.4	23.1		27.1	22.7	33.8		31.8
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	0.7	0.2			4.9	0.1		9.7	0.1	2.5		0.0
Delay (s)	32.5	15.1			32.3	23.2		36.8	22.8	36.3		31.8
Level of Service	C	B			C	C		D	C	D		C
Approach Delay (s)		21.1			29.2			30.0			34.5	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	80.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	209	490	128	70	1143	156	100	125	42	125	125	416
Future Volume (veh/h)	209	490	128	70	1143	156	100	125	42	125	125	416
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945
Adj Flow Rate, veh/h	225	527	119	75	1229	168	108	134	45	134	134	447
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	416	1554	349	96	1099	150	95	367	123	197	159	829
Arrive On Green	0.23	0.54	0.54	0.05	0.35	0.35	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1781	2881	648	1781	3140	427	831	1329	446	516	575	1605
Grp Volume(v), veh/h	225	324	322	75	693	704	108	0	179	268	0	447
Grp Sat Flow(s),veh/h/ln	1781	1777	1752	1781	1777	1790	831	0	1776	1091	0	1605
Q Serve(g_s), s	11.1	10.3	10.4	4.2	35.0	35.0	2.8	0.0	8.1	16.7	0.0	0.0
Cycle Q Clear(g_c), s	11.1	10.3	10.4	4.2	35.0	35.0	27.6	0.0	8.1	24.8	0.0	0.0
Prop In Lane	1.00		0.37	1.00		0.24	1.00		0.25	0.50		1.00
Lane Grp Cap(c), veh/h	416	959	945	96	622	626	95	0	491	355	0	829
V/C Ratio(X)	0.54	0.34	0.34	0.78	1.11	1.12	1.13	0.00	0.36	0.75	0.00	0.54
Avail Cap(c_a), veh/h	416	959	945	143	622	626	95	0	491	375	0	850
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	0.92	0.61	0.61	0.61	1.00	0.00	1.00	0.93	0.00	0.93
Uniform Delay (d), s/veh	33.6	13.0	13.0	46.7	32.5	32.5	49.7	0.0	29.1	38.1	0.0	16.5
Incr Delay (d2), s/veh	0.7	0.9	0.9	4.9	65.1	68.6	132.5	0.0	0.2	6.5	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	4.0	4.0	1.9	25.5	26.3	5.9	0.0	3.5	7.0	0.0	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.3	13.8	13.9	51.7	97.6	101.1	182.2	0.0	29.3	44.6	0.0	16.8
LnGrp LOS	C	B	B	D	F	F	F	A	C	D	A	B
Approach Vol, veh/h		871			1472			287			715	
Approach Delay, s/veh		19.2			96.9			86.8			27.2	
Approach LOS		B			F			F			C	

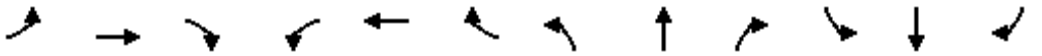
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	28.4	40.0		31.6	9.4	59.0		31.6				
Change Period (Y+Rc), s	5.0	* 5		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	23.0	* 35		29.0	8.0	46.0		25.0				
Max Q Clear Time (g_c+I1), s	13.1	37.0		26.8	6.2	12.4		29.6				
Green Ext Time (p_c), s	0.2	0.0		0.6	0.0	6.1		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		60.9	
HCM 6th LOS		E	

Notes

User approved pedestrian interval to be less than phase max green.

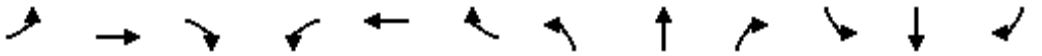
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	480	0	1213	0	1626	330	0	1719	365
Future Volume (vph)	0	0	0	480	0	1213	0	1626	330	0	1719	365
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.6		4.6		4.4	4.4		4.4	4.4
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.93		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3467		2814		5136	1487		5136	1557
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3467		2814		5136	1487		5136	1557
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	500	0	1264	0	1694	344	0	1791	380
RTOR Reduction (vph)	0	0	0	0	0	7	0	0	181	0	0	97
Lane Group Flow (vph)	0	0	0	500	0	1257	0	1694	163	0	1791	283
Confl. Peds. (#/hr)							10		15	15		10
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				29.3		69.9		71.1	71.1		111.7	111.7
Effective Green, g (s)				29.3		66.3		71.1	71.1		111.7	111.7
Actuated g/C Ratio				0.20		0.44		0.47	0.47		0.74	0.74
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				677		1243		2434	704		3824	1159
v/s Ratio Prot				0.14		c0.45		c0.33			0.35	
v/s Ratio Perm									0.11			0.18
v/c Ratio				0.74		1.01		0.70	0.23		0.47	0.24
Uniform Delay, d1				56.7		41.9		31.0	23.3		7.5	6.0
Progression Factor				1.00		1.00		0.86	1.89		1.00	1.00
Incremental Delay, d2				3.6		28.4		1.3	0.6		0.4	0.5
Delay (s)				60.4		70.2		27.9	44.7		7.9	6.5
Level of Service				E		E		C	D		A	A
Approach Delay (s)		0.0			67.5			30.8			7.7	
Approach LOS		A			E			C			A	

Intersection Summary			
HCM 2000 Control Delay	33.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		

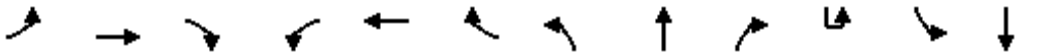
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	0	391	0	0	0	0	1666	527	0	1496	733
Future Volume (vph)	290	0	391	0	0	0	0	1666	527	0	1496	733
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5					4.5			4.5	4.5
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.88	0.85					0.96			1.00	0.85
Flt Protected	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1698	1497	1519					4752			5136	1553
Flt Permitted	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1698	1497	1519					4752			5136	1553
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	305	0	412	0	0	0	0	1754	555	0	1575	772
RTOR Reduction (vph)	0	51	51	0	0	0	0	0	0	0	0	171
Lane Group Flow (vph)	250	185	180	0	0	0	0	2309	0	0	1575	601
Confl. Peds. (#/hr)	5					5	10		15	15		10
Confl. Bikes (#/hr)												5
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	24.3	24.3	24.3					116.7			116.7	116.7
Effective Green, g (s)	24.3	24.3	24.3					116.7			116.7	116.7
Actuated g/C Ratio	0.16	0.16	0.16					0.78			0.78	0.78
Clearance Time (s)	4.5	4.5	4.5					4.5			4.5	4.5
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	275	242	246					3697			3995	1208
v/s Ratio Prot	c0.15	0.12						c0.49			0.31	
v/s Ratio Perm			0.12									0.39
v/c Ratio	0.91	0.76	0.73					0.62			0.39	0.50
Uniform Delay, d1	61.8	60.1	59.7					7.2			5.3	6.0
Progression Factor	1.00	1.00	1.00					1.90			1.41	5.56
Incremental Delay, d2	30.7	12.1	9.2					0.7			0.3	1.3
Delay (s)	92.4	72.2	69.0					14.3			7.8	34.8
Level of Service	F	E	E					B			A	C
Approach Delay (s)		78.2			0.0			14.3			16.7	
Approach LOS		E			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (veh/h)	189	298	223	299	445	192	315	1352	124	61	278	1222
Future Volume (veh/h)	189	298	223	299	445	192	315	1352	124	61	278	1222
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0		0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		0.96	1.00		0.98		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Work Zone On Approach		No			No			No				No
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885		1885	1885
Adj Flow Rate, veh/h	201	317	113	318	473	170	335	1438	72		296	1300
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94		0.94	0.94
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1		1	1
Cap, veh/h	228	897	380	372	589	210	906	1396	424		918	1396
Arrive On Green	0.13	0.25	0.25	0.11	0.23	0.23	0.26	0.27	0.27		0.26	0.27
Sat Flow, veh/h	1795	3582	1516	3483	2557	911	3483	5147	1562		3483	5147
Grp Volume(v), veh/h	201	317	113	318	330	313	335	1438	72		296	1300
Grp Sat Flow(s),veh/h/ln	1795	1791	1516	1742	1791	1677	1742	1716	1562		1742	1716
Q Serve(g_s), s	16.5	10.9	5.2	13.5	26.1	26.5	11.8	40.7	4.1		10.3	36.9
Cycle Q Clear(g_c), s	16.5	10.9	5.2	13.5	26.1	26.5	11.8	40.7	4.1		10.3	36.9
Prop In Lane	1.00		1.00	1.00		0.54	1.00		1.00		1.00	
Lane Grp Cap(c), veh/h	228	897	380	372	413	386	906	1396	424		918	1396
V/C Ratio(X)	0.88	0.35	0.30	0.86	0.80	0.81	0.37	1.03	0.17		0.32	0.93
Avail Cap(c_a), veh/h	455	931	394	488	430	403	906	1396	424		918	1396
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Upstream Filter(I)	0.92	0.92	0.92	0.09	0.09	0.09	1.00	1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	64.4	46.2	15.1	65.9	54.5	54.6	45.4	54.6	25.7		44.5	53.3
Incr Delay (d2), s/veh	10.0	0.2	0.4	1.2	1.0	1.1	0.3	32.0	0.9		0.2	12.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	8.2	4.9	3.4	6.0	11.8	11.3	5.2	21.5	2.1		4.5	17.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.4	46.4	15.5	67.0	55.4	55.8	45.7	86.7	26.5		44.7	65.7
LnGrp LOS	E	D	B	E	E	E	D	F	C		D	E
Approach Vol, veh/h		631			961			1845				1752
Approach Delay, s/veh		49.8			59.4			76.9				58.7
Approach LOS		D			E			E				E

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	42.5	45.3	22.5	39.7	43.0	44.8	19.5	42.7
Change Period (Y+Rc), s	3.5	4.6	3.5	* 5.1	3.5	4.1	3.5	5.1
Max Green Setting (Gmax), s	20.0	40.7	38.0	* 36	19.0	40.7	21.0	39.0
Max Q Clear Time (g_c+I1), s	13.8	38.9	18.5	28.5	12.3	42.7	15.5	12.9
Green Ext Time (p_c), s	0.6	1.4	0.5	2.3	0.6	0.0	0.5	2.4

Intersection Summary	
HCM 6th Ctrl Delay	64.2
HCM 6th LOS	E

Notes

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	203
Future Volume (veh/h)	203
Initial Q (Qb), veh	0
Ped-Bike Adj(A_pbT)	0.98
Parking Bus, Adj	1.00
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	1885
Adj Flow Rate, veh/h	156
Peak Hour Factor	0.94
Percent Heavy Veh, %	1
Cap, veh/h	424
Arrive On Green	0.27
Sat Flow, veh/h	1562
Grp Volume(v), veh/h	156
Grp Sat Flow(s),veh/h/ln	1562
Q Serve(g_s), s	9.1
Cycle Q Clear(g_c), s	9.1
Prop In Lane	1.00
Lane Grp Cap(c), veh/h	424
V/C Ratio(X)	0.37
Avail Cap(c_a), veh/h	424
HCM Platoon Ratio	1.00
Upstream Filter(I)	1.00
Uniform Delay (d), s/veh	25.0
Incr Delay (d2), s/veh	2.5
Initial Q Delay(d3),s/veh	0.0
%ile BackOfQ(50%),veh/ln	3.7
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	27.5
LnGrp LOS	C
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	
Timer - Assigned Phs	

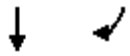
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	81	71	51	375	160	384	97	206	1709	345	52	193
Future Volume (veh/h)	81	71	51	375	160	384	97	206	1709	345	52	193
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.98		0.96		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885		1885	1885	1885		1885
Adj Flow Rate, veh/h	85	75	27	282	327	156		217	1799	251		203
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	1	1	1	1	1	1		1	1	1		1
Cap, veh/h	150	318	114	325	501	408		244	2741	846		229
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27		0.14	0.53	0.53		0.13
Sat Flow, veh/h	383	1196	430	1281	1885	1537		1795	5147	1589		1795
Grp Volume(v), veh/h	85	0	102	282	327	156		217	1799	251		203
Grp Sat Flow(s),veh/h/ln	383	0	1626	1281	1885	1537		1795	1716	1589		1795
Q Serve(g_s), s	13.7	0.0	7.4	32.5	23.1	12.4		17.8	37.7	13.2		16.7
Cycle Q Clear(g_c), s	36.8	0.0	7.4	39.9	23.1	12.4		17.8	37.7	13.2		16.7
Prop In Lane	1.00		0.26	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	150	0	432	325	501	408		244	2741	846		229
V/C Ratio(X)	0.57	0.00	0.24	0.87	0.65	0.38		0.89	0.66	0.30		0.89
Avail Cap(c_a), veh/h	236	0	585	325	501	408		431	2741	846		395
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	65.3	0.0	43.1	59.0	48.9	45.0		63.7	25.2	19.5		64.4
Incr Delay (d2), s/veh	3.3	0.0	0.3	21.0	3.0	0.6		10.9	1.2	0.9		11.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	3.4	0.0	3.1	12.7	11.4	4.9		8.9	15.6	5.2		8.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.6	0.0	43.4	80.0	51.9	45.6		74.6	26.4	20.4		76.2
LnGrp LOS	E	A	D	F	D	D		E	C	C		E
Approach Vol, veh/h		187			765				2267			
Approach Delay, s/veh		54.9			61.0				30.4			
Approach LOS		D			E				C			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.4	83.1		43.6	22.1	84.3		43.6				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	36.0	48.9		36.0	33.0	27.6		54.0				
Max Q Clear Time (g_c+I1), s	19.8	22.7		41.9	18.7	39.7		38.8				
Green Ext Time (p_c), s	0.5	9.2		0.0	0.5	0.0		1.1				

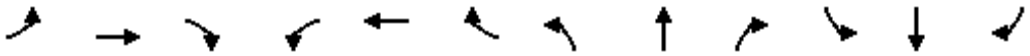
Intersection Summary		
HCM 6th Ctrl Delay		36.6
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1014	106
Future Volume (veh/h)	1014	106
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		0.99
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1885	1885
Adj Flow Rate, veh/h	1067	106
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	1	1
Cap, veh/h	2495	248
Arrive On Green	0.52	0.52
Sat Flow, veh/h	4756	472
Grp Volume(v), veh/h	769	404
Grp Sat Flow(s),veh/h/ln	1716	1797
Q Serve(g_s), s	20.6	20.7
Cycle Q Clear(g_c), s	20.6	20.7
Prop In Lane		0.26
Lane Grp Cap(c), veh/h	1800	943
V/C Ratio(X)	0.43	0.43
Avail Cap(c_a), veh/h	1800	943
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	21.9	21.9
Incr Delay (d2), s/veh	0.7	1.4
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.6	9.2
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	22.6	23.3
LnGrp LOS	C	C
Approach Vol, veh/h	1376	
Approach Delay, s/veh	30.7	
Approach LOS	C	
Timer - Assigned Phs		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	148	528	0	0	1032	648	281	524	309	0	0	0
Future Volume (veh/h)	148	528	0	0	1032	648	281	524	309	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1885	1885	1885			
Adj Flow Rate, veh/h	161	574	0	0	1122	0	305	570	336			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	1	1	1			
Cap, veh/h	228	2038	0	0	1645		574	603	508			
Arrive On Green	0.13	1.00	0.00	0.00	0.46	0.00	0.32	0.32	0.32			
Sat Flow, veh/h	3483	3676	0	0	3676	1598	1795	1885	1590			
Grp Volume(v), veh/h	161	574	0	0	1122	0	305	570	336			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1791	1598	1795	1885	1590			
Q Serve(g_s), s	4.0	0.0	0.0	0.0	22.2	0.0	12.5	26.5	16.4			
Cycle Q Clear(g_c), s	4.0	0.0	0.0	0.0	22.2	0.0	12.5	26.5	16.4			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	228	2038	0	0	1645		574	603	508			
V/C Ratio(X)	0.71	0.28	0.00	0.00	0.68		0.53	0.95	0.66			
Avail Cap(c_a), veh/h	232	2038	0	0	1645		579	607	512			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.96	0.96	0.00	0.00	0.50	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	38.3	0.0	0.0	0.0	19.2	0.0	25.1	29.8	26.4			
Incr Delay (d2), s/veh	7.6	0.3	0.0	0.0	1.2	0.0	0.5	23.5	2.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.8	0.1	0.0	0.0	8.8	0.0	5.2	15.3	6.3			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.9	0.3	0.0	0.0	20.3	0.0	25.5	53.3	28.9			
LnGrp LOS	D	A	A	A	C		C	D	C			
Approach Vol, veh/h		735			1122	A		1211				
Approach Delay, s/veh		10.3			20.3			39.5				
Approach LOS		B			C			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		56.2			9.9	46.3		33.8				
Change Period (Y+Rc), s		5.0			4.0	5.0		5.0				
Max Green Setting (Gmax), s		51.0			6.0	41.0		29.0				
Max Q Clear Time (g_c+I1), s		2.0			6.0	24.2		28.5				
Green Ext Time (p_c), s		6.0			0.0	9.4		0.2				

Intersection Summary	
HCM 6th Ctrl Delay	25.5
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2: Train & Scott St Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.1	0.1	0.0
Total Del/Veh (s)	2.2	8.5	3.7	5.7
Vehicles Entered	134	185	11	330
Vehicles Exited	134	185	11	330
Hourly Exit Rate	134	185	11	330
Input Volume	137	183	9	329
% of Volume	98	101	119	100
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0		0.0	0.3	0.3	0.2	0.3	0.3	0.3
Total Del/Veh (s)	5.5	9.2	3.9	4.2		3.0	10.4	10.0	7.6	9.4	8.1	5.0
Vehicles Entered	2	6	8	151	0	27	9	146	86	42	208	6
Vehicles Exited	2	6	8	151	0	28	9	147	86	41	208	6
Hourly Exit Rate	2	6	8	151	0	28	9	147	86	41	208	6
Input Volume	2	6	8	150	0	27	10	147	89	41	205	5
% of Volume	100	100	97	100	0	105	88	100	97	100	101	120
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	7.4
Vehicles Entered	691
Vehicles Exited	692
Hourly Exit Rate	692
Input Volume	691
% of Volume	100
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	0.3	0.4	0.3	0.3
Total Del/Veh (s)	5.6	0.5	3.9	6.1	6.4	8.3	6.1	6.6
Vehicles Entered	46	12	80	64	172	243	112	729
Vehicles Exited	46	12	80	64	172	242	112	728
Hourly Exit Rate	46	12	80	64	172	242	112	728
Input Volume	49	10	81	61	166	245	114	727
% of Volume	93	114	98	105	104	99	98	100
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	12.5
Vehicles Entered	1131
Vehicles Exited	1130
Hourly Exit Rate	1130
Input Volume	3163
% of Volume	36
Denied Entry Before	0
Denied Entry After	0

Intersection: 2: Train & Scott St

Movement	EB	WB	SB
Directions Served	T	T	T
Maximum Queue (ft)	84	142	22
Average Queue (ft)	16	42	2
95th Queue (ft)	56	103	13
Link Distance (ft)	8	138	482
Upstream Blk Time (%)	6	1	
Queuing Penalty (veh)	9	1	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Dollar Ave/Herman Ave & Scott St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	31	65	139	170
Average Queue (ft)	13	36	59	78
95th Queue (ft)	37	51	106	129
Link Distance (ft)	516	8	947	1729
Upstream Blk Time (%)		14		
Queuing Penalty (veh)		25		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

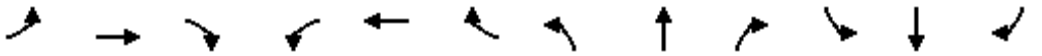
Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	84	125	153
Average Queue (ft)	42	59	78
95th Queue (ft)	69	93	127
Link Distance (ft)	186	939	1415
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 35

2024 Plus Phase 1 AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	55	475	160	5	35	135	0	0	365	55
Future Volume (vph)	0	0	55	475	160	5	35	135	0	0	365	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.6	4.0	4.0			4.6			4.6	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			0.99	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.98	
Flt Protected			1.00	0.95	0.98			0.99			1.00	
Satd. Flow (prot)			1580	1649	1690			3436			3376	
Flt Permitted			1.00	0.95	0.98			0.99			1.00	
Satd. Flow (perm)			1580	1649	1690			3436			3376	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	0	62	540	182	6	40	153	0	0	415	62
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	12	0
Lane Group Flow (vph)	0	0	63	362	366	0	0	193	0	0	466	0
Confl. Peds. (#/hr)							10					10
Confl. Bikes (#/hr)									5			5
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	2%	4%	4%	4%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			12.1	51.7	51.7			12.1			23.0	
Effective Green, g (s)			12.1	51.7	51.7			12.1			23.0	
Actuated g/C Ratio			0.12	0.52	0.52			0.12			0.23	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			191	852	873			415			776	
v/s Ratio Prot			0.04					c0.06			c0.14	
v/s Ratio Perm				c0.22	0.22							
v/c Ratio			0.33	0.42	0.42			0.47			0.60	
Uniform Delay, d1			40.2	14.9	14.9			40.9			34.4	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			1.4	1.6	1.5			1.1			3.4	
Delay (s)			41.6	16.5	16.4			42.1			37.8	
Level of Service			D	B	B			D			D	
Approach Delay (s)		41.6			16.4			42.1			37.8	
Approach LOS		D			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	27.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/24/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	555	275	30	135	175	5	380	215
Future Volume (veh/h)	555	275	30	135	175	5	380	215
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.95
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1590	1710		1590	1590		1590	1590
Adj Flow Rate, veh/h	391	405		141	182		396	37
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	9	0		9	9		9	9
Cap, veh/h	456	437		1175	1851		503	214
Arrive On Green	0.30	0.30		0.40	0.61		0.17	0.17
Sat Flow, veh/h	1514	1449		2938	3100		3100	1286
Grp Volume(v), veh/h	391	405		141	182		396	37
Grp Sat Flow(s),veh/h/ln	1514	1449		1469	1510		1510	1286
Q Serve(g_s), s	24.3	27.1		3.0	2.5		12.6	2.5
Cycle Q Clear(g_c), s	24.3	27.1		3.0	2.5		12.6	2.5
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	456	437		1175	1851		503	214
V/C Ratio(X)	0.86	0.93		0.12	0.10		0.79	0.17
Avail Cap(c_a), veh/h	500	478		1175	1851		1190	507
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.91	0.91		0.70	0.70		0.76	0.76
Uniform Delay (d), s/veh	32.9	33.9		18.9	8.0		40.0	35.8
Incr Delay (d2), s/veh	11.0	21.0		0.0	0.1		9.2	1.3
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	10.2	11.9		1.0	0.8		5.2	0.8
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	43.9	54.8		18.9	8.1		49.1	37.1
LnGrp LOS	D	D		B	A		D	D
Approach Vol, veh/h	796				323		433	
Approach Delay, s/veh	49.5				12.8		48.1	
Approach LOS	D				B		D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	44.6	21.3				65.9		34.1
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	13.0	* 39				48.4		33.0
Max Q Clear Time (g_c+I1), s	5.0	14.6				4.5		29.1
Green Ext Time (p_c), s	0.2	1.7				0.7		1.0

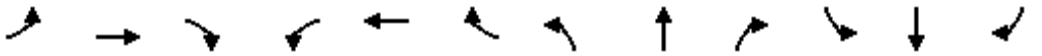
Intersection Summary	
HCM 6th Ctrl Delay	41.5
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	215	80	210	115	65	40	355	330	405	385	130
Future Volume (vph)	195	215	80	210	115	65	40	355	330	405	385	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.99		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (prot)		3002		2814	1527	1298	1464	2927	1309	1421	2954	1264
Flt Permitted		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (perm)		3002		2814	1527	1298	1464	2927	1309	1421	2954	1264
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	205	226	84	221	121	68	42	374	347	426	405	137
RTOR Reduction (vph)	0	16	0	0	0	61	0	0	0	0	0	91
Lane Group Flow (vph)	0	499	0	221	121	7	42	374	347	281	550	46
Confl. Peds. (#/hr)			65									25
Heavy Vehicles (%)	2%	2%	2%	12%	12%	12%	11%	11%	11%	4%	4%	4%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		22.8		11.0	11.0	11.0	16.9	16.9	73.3	35.6	35.6	35.6
Effective Green, g (s)		22.8		11.0	11.0	11.0	16.9	16.9	73.3	35.6	35.6	35.6
Actuated g/C Ratio		0.22		0.10	0.10	0.10	0.16	0.16	0.70	0.34	0.34	0.34
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		651		294	159	135	235	471	913	481	1001	428
v/s Ratio Prot		c0.17		0.08	c0.08		0.03	c0.13	0.26	c0.20	0.19	
v/s Ratio Perm						0.01						0.04
v/c Ratio		0.77		0.75	0.76	0.05	0.18	0.79	0.38	0.58	0.55	0.11
Uniform Delay, d1		38.6		45.7	45.7	42.3	38.1	42.4	6.5	28.6	28.2	23.8
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		4.8		10.3	19.1	0.2	0.3	8.7	0.2	5.1	2.2	0.5
Delay (s)		43.4		56.0	64.8	42.5	38.3	51.1	6.7	33.7	30.4	24.3
Level of Service		D		E	E	D	D	D	A	C	C	C
Approach Delay (s)		43.4			56.4			30.2			30.5	
Approach LOS		D			E			C			C	

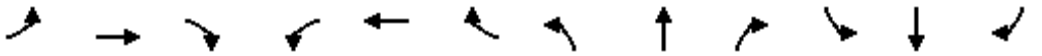
Intersection Summary			
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	360	45	245	80	20	15	135	445	45	265	15
Future Volume (vph)	35	360	45	245	80	20	15	135	445	45	265	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		3.5	3.5			3.0	3.0		3.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		1.00		1.00	0.99			1.00	1.00		1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	0.97			1.00	0.85		0.99	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2759		1413	1430			1480	2224		1464	
Flt Permitted		1.00		0.95	1.00			0.97	1.00		0.94	
Satd. Flow (perm)		2759		1413	1430			1435	2224		1390	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	38	387	48	263	86	22	16	145	478	48	285	16
RTOR Reduction (vph)	0	11	0	0	13	0	0	0	152	0	2	0
Lane Group Flow (vph)	0	462	0	263	95	0	0	161	326	0	347	0
Confl. Peds. (#/hr)			15			10			10			20
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		25.6		16.8	16.8			20.6	40.9		20.6	
Effective Green, g (s)		25.6		16.8	16.8			20.6	37.4		20.6	
Actuated g/C Ratio		0.35		0.23	0.23			0.28	0.51		0.28	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		967		325	329			404	1139		392	
v/s Ratio Prot		c0.17		c0.19	0.07				0.15			
v/s Ratio Perm								0.11			c0.25	
v/c Ratio		0.48		0.81	0.29			0.40	0.29		0.88	
Uniform Delay, d1		18.5		26.6	23.2			21.2	10.2		25.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.7		13.1	0.2			0.2	0.1		20.0	
Delay (s)		20.2		39.6	23.3			21.4	10.2		45.0	
Level of Service		C		D	C			C	B		D	
Approach Delay (s)		20.2			34.9			13.0			45.0	
Approach LOS		C			C			B			D	

Intersection Summary			
HCM 2000 Control Delay	25.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	215	150	315	195	175	190	45	400	210	650	80
Future Volume (veh/h)	155	215	150	315	195	175	190	45	400	210	650	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1441	1441	1441	1618	1618	1618	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	130	273	0	332	205	0	200	47	0	221	684	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	31	31	31	19	19	19	7	7	7	6	6	6
Cap, veh/h	175	367		518	272		230	711		544	1368	
Arrive On Green	0.13	0.13	0.00	0.06	0.06	0.00	0.13	0.21	0.00	0.32	0.40	0.00
Sat Flow, veh/h	1372	2881	1221	3083	1618	1372	1711	3503	0	1725	3441	1535
Grp Volume(v), veh/h	130	273	0	332	205	0	200	47	0	221	684	0
Grp Sat Flow(s),veh/h/ln	1372	1441	1221	1541	1618	1372	1711	1706	0	1725	1721	1535
Q Serve(g_s), s	9.6	9.6	0.0	11.1	13.1	0.0	12.0	1.2	0.0	10.6	15.7	0.0
Cycle Q Clear(g_c), s	9.6	9.6	0.0	11.1	13.1	0.0	12.0	1.2	0.0	10.6	15.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	175	367		518	272		230	711		544	1368	
V/C Ratio(X)	0.74	0.74		0.64	0.75		0.87	0.07		0.41	0.50	
Avail Cap(c_a), veh/h	289	606		611	321		293	809		544	1368	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.86	0.86	0.00	0.86	0.86	0.00	1.00	1.00	0.00	0.68	0.68	0.00
Uniform Delay (d), s/veh	44.2	44.2	0.0	46.5	47.4	0.0	44.5	33.4	0.0	28.2	23.8	0.0
Incr Delay (d2), s/veh	2.0	1.0	0.0	1.5	7.1	0.0	16.7	0.0	0.0	0.1	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	3.5	0.0	4.7	6.2	0.0	6.1	0.5	0.0	4.3	6.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.2	45.1	0.0	48.0	54.5	0.0	61.2	33.4	0.0	28.4	24.7	0.0
LnGrp LOS	D	D		D	D		E	C		C	C	
Approach Vol, veh/h		403	A		537	A		247	A		905	A
Approach Delay, s/veh		45.5			50.5			55.9			25.6	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.1	46.6		18.0	38.0	26.8		22.3				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	18.0	26.0		22.1	19.1	* 25		20.8				
Max Q Clear Time (g_c+I1), s	14.0	17.7		11.6	12.6	3.2		15.1				
Green Ext Time (p_c), s	0.2	3.1		1.1	0.3	0.1		1.5				

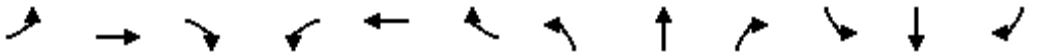
Intersection Summary			
HCM 6th Ctrl Delay		39.4	
HCM 6th LOS		D	

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	105	340	370	30	165	20	330	485	355	25	125	215
Future Volume (veh/h)	105	340	370	30	165	20	330	485	355	25	125	215
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.95	1.00		1.00	1.00		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1722	1722	1722	1574	1574	1574	1811	1811	1811	1663	1663	1663
Adj Flow Rate, veh/h	113	366	118	32	177	18	355	522	0	27	134	43
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	12	12	12	22	22	22	6	6	6	16	16	16
Cap, veh/h	227	423	351	87	223	23	1361	1400		186	195	152
Arrive On Green	0.04	0.08	0.08	0.06	0.16	0.16	0.42	0.42	0.00	0.12	0.12	0.12
Sat Flow, veh/h	1640	1722	1426	1499	1398	142	3346	3532	0	1584	1663	1301
Grp Volume(v), veh/h	113	366	118	32	0	195	355	522	0	27	134	43
Grp Sat Flow(s),veh/h/ln	1640	1722	1426	1499	0	1540	1673	1721	0	1584	1663	1301
Q Serve(g_s), s	7.1	22.1	8.2	2.2	0.0	12.8	7.3	10.9	0.0	1.6	8.1	3.2
Cycle Q Clear(g_c), s	7.1	22.1	8.2	2.2	0.0	12.8	7.3	10.9	0.0	1.6	8.1	3.2
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	227	423	351	87	0	246	1361	1400		186	195	152
V/C Ratio(X)	0.50	0.86	0.34	0.37	0.00	0.79	0.26	0.37		0.15	0.69	0.28
Avail Cap(c_a), veh/h	208	426	353	144	0	362	1399	1439		353	371	290
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.86	0.86	0.86	1.00	0.00	1.00	0.73	0.73	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.5	48.1	40.2	47.6	0.0	42.5	20.7	21.8	0.0	41.6	44.5	42.3
Incr Delay (d2), s/veh	1.1	14.4	0.4	1.0	0.0	4.1	0.3	0.6	0.0	0.1	1.6	0.4
Initial Q Delay(d3),s/veh	0.0	50.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	19.3	3.1	0.8	0.0	5.1	2.9	4.5	0.0	0.6	3.4	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.6	112.7	40.5	48.6	0.0	46.5	21.0	22.3	0.0	41.8	46.1	42.7
LnGrp LOS	D	F	D	D	A	D	C	C		D	D	D
Approach Vol, veh/h		597			227			877	A		204	
Approach Delay, s/veh		86.1			46.8			21.8			44.8	
Approach LOS		F			D			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.1	29.2		48.5	17.9	21.4		17.2				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.6	* 4.6		4.9				
Max Green Setting (Gmax), s	10.1	26.0		27.4	11.4	* 25		23.4				
Max Q Clear Time (g_c+I1), s	4.2	24.1		12.9	9.1	14.8		10.1				
Green Ext Time (p_c), s	0.0	0.5		2.9	0.0	0.5		0.5				

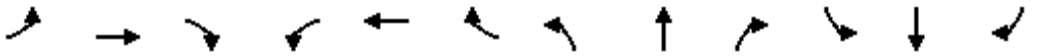
Intersection Summary		
HCM 6th Ctrl Delay		47.4
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.

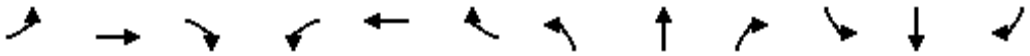
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	850	20	690	15	15	20	210	235	20	30	440	120
Future Volume (vph)	850	20	690	15	15	20	210	235	20	30	440	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	0.95	1.00		0.98	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1633	1641	2707		1701	1482	1656	3273		1626	3252	1455
Flt Permitted	0.95	0.95	1.00		0.98	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1633	1641	2707		1701	1482	1656	3273		1626	3252	1455
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	895	21	726	16	16	21	221	247	21	32	463	126
RTOR Reduction (vph)	0	0	516	0	0	20	0	5	0	0	0	95
Lane Group Flow (vph)	456	460	210	0	32	1	221	263	0	32	463	31
Heavy Vehicles (%)	5%	5%	5%	9%	9%	9%	9%	9%	9%	11%	11%	11%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	20.9	20.9	20.9		4.1	4.1	14.6	29.5		2.8	17.7	17.7
Effective Green, g (s)	20.9	20.9	20.9		4.1	4.1	14.6	29.5		2.8	17.7	17.7
Actuated g/C Ratio	0.29	0.29	0.29		0.06	0.06	0.20	0.41		0.04	0.25	0.25
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	473	475	784		96	84	335	1339		63	798	357
v/s Ratio Prot	0.28	c0.28			c0.02		c0.13	0.08		0.02	c0.14	
v/s Ratio Perm			0.08			0.00						0.02
v/c Ratio	0.96	0.97	0.27		0.33	0.01	0.66	0.20		0.51	0.58	0.09
Uniform Delay, d1	25.2	25.3	19.7		32.7	32.1	26.5	13.7		34.0	23.9	21.0
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	32.0	32.8	0.2		2.0	0.1	4.7	0.1		6.3	1.1	0.1
Delay (s)	57.3	58.1	19.9		34.7	32.2	31.1	13.8		40.3	25.0	21.1
Level of Service	E	E	B		C	C	C	B		D	C	C
Approach Delay (s)		41.0			33.7			21.6			25.0	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	33.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	72.1	Sum of lost time (s)	14.8
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



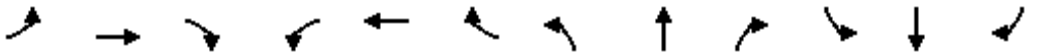
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	795	265	55	285	205	30	20	175	380	335	25
Future Volume (veh/h)	55	795	265	55	285	205	30	20	175	380	335	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	60	874	281	60	313	96	33	22	0	418	368	26
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	90	650	209	90	897	757	53	35		465	450	32
Arrive On Green	0.05	0.48	0.48	0.05	0.48	0.48	0.05	0.05	0.00	0.26	0.26	0.26
Sat Flow, veh/h	1781	1354	435	1781	1870	1577	1090	726	1585	1781	1726	122
Grp Volume(v), veh/h	60	0	1155	60	313	96	55	0	0	418	0	394
Grp Sat Flow(s),veh/h/ln	1781	0	1789	1781	1870	1577	1816	0	1585	1781	0	1848
Q Serve(g_s), s	3.1	0.0	45.0	3.1	9.8	3.2	2.8	0.0	0.0	21.3	0.0	18.8
Cycle Q Clear(g_c), s	3.1	0.0	45.0	3.1	9.8	3.2	2.8	0.0	0.0	21.3	0.0	18.8
Prop In Lane	1.00		0.24	1.00		1.00	0.60		1.00	1.00		0.07
Lane Grp Cap(c), veh/h	90	0	859	90	897	757	88	0		465	0	482
V/C Ratio(X)	0.67	0.00	1.35	0.67	0.35	0.13	0.62	0.00		0.90	0.00	0.82
Avail Cap(c_a), veh/h	380	0	859	380	897	757	426	0		532	0	552
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	43.7	0.0	24.4	43.7	15.2	13.5	43.8	0.0	0.0	33.5	0.0	32.6
Incr Delay (d2), s/veh	3.1	0.0	163.2	3.1	0.3	0.1	2.6	0.0	0.0	15.6	0.0	7.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	56.5	1.4	3.9	1.1	1.3	0.0	0.0	11.1	0.0	9.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.9	0.0	187.6	46.9	15.6	13.6	46.4	0.0	0.0	49.1	0.0	39.8
LnGrp LOS	D	A	F	D	B	B	D	A		D	A	D
Approach Vol, veh/h		1215			469			55	A		812	
Approach Delay, s/veh		180.6			19.2			46.4			44.6	
Approach LOS		F			B			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.2	49.5		28.0	8.2	49.5		8.1				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	20.0	45.0		28.0	20.0	45.0		22.0				
Max Q Clear Time (g_c+I1), s	5.1	11.8		23.3	5.1	47.0		4.8				
Green Ext Time (p_c), s	0.0	3.2		1.2	0.0	0.0		0.1				

Intersection Summary		
HCM 6th Ctrl Delay		104.7
HCM 6th LOS		F

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1145	190	115	390	5	135	10	250	0	5	5
Future Volume (veh/h)	5	1145	190	115	390	5	135	10	250	0	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	5	1258	169	126	429	5	163	0	26	0	5	4
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	6	1670	716	324	671	8	337	0	150	0	13	11
Arrive On Green	0.46	0.46	0.46	0.18	0.18	0.18	0.09	0.00	0.09	0.00	0.01	0.01
Sat Flow, veh/h	14	3633	1557	1781	3689	43	3563	0	1585	0	962	770
Grp Volume(v), veh/h	677	586	169	126	217	217	163	0	26	0	0	9
Grp Sat Flow(s),veh/h/ln	1870	1777	1557	1781	1870	1862	1781	0	1585	0	0	1732
Q Serve(g_s), s	18.7	16.2	4.0	3.8	6.5	6.6	2.6	0.0	0.9	0.0	0.0	0.3
Cycle Q Clear(g_c), s	18.7	16.2	4.0	3.8	6.5	6.6	2.6	0.0	0.9	0.0	0.0	0.3
Prop In Lane	0.01		1.00	1.00		0.02	1.00		1.00	0.00		0.44
Lane Grp Cap(c), veh/h	859	817	716	324	340	339	337	0	150	0	0	24
V/C Ratio(X)	0.79	0.72	0.24	0.39	0.64	0.64	0.48	0.00	0.17	0.00	0.00	0.37
Avail Cap(c_a), veh/h	1261	1198	1050	1055	1107	1102	1406	0	626	0	0	570
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	13.9	13.2	10.0	21.9	23.0	23.0	26.1	0.0	25.3	0.0	0.0	29.7
Incr Delay (d2), s/veh	1.7	0.9	0.1	0.6	1.5	1.5	0.4	0.0	0.2	0.0	0.0	3.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	5.3	1.1	1.5	2.7	2.7	1.1	0.0	0.3	0.0	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.6	14.1	10.1	22.5	24.5	24.5	26.5	0.0	25.5	0.0	0.0	33.2
LnGrp LOS	B	B	B	C	C	C	C	A	C	A	A	C
Approach Vol, veh/h		1432			560			189			9	
Approach Delay, s/veh		14.4			24.1			26.4			33.2	
Approach LOS		B			C			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		15.2		9.3		32.0		4.3				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		8.6		4.6		20.7		2.3				
Green Ext Time (p_c), s		2.2		0.3		7.2		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			18.0									
HCM 6th LOS			B									

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

Movement	EBT	EBR	WBU	WBL	WBT	NBU	NBL	NBR
Lane Configurations								
Traffic Volume (veh/h)	1020	335	5	90	390	5	125	165
Future Volume (veh/h)	1020	335	5	90	390	5	125	165
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)		0.97		1.00			1.00	1.00
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870		1870	1870
Adj Flow Rate, veh/h	1062	244		94	406		130	32
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	2	2		2	2		2	2
Cap, veh/h	2041	885		127	2634		299	137
Arrive On Green	0.57	0.57		0.07	0.74		0.09	0.09
Sat Flow, veh/h	3647	1541		1781	3647		3456	1585
Grp Volume(v), veh/h	1062	244		94	406		130	32
Grp Sat Flow(s),veh/h/ln	1777	1541		1781	1777		1728	1585
Q Serve(g_s), s	9.5	1.6		2.7	1.7		1.9	1.0
Cycle Q Clear(g_c), s	9.5	1.6		2.7	1.7		1.9	1.0
Prop In Lane		1.00		1.00			1.00	1.00
Lane Grp Cap(c), veh/h	2041	885		127	2634		299	137
V/C Ratio(X)	0.52	0.28		0.74	0.15		0.43	0.23
Avail Cap(c_a), veh/h	4149	1800		1193	6802		2447	1123
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	6.8	0.9		23.8	2.0		22.6	22.2
Incr Delay (d2), s/veh	0.3	0.2		3.2	0.0		1.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.8		1.1	0.1		0.7	0.4
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	7.0	1.1		26.9	2.0		23.6	23.1
LnGrp LOS	A	A		C	A		C	C
Approach Vol, veh/h	1306				500		162	
Approach Delay, s/veh	5.9				6.7		23.5	
Approach LOS	A				A		C	

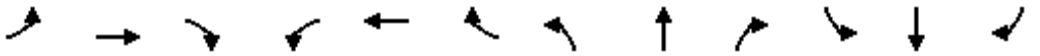
Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	8.7	35.0				43.7		8.5
Change Period (Y+Rc), s	5.0	* 5				5.0		4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0		37.0
Max Q Clear Time (g_c+I1), s	4.7	11.5				3.7		3.9
Green Ext Time (p_c), s	0.1	16.6				4.1		0.5

Intersection Summary	
HCM 6th Ctrl Delay	7.6
HCM 6th LOS	A

Notes

User approved ignoring U-Turning movement.

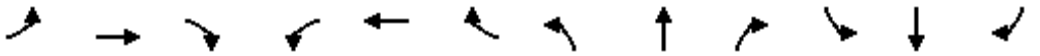
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	455	90	0	315	0	0	240	5	85	95	130
Future Volume (vph)	100	455	90	0	315	0	0	240	5	85	95	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7			2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95			0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00			1.00		1.00	1.00	
Frt	1.00	0.98			1.00			1.00		1.00	0.91	
Flt Protected	0.95	1.00			1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1719	3116			3209			1804		1719	3085	
Flt Permitted	0.95	1.00			1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1719	3116			3209			1804		1719	3085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	495	98	0	342	0	0	261	5	92	103	141
RTOR Reduction (vph)	0	9	0	0	0	0	0	1	0	0	84	0
Lane Group Flow (vph)	109	584	0	0	342	0	0	265	0	92	160	0
Confl. Peds. (#/hr)	20		15	15					10	10		20
Confl. Bikes (#/hr)			5						5			5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	2%	2%	5%	5%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	7.5	32.6			21.4			16.8		7.0	27.5	
Effective Green, g (s)	7.5	33.6			22.4			16.8		7.0	27.5	
Actuated g/C Ratio	0.11	0.50			0.33			0.25		0.10	0.41	
Clearance Time (s)	3.7	3.7			3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0			3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	191	1551			1064			448		178	1256	
v/s Ratio Prot	c0.06	c0.19			0.11			c0.15		c0.05	0.05	
v/s Ratio Perm												
v/c Ratio	0.57	0.38			0.32			0.59		0.52	0.13	
Uniform Delay, d1	28.5	10.5			16.9			22.3		28.6	12.5	
Progression Factor	1.00	1.00			0.45			1.00		1.00	1.00	
Incremental Delay, d2	2.5	0.2			0.2			2.1		1.1	0.0	
Delay (s)	31.0	10.6			7.8			24.4		29.7	12.5	
Level of Service	C	B			A			C		C	B	
Approach Delay (s)		13.8			7.8			24.4			17.2	
Approach LOS		B			A			C			B	

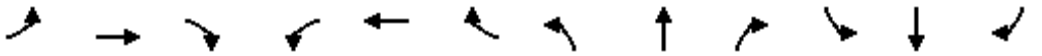
Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	67.5	Sum of lost time (s)	14.8
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	390	0	85	300	145	10	45	190	0	10	65
Future Volume (vph)	115	390	0	85	300	145	10	45	190	0	10	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.95			1.00	0.85		0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)	1687	3374		1687	3174			1759	1473		1522	
Flt Permitted	0.95	1.00		0.95	1.00			0.97	1.00		1.00	
Satd. Flow (perm)	1687	3374		1687	3174			1716	1473		1522	
Peak-hour factor, PHF	0.91	0.91	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.91	0.91
Adj. Flow (vph)	126	429	0	93	330	159	11	49	209	0	11	71
RTOR Reduction (vph)	0	0	0	0	46	0	0	0	124	0	41	0
Lane Group Flow (vph)	126	429	0	93	443	0	0	60	85	0	41	0
Confl. Peds. (#/hr)	10			10		10	5		10			5
Confl. Bikes (#/hr)									10			5
Heavy Vehicles (%)	7%	7%	2%	7%	7%	7%	7%	7%	7%	2%	7%	7%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	10.5	21.8		7.1	18.4			27.5	27.5		27.5	
Effective Green, g (s)	10.5	21.8		7.1	19.4			28.5	27.5		28.5	
Actuated g/C Ratio	0.16	0.32		0.11	0.29			0.42	0.41		0.42	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	262	1089		177	912			724	600		642	
v/s Ratio Prot	c0.07	c0.13		0.06	c0.14						0.03	
v/s Ratio Perm								0.03	c0.06			
v/c Ratio	0.48	0.39		0.53	0.49			0.08	0.14		0.06	
Uniform Delay, d1	26.0	17.7		28.6	19.9			11.7	12.6		11.6	
Progression Factor	1.03	0.72		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.5	0.2		1.3	0.4			0.0	0.1		0.0	
Delay (s)	27.2	13.0		29.9	20.3			11.7	12.7		11.6	
Level of Service	C	B		C	C			B	B		B	
Approach Delay (s)		16.2			21.9			12.5			11.6	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	67.5	Sum of lost time (s)	14.8
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	940	315	210	405	0	0	0	0	350	355	175
Future Volume (veh/h)	0	940	315	210	405	0	0	0	0	350	355	175
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1885	1885	1885	1885	0				1885	1885	1885
Adj Flow Rate, veh/h	0	989	0	221	426	0				245	545	63
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	1	1	1	1	0				1	1	1
Cap, veh/h	0	2173		808	2542	0				334	701	297
Arrive On Green	0.00	0.42	0.00	0.46	1.00	0.00				0.19	0.19	0.19
Sat Flow, veh/h	0	5316	1598	3483	3676	0				1795	3770	1598
Grp Volume(v), veh/h	0	989	0	221	426	0				245	545	63
Grp Sat Flow(s),veh/h/ln	0	1716	1598	1742	1791	0				1795	1885	1598
Q Serve(g_s), s	0.0	12.4	0.0	3.5	0.0	0.0				11.6	12.4	3.0
Cycle Q Clear(g_c), s	0.0	12.4	0.0	3.5	0.0	0.0				11.6	12.4	3.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2173		808	2542	0				334	701	297
V/C Ratio(X)	0.00	0.46		0.27	0.17	0.00				0.73	0.78	0.21
Avail Cap(c_a), veh/h	0	2173		808	2542	0				531	1114	472
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.96	0.96	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	18.6	0.0	19.5	0.0	0.0				34.5	34.9	31.1
Incr Delay (d2), s/veh	0.0	0.7	0.0	0.1	0.1	0.0				1.2	0.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.7	0.0	1.3	0.0	0.0				5.0	5.6	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	19.3	0.0	19.5	0.1	0.0				35.7	35.6	31.2
LnGrp LOS	A	B		B	A	A				D	D	C
Approach Vol, veh/h		989	A		647						853	
Approach Delay, s/veh		19.3			6.8						35.3	
Approach LOS		B			A						D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	25.9	43.0		21.1		68.9
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	12.5	* 38		26.6		54.0
Max Q Clear Time (g_c+I1), s	5.5	14.4		14.4		2.0
Green Ext Time (p_c), s	0.2	9.5		2.3		4.4

Intersection Summary	
HCM 6th Ctrl Delay	21.5
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	25	20	25	105	0	40	10	0	275	160	75	190
Future Vol, veh/h	25	20	25	105	0	40	10	0	275	160	75	190
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	27	22	27	114	0	43	11	0	299	174	82	207
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	10.6	12.4	13.3	9.3
HCM LOS	B	B	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	36%	72%	100%	0%	0%
Vol Thru, %	100%	46%	29%	0%	0%	100%	100%
Vol Right, %	0%	54%	36%	28%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	148	298	70	145	75	95	95
LT Vol	0	0	25	105	75	0	0
Through Vol	148	138	20	0	0	95	95
RT Vol	0	160	25	40	0	0	0
Lane Flow Rate	160	323	76	158	82	103	103
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.272	0.515	0.142	0.296	0.148	0.173	0.122
Departure Headway (Hd)	6.111	5.729	6.719	6.768	6.54	6.033	4.238
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	587	627	533	531	548	594	842
Service Time	3.853	3.471	4.476	4.518	4.286	3.778	1.983
HCM Lane V/C Ratio	0.273	0.515	0.143	0.298	0.15	0.173	0.122
HCM Control Delay	11.1	14.4	10.6	12.4	10.4	10	7.6
HCM Lane LOS	B	B	B	B	B	A	A
HCM 95th-tile Q	1.1	3	0.5	1.2	0.5	0.6	0.4

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.92
Heavy Vehicles, %	4
Mvmt Flow	0
Number of Lanes	0

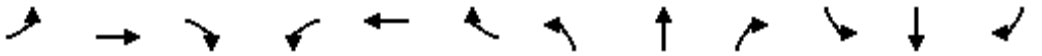
Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	0	485	330	10	155	415	0	0	0	0	5	225
Future Volume (vph)	0	485	330	10	155	415	0	0	0	0	5	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0						4.5
Lane Util. Factor		0.95			0.91	0.91						0.95
Frpb, ped/bikes		0.99			1.00	1.00						1.00
Flpb, ped/bikes		1.00			1.00	1.00						1.00
Frt		0.94			1.00	1.00						1.00
Flt Protected		1.00			0.95	1.00						0.95
Satd. Flow (prot)		3137			1535	3226						1603
Flt Permitted		1.00			0.95	1.00						0.95
Satd. Flow (perm)		3137			1535	3226						1603
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	505	344	10	161	432	0	0	0	0	5	234
RTOR Reduction (vph)	0	128	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	721	0	0	155	448	0	0	0	0	0	122
Confl. Peds. (#/hr)	5		5		5		5					
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type		NA		Split	Split	NA					Split	Split
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		21.5			20.6	20.6						10.6
Effective Green, g (s)		21.5			20.6	20.6						10.6
Actuated g/C Ratio		0.32			0.31	0.31						0.16
Clearance Time (s)		5.0			5.0	5.0						4.5
Vehicle Extension (s)		3.0			3.0	3.0						3.0
Lane Grp Cap (vph)		1003			470	988						252
v/s Ratio Prot		c0.23			0.10	c0.14						c0.08
v/s Ratio Perm												
v/c Ratio		0.72			0.33	0.45						0.48
Uniform Delay, d1		20.2			18.0	18.8						25.8
Progression Factor		1.00			1.00	1.00						1.00
Incremental Delay, d2		2.5			0.4	0.3						1.5
Delay (s)		22.7			18.4	19.1						27.3
Level of Service		C			B	B						C
Approach Delay (s)		22.7				18.9			0.0			
Approach LOS		C				B			A			

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	67.2	Sum of lost time (s)	14.5
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

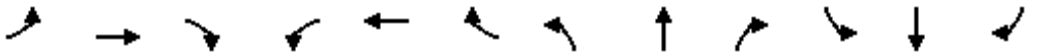
Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	5	155
Future Volume (vph)	5	155
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.5	5.0
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	1.00
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	0.95	1.00
Satd. Flow (prot)	1610	1509
Flt Permitted	0.95	1.00
Satd. Flow (perm)	1610	1509
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	5	161
RTOR Reduction (vph)	0	72
Lane Group Flow (vph)	122	89
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	7%	7%
Turn Type	NA	custom
Protected Phases	4	5
Permitted Phases		4
Actuated Green, G (s)	10.6	32.1
Effective Green, g (s)	10.6	32.1
Actuated g/C Ratio	0.16	0.48
Clearance Time (s)	4.5	5.0
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	253	720
v/s Ratio Prot	0.08	0.04
v/s Ratio Perm		0.02
v/c Ratio	0.48	0.12
Uniform Delay, d1	25.8	9.7
Progression Factor	1.00	1.00
Incremental Delay, d2	1.4	0.1
Delay (s)	27.2	9.8
Level of Service	C	A
Approach Delay (s)	20.3	
Approach LOS	C	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	215	520	0	0	220	120	295	0	290	75	0	55
Future Volume (vph)	215	520	0	0	220	120	295	0	290	75	0	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00	0.98	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3242	1759			3343	1467		1671	1472	1671		1495
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3242	1759			3343	1467		1671	1472	1671		1495
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	250	605	0	0	256	140	343	0	337	87	0	64
RTOR Reduction (vph)	0	0	0	0	0	107	0	0	198	0	0	58
Lane Group Flow (vph)	250	605	0	0	256	33	0	343	139	87	0	6
Confl. Peds. (#/hr)	10		5	5		10			5	5		
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	11.8	32.3			16.0	16.0		18.0	18.0	6.0		6.0
Effective Green, g (s)	11.8	32.3			16.0	16.0		18.0	18.0	6.0		6.0
Actuated g/C Ratio	0.17	0.48			0.24	0.24		0.27	0.27	0.09		0.09
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	564	837			788	346		443	390	147		132
v/s Ratio Prot	0.08	c0.34			0.08					c0.05		0.00
v/s Ratio Perm						0.02		0.21	0.09			
v/c Ratio	0.44	0.72			0.32	0.10		0.77	0.36	0.59		0.04
Uniform Delay, d1	25.1	14.2			21.4	20.2		23.0	20.2	29.7		28.3
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	0.6	2.6			0.1	0.0		7.5	0.2	4.2		0.0
Delay (s)	25.6	16.8			21.5	20.3		30.5	20.4	33.9		28.3
Level of Service	C	B			C	C		C	C	C		C
Approach Delay (s)		19.4			21.1			25.5			31.5	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	67.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



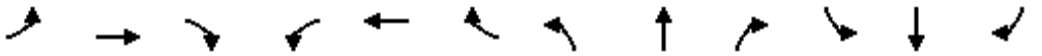
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	390	1005	65	25	545	95	145	105	40	125	70	90
Future Volume (veh/h)	390	1005	65	25	545	95	145	105	40	125	70	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	0.99		0.97	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1930
Adj Flow Rate, veh/h	406	1047	64	26	568	84	151	109	42	130	73	94
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	373	1612	99	79	991	146	193	351	135	252	128	795
Arrive On Green	0.14	0.32	0.32	0.04	0.32	0.32	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1767	3373	206	1767	3075	453	1202	1265	487	671	460	1618
Grp Volume(v), veh/h	406	547	564	26	325	327	151	0	151	203	0	94
Grp Sat Flow(s),veh/h/ln	1767	1763	1817	1767	1763	1766	1202	0	1752	1132	0	1618
Q Serve(g_s), s	19.0	24.0	24.0	1.3	13.8	13.9	8.5	0.0	6.1	10.4	0.0	2.8
Cycle Q Clear(g_c), s	19.0	24.0	24.0	1.3	13.8	13.9	25.0	0.0	6.1	16.5	0.0	2.8
Prop In Lane	1.00		0.11	1.00		0.26	1.00		0.28	0.64		1.00
Lane Grp Cap(c), veh/h	373	842	868	79	568	569	193	0	487	380	0	795
V/C Ratio(X)	1.09	0.65	0.65	0.33	0.57	0.58	0.78	0.00	0.31	0.53	0.00	0.12
Avail Cap(c_a), veh/h	373	842	868	98	568	569	193	0	487	380	0	795
HCM Platoon Ratio	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.81	0.81	0.81	0.81	0.81	1.00	0.00	1.00	0.93	0.00	0.93
Uniform Delay (d), s/veh	38.6	24.1	24.1	41.7	25.3	25.4	41.8	0.0	25.7	31.0	0.0	12.5
Incr Delay (d2), s/veh	67.9	3.1	3.1	0.7	3.4	3.4	17.2	0.0	0.1	0.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.4	10.9	11.2	0.6	6.0	6.1	4.3	0.0	2.6	4.0	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	106.5	27.3	27.2	42.4	28.7	28.8	59.0	0.0	25.8	31.7	0.0	12.5
LnGrp LOS	F	C	C	D	C	C	E	A	C	C	A	B
Approach Vol, veh/h		1517			678			302			297	
Approach Delay, s/veh		48.5			29.3			42.4			25.6	
Approach LOS		D			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	38.0		29.0	13.0	48.0		29.0				
Change Period (Y+Rc), s	4.0	9.0		4.0	9.0	* 5		4.0				
Max Green Setting (Gmax), s	19.0	29.0		25.0	5.0	* 43		25.0				
Max Q Clear Time (g_c+I1), s	21.0	15.9		18.5	3.3	26.0		27.0				
Green Ext Time (p_c), s	0.0	4.4		0.6	0.0	8.7		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		40.7
HCM 6th LOS		D

Notes

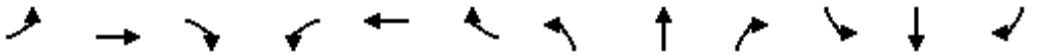
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	500	0	700	0	945	315	0	2195	275
Future Volume (vph)	0	0	0	500	0	700	0	945	315	0	2195	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.6		4.6		4.4	4.4		4.4	4.4
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.94		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3400		2760		5036	1474		5036	1521
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3400		2760		5036	1474		5036	1521
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	515	0	722	0	974	325	0	2263	284
RTOR Reduction (vph)	0	0	0	0	0	69	0	0	132	0	0	72
Lane Group Flow (vph)	0	0	0	515	0	653	0	974	193	0	2263	212
Confl. Peds. (#/hr)							15		15	15		15
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				21.3		39.9		71.1	71.1		89.7	89.7
Effective Green, g (s)				21.3		36.3		71.1	71.1		89.7	89.7
Actuated g/C Ratio				0.18		0.30		0.59	0.59		0.75	0.75
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				603		834		2983	873		3764	1136
v/s Ratio Prot				c0.15		c0.24		0.19			c0.45	
v/s Ratio Perm									0.13			0.14
v/c Ratio				0.85		0.78		0.33	0.22		0.60	0.19
Uniform Delay, d1				47.8		38.2		12.4	11.5		6.9	4.4
Progression Factor				1.00		1.00		0.82	1.05		1.00	1.00
Incremental Delay, d2				10.9		4.5		0.3	0.5		0.7	0.4
Delay (s)				58.8		42.7		10.4	12.6		7.7	4.8
Level of Service				E		D		B	B		A	A
Approach Delay (s)		0.0			49.4			10.9			7.3	
Approach LOS		A			D			B			A	

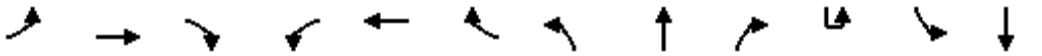
Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	0	120	0	0	0	0	1055	570	0	1620	1040
Future Volume (vph)	205	0	120	0	0	0	0	1055	570	0	1620	1040
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.97	0.85					0.95			1.00	0.85
Flt Protected	0.95	0.96	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1665	1571	1490					4565			5036	1491
Flt Permitted	0.95	0.96	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1665	1571	1490					4565			5036	1491
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	218	0	128	0	0	0	0	1122	606	0	1723	1106
RTOR Reduction (vph)	0	12	30	0	0	0	0	0	0	0	0	185
Lane Group Flow (vph)	120	106	78	0	0	0	0	1728	0	0	1723	921
Confl. Peds. (#/hr)	10					10	10		15	15		10
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	11.4	11.4	11.4					99.6			99.6	99.6
Effective Green, g (s)	11.4	11.4	11.4					99.6			99.6	99.6
Actuated g/C Ratio	0.10	0.10	0.10					0.83			0.83	0.83
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	158	149	141					3788			4179	1237
v/s Ratio Prot	c0.07	0.07						0.38			0.34	
v/s Ratio Perm			0.05									c0.62
v/c Ratio	0.76	0.71	0.55					0.46			0.41	0.74
Uniform Delay, d1	53.0	52.7	51.9					2.8			2.6	4.5
Progression Factor	1.00	1.00	1.00					1.20			0.74	9.99
Incremental Delay, d2	16.8	12.6	2.7					0.3			0.3	3.4
Delay (s)	69.8	65.3	54.5					3.7			2.2	48.7
Level of Service	E	E	D					A			A	D
Approach Delay (s)		63.5			0.0			3.7			20.4	
Approach LOS		E			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	220	470	195	205	255	125	230	1120	170	20	225	940
Future Volume (vph)	220	470	195	205	255	125	230	1120	170	20	225	940
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.97	0.91	1.00		0.97	0.91
Frpb, ped/bikes	1.00	1.00	0.95	1.00	0.99		1.00	1.00	0.96		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85		1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1752	3505	1489	3400	3291		3400	5036	1505		3400	5036
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1752	3505	1489	3400	3291		3400	5036	1505		3400	5036
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	232	495	205	216	268	132	242	1179	179	21	237	989
RTOR Reduction (vph)	0	0	81	0	57	0	0	0	66	0	0	0
Lane Group Flow (vph)	232	495	124	216	343	0	242	1179	113	0	258	989
Confl. Peds. (#/hr)	20		35	35		20	15		20		20	
Confl. Bikes (#/hr)			5			5						
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	3	8		7	4		1	6		5	5	2
Permitted Phases			8						6			
Actuated Green, G (s)	17.6	30.8	30.8	10.1	24.7		10.8	51.6	51.6		11.3	51.6
Effective Green, g (s)	17.6	30.8	30.8	10.1	24.7		10.8	51.6	51.6		11.3	51.6
Actuated g/C Ratio	0.15	0.26	0.26	0.08	0.21		0.09	0.43	0.43		0.09	0.43
Clearance Time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)	256	899	382	286	677		306	2165	647		320	2165
v/s Ratio Prot	c0.13	c0.14		0.06	0.10		0.07	c0.23			c0.08	0.20
v/s Ratio Perm			0.08						0.08			
v/c Ratio	0.91	0.55	0.32	0.76	0.51		0.79	0.54	0.18		0.81	0.46
Uniform Delay, d1	50.4	38.6	36.2	53.7	42.2		53.5	25.5	21.1		53.3	24.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.04	1.16
Incremental Delay, d2	31.8	0.4	0.2	9.6	0.2		12.2	1.0	0.6		12.2	0.6
Delay (s)	82.2	39.0	36.3	63.4	42.5		65.7	26.4	21.7		67.5	28.8
Level of Service	F	D	D	E	D		E	C	C		E	C
Approach Delay (s)		49.2			49.8			31.8				36.3
Approach LOS		D			D			C				D

Intersection Summary			
HCM 2000 Control Delay	39.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.7
Intersection Capacity Utilization	74.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	135
Future Volume (vph)	135
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.6
Lane Util. Factor	1.00
Frpb, ped/bikes	0.97
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1516
Flt Permitted	1.00
Satd. Flow (perm)	1516
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	142
RTOR Reduction (vph)	66
Lane Group Flow (vph)	76
Confl. Peds. (#/hr)	15
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	3%
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	51.6
Effective Green, g (s)	51.6
Actuated g/C Ratio	0.43
Clearance Time (s)	4.6
Vehicle Extension (s)	0.2
Lane Grp Cap (vph)	651
v/s Ratio Prot	
v/s Ratio Perm	0.05
v/c Ratio	0.12
Uniform Delay, d1	20.5
Progression Factor	1.54
Incremental Delay, d2	0.3
Delay (s)	31.9
Level of Service	C
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	75	110	65	195	75	240	30	60	725	245	40	450
Future Volume (veh/h)	75	110	65	195	75	240	30	60	725	245	40	450
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.96	0.99		0.98		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856		1856	1856	1856		1856
Adj Flow Rate, veh/h	79	116	40	142	167	51		63	763	17		474
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	3	3	3	3	3	3		3	3	3		3
Cap, veh/h	167	275	102	222	378	313		82	2107	649		509
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20		0.05	0.42	0.42		0.29
Sat Flow, veh/h	565	1349	502	1203	1856	1538		1767	5066	1561		1767
Grp Volume(v), veh/h	110	0	125	142	167	51		63	763	17		474
Grp Sat Flow(s),veh/h/ln	842	0	1574	1203	1856	1538		1767	1689	1561		1767
Q Serve(g_s), s	8.6	0.0	8.3	13.9	9.4	3.3		4.2	12.4	0.8		31.3
Cycle Q Clear(g_c), s	18.1	0.0	8.3	22.2	9.4	3.3		4.2	12.4	0.8		31.3
Prop In Lane	0.72		0.32	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	223	0	321	222	378	313		82	2107	649		509
V/C Ratio(X)	0.49	0.00	0.39	0.64	0.44	0.16		0.77	0.36	0.03		0.93
Avail Cap(c_a), veh/h	360	0	489	222	378	313		265	2107	649		648
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	48.3	0.0	41.3	50.9	41.8	39.3		56.6	24.1	20.7		41.6
Incr Delay (d2), s/veh	1.7	0.0	0.8	6.0	0.8	0.2		14.2	0.5	0.1		17.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	3.2	0.0	3.3	4.6	4.4	1.3		2.2	5.1	0.3		16.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.9	0.0	42.1	56.9	42.6	39.6		70.8	24.6	20.8		59.3
LnGrp LOS	D	A	D	E	D	D		E	C	C		E
Approach Vol, veh/h		235			360				843			
Approach Delay, s/veh		45.8			47.8				28.0			
Approach LOS		D			D				C			

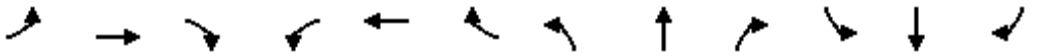
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.5	83.3		28.2	37.5	54.3		28.2				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	18.0	53.6		19.0	44.0	27.6		37.3				
Max Q Clear Time (g_c+I1), s	6.2	18.1		24.2	33.3	14.4		20.1				
Green Ext Time (p_c), s	0.1	13.7		0.0	1.2	4.4		1.3				

Intersection Summary		
HCM 6th Ctrl Delay		28.2
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1335	55
Future Volume (veh/h)	1335	55
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		1.00
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1856	1856
Adj Flow Rate, veh/h	1405	56
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	3	3
Cap, veh/h	3286	131
Arrive On Green	0.66	0.66
Sat Flow, veh/h	4997	199
Grp Volume(v), veh/h	950	511
Grp Sat Flow(s),veh/h/ln	1689	1819
Q Serve(g_s), s	16.1	16.1
Cycle Q Clear(g_c), s	16.1	16.1
Prop In Lane		0.11
Lane Grp Cap(c), veh/h	2221	1196
V/C Ratio(X)	0.43	0.43
Avail Cap(c_a), veh/h	2221	1196
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	9.8	9.8
Incr Delay (d2), s/veh	0.6	1.1
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.8	6.4
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	10.4	10.9
LnGrp LOS	B	B
Approach Vol, veh/h	1935	
Approach Delay, s/veh	22.5	
Approach LOS	C	
Timer - Assigned Phs		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	325	980	0	0	500	270	120	230	455	0	0	0
Future Volume (veh/h)	325	980	0	0	500	270	120	230	455	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	335	1010	0	0	515	0	124	345	353			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	700	2260	0	0	1343		450	473	401			
Arrive On Green	0.41	1.00	0.00	0.00	0.12	0.00	0.25	0.25	0.25			
Sat Flow, veh/h	3456	3647	0	0	3647	1585	1781	1870	1585			
Grp Volume(v), veh/h	335	1010	0	0	515	0	124	345	353			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1777	1585	1781	1870	1585			
Q Serve(g_s), s	6.4	0.0	0.0	0.0	12.0	0.0	5.0	15.2	19.3			
Cycle Q Clear(g_c), s	6.4	0.0	0.0	0.0	12.0	0.0	5.0	15.2	19.3			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	700	2260	0	0	1343		450	473	401			
V/C Ratio(X)	0.48	0.45	0.00	0.00	0.38		0.28	0.73	0.88			
Avail Cap(c_a), veh/h	700	2260	0	0	1343		574	603	511			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.89	0.89	0.00	0.00	0.89	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	23.2	0.0	0.0	0.0	29.8	0.0	27.0	30.8	32.3			
Incr Delay (d2), s/veh	0.2	0.6	0.0	0.0	0.7	0.0	0.1	2.2	11.7			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.2	0.2	0.0	0.0	5.8	0.0	2.1	6.9	8.4			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.4	0.6	0.0	0.0	30.5	0.0	27.1	33.0	44.1			
LnGrp LOS	C	A	A	A	C		C	C	D			
Approach Vol, veh/h		1345			515	A		822				
Approach Delay, s/veh		6.3			30.5			36.8				
Approach LOS		A			C			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		62.2			23.2	39.0		27.8				
Change Period (Y+Rc), s		5.0			5.0	* 5		5.0				
Max Green Setting (Gmax), s		44.0			13.0	* 34		29.0				
Max Q Clear Time (g_c+I1), s		2.0			8.4	14.0		21.3				
Green Ext Time (p_c), s		12.4			0.3	4.4		1.5				

Intersection Summary	
HCM 6th Ctrl Delay	20.3
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

4: Train & Scott St Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0
Total Del/Veh (s)	2.5	6.4	3.7	3.8
Vehicles Entered	177	90	11	278
Vehicles Exited	177	90	11	278
Hourly Exit Rate	177	90	11	278
Input Volume	181	90	10	281
% of Volume	98	100	107	99
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.2	0.1	0.0	0.0	0.0	0.2	0.3	0.2	0.2	0.2	0.2
Total Del/Veh (s)	6.9	7.5	3.5	4.0	1.8	2.7	9.3	11.0	8.5	10.4	8.6	7.9
Vehicles Entered	10	15	8	36	15	36	5	146	85	77	98	21
Vehicles Exited	10	15	8	36	15	36	5	146	85	78	97	21
Hourly Exit Rate	10	15	8	36	15	36	5	146	85	78	97	21
Input Volume	10	15	10	35	15	35	5	145	90	75	100	20
% of Volume	98	98	78	103	98	103	100	101	95	104	97	106
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	8.4
Vehicles Entered	552
Vehicles Exited	552
Hourly Exit Rate	552
Input Volume	556
% of Volume	99
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	0.3	0.2	0.2	0.2
Total Del/Veh (s)	5.5	0.9	3.8	6.0	6.7	6.4	4.1	5.7
Vehicles Entered	100	22	63	56	190	125	28	584
Vehicles Exited	100	22	62	56	192	125	29	586
Hourly Exit Rate	100	22	62	56	192	125	29	586
Input Volume	105	20	65	55	190	130	30	595
% of Volume	95	109	96	101	101	96	97	99
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.2
Total Del/Veh (s)	12.1
Vehicles Entered	889
Vehicles Exited	889
Hourly Exit Rate	889
Input Volume	2562
% of Volume	35
Denied Entry Before	0
Denied Entry After	0

Intersection: 4: Train & Scott St

Movement	EB	WB	SB
Directions Served	T	T	T
Maximum Queue (ft)	84	86	32
Average Queue (ft)	34	16	4
95th Queue (ft)	83	57	22
Link Distance (ft)	5	142	1849
Upstream Blk Time (%)	10		
Queuing Penalty (veh)	17		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Dollar Ave/Herman Ave & Scott St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	50	53	169	182
Average Queue (ft)	21	29	62	71
95th Queue (ft)	47	45	124	133
Link Distance (ft)	525	5	1137	1856
Upstream Blk Time (%)		5		
Queuing Penalty (veh)		4		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

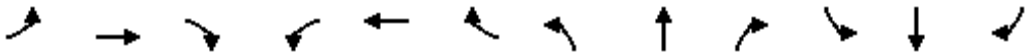
Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	101	116	106
Average Queue (ft)	47	62	52
95th Queue (ft)	79	96	86
Link Distance (ft)	174	939	1430
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 21

2024 Plus Phase 1 PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	90	295	330	5	130	410	0	0	280	100
Future Volume (vph)	0	0	90	295	330	5	130	410	0	0	280	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.6	4.0	4.0			4.6			4.6	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			0.99	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.96	
Flt Protected			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)			1565	1633	1740			3488			3265	
Flt Permitted			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (perm)			1565	1633	1740			3488			3265	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	99	324	363	5	143	451	0	0	308	110
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	83	0
Lane Group Flow (vph)	0	0	99	292	400	0	0	594	0	0	335	0
Confl. Peds. (#/hr)												15
Heavy Vehicles (%)	0%	0%	5%	5%	3%	0%	0%	3%	0%	0%	5%	5%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			12.6	13.4	13.4			12.6			10.8	
Effective Green, g (s)			12.6	13.4	13.4			12.6			10.8	
Actuated g/C Ratio			0.25	0.27	0.27			0.25			0.22	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			394	437	466			878			705	
v/s Ratio Prot			0.06					c0.17			c0.10	
v/s Ratio Perm				0.18	0.23							
v/c Ratio			0.25	0.67	0.86			0.68			0.48	
Uniform Delay, d1			14.9	16.3	17.4			16.9			17.1	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			0.5	7.9	18.2			2.3			0.5	
Delay (s)			15.4	24.2	35.6			19.1			17.6	
Level of Service			B	C	D			B			B	
Approach Delay (s)		15.4			30.8			19.1			17.6	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/24/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	355	205	25	310	335	5	845	435
Future Volume (veh/h)	355	205	25	310	335	5	845	435
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.99
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1657	1710		1657	1657		1657	1657
Adj Flow Rate, veh/h	447	0		330	356		899	169
Peak Hour Factor	0.94	0.94		0.94	0.94		0.94	0.94
Percent Heavy Veh, %	4	0		4	4		4	4
Cap, veh/h	535	246		1145	2343		1021	452
Arrive On Green	0.17	0.00		0.37	0.74		0.32	0.32
Sat Flow, veh/h	3156	1449		3061	3230		3230	1393
Grp Volume(v), veh/h	447	0		330	356		899	169
Grp Sat Flow(s),veh/h/ln	1578	1449		1530	1574		1574	1393
Q Serve(g_s), s	13.7	0.0		7.6	3.3		27.0	9.3
Cycle Q Clear(g_c), s	13.7	0.0		7.6	3.3		27.0	9.3
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	535	246		1145	2343		1021	452
V/C Ratio(X)	0.84	0.00		0.29	0.15		0.88	0.37
Avail Cap(c_a), veh/h	1041	478		1145	2343		1240	549
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.97	0.00		0.85	0.85		0.45	0.45
Uniform Delay (d), s/veh	40.2	0.0		22.0	3.7		32.0	26.0
Incr Delay (d2), s/veh	1.3	0.0		0.0	0.1		5.3	1.1
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	0.0		2.6	0.8		10.6	3.1
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	41.5	0.0		22.0	3.8		37.3	27.0
LnGrp LOS	D	A		C	A		D	C
Approach Vol, veh/h	447				686		1068	
Approach Delay, s/veh	41.5				12.6		35.7	
Approach LOS	D				B		D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	42.0	37.0				79.0		21.0
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	13.0	* 39				48.4		33.0
Max Q Clear Time (g_c+I1), s	9.6	29.0				5.3		15.7
Green Ext Time (p_c), s	0.3	3.4				1.5		1.3

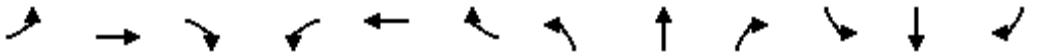
Intersection Summary	
HCM 6th Ctrl Delay	29.6
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

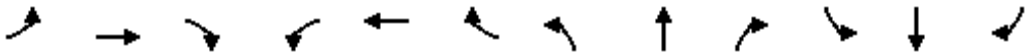
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	55	90	685	250	240	45	485	125	115	475	120
Future Volume (vph)	170	55	90	685	250	240	45	485	125	115	475	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.96		1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.95
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		2890		3060	1660	1383	1547	3094	1384	1408	2953	1309
Flt Permitted		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		2890		3060	1660	1383	1547	3094	1384	1408	2953	1309
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	175	57	93	706	258	247	46	500	129	119	490	124
RTOR Reduction (vph)	0	38	0	0	0	179	0	0	0	0	0	97
Lane Group Flow (vph)	0	287	0	706	258	68	46	500	129	79	530	27
Confl. Peds. (#/hr)			80									10
Confl. Bikes (#/hr)			5			10			5			
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	5%	5%	5%	5%	5%	5%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		20.6		33.0	33.0	33.0	21.5	21.5	90.5	26.2	26.2	26.2
Effective Green, g (s)		20.6		33.0	33.0	33.0	21.5	21.5	90.5	26.2	26.2	26.2
Actuated g/C Ratio		0.17		0.28	0.28	0.28	0.18	0.18	0.75	0.22	0.22	0.22
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		496		841	456	380	277	554	1043	307	644	285
v/s Ratio Prot		c0.10		c0.23	0.16		0.03	c0.16	0.09	0.06	c0.18	
v/s Ratio Perm						0.05						0.02
v/c Ratio		0.58		0.84	0.57	0.18	0.17	0.90	0.12	0.26	0.82	0.09
Uniform Delay, d1		45.7		41.0	37.3	33.2	41.7	48.2	4.0	38.8	44.7	37.4
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.0		7.4	1.6	0.2	0.2	17.9	0.0	2.0	11.4	0.7
Delay (s)		46.7		48.4	39.0	33.4	41.9	66.2	4.0	40.9	56.1	38.1
Level of Service		D		D	D	C	D	E	A	D	E	D
Approach Delay (s)		46.7			43.3			52.6			51.4	
Approach LOS		D			D			D			D	

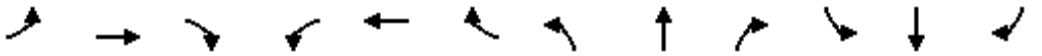
Intersection Summary			
HCM 2000 Control Delay	47.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	180	35	370	250	20	20	225	400	40	260	45
Future Volume (vph)	35	180	35	370	250	20	20	225	400	40	260	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		3.5	3.5			3.0	3.0		3.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		0.99		1.00	1.00			1.00	1.00		0.99	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	0.99			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2725		1413	1465			1481	2224		1439	
Flt Permitted		0.99		0.95	1.00			0.94	1.00		0.88	
Satd. Flow (perm)		2725		1413	1465			1404	2224		1274	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	38	194	38	398	269	22	22	242	430	43	280	48
RTOR Reduction (vph)	0	14	0	0	3	0	0	0	184	0	6	0
Lane Group Flow (vph)	0	256	0	398	288	0	0	264	246	0	365	0
Confl. Peds. (#/hr)			15			10			10			20
Confl. Bikes (#/hr)			5			5			5			10
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		28.5		27.4	27.4			24.1	55.0		24.1	
Effective Green, g (s)		28.5		27.4	27.4			24.1	51.5		24.1	
Actuated g/C Ratio		0.32		0.30	0.30			0.27	0.57		0.27	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		862		430	446			375	1272		341	
v/s Ratio Prot		c0.09		c0.28	0.20				0.11			
v/s Ratio Perm								0.19			c0.29	
v/c Ratio		0.30		0.93	0.64			0.70	0.19		1.07	
Uniform Delay, d1		23.2		30.3	27.1			29.7	9.3		33.0	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.9		25.4	2.4			4.8	0.0		68.8	
Delay (s)		24.1		55.7	29.5			34.6	9.3		101.8	
Level of Service		C		E	C			C	A		F	
Approach Delay (s)		24.1			44.6			18.9			101.8	
Approach LOS		C			D			B			F	

Intersection Summary			
HCM 2000 Control Delay	43.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	165	215	190	760	290	380	120	20	275	160	840	145
Future Volume (veh/h)	165	215	190	760	290	380	120	20	275	160	840	145
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1811	1811	1811	1811	1811	1678	1678	1678	1856	1856	1856
Adj Flow Rate, veh/h	133	283	0	800	305	0	126	21	0	168	884	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	6	6	6	15	15	15	3	3	3
Cap, veh/h	197	413		880	462		149	821		380	1364	
Arrive On Green	0.11	0.11	0.00	0.26	0.26	0.00	0.09	0.26	0.00	0.21	0.39	0.00
Sat Flow, veh/h	1725	3622	1535	3450	1811	1535	1598	3272	0	1767	3526	1572
Grp Volume(v), veh/h	133	283	0	800	305	0	126	21	0	168	884	0
Grp Sat Flow(s),veh/h/ln	1725	1811	1535	1725	1811	1535	1598	1594	0	1767	1763	1572
Q Serve(g_s), s	8.9	9.0	0.0	27.0	18.1	0.0	9.3	0.6	0.0	9.9	24.6	0.0
Cycle Q Clear(g_c), s	8.9	9.0	0.0	27.0	18.1	0.0	9.3	0.6	0.0	9.9	24.6	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	197	413		880	462		149	821		380	1364	
V/C Ratio(X)	0.68	0.68		0.91	0.66		0.85	0.03		0.44	0.65	
Avail Cap(c_a), veh/h	318	667		914	480		160	821		380	1364	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.90	0.90	0.00	0.30	0.30	0.00	1.00	1.00	0.00	0.67	0.67	0.00
Uniform Delay (d), s/veh	51.0	51.1	0.0	43.3	40.0	0.0	53.6	33.3	0.0	40.9	30.1	0.0
Incr Delay (d2), s/veh	1.4	0.7	0.0	4.4	1.0	0.0	29.0	0.1	0.0	2.5	1.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	4.1	0.0	12.1	8.2	0.0	4.9	0.2	0.0	4.5	10.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.4	51.8	0.0	47.8	41.0	0.0	82.5	33.4	0.0	43.4	31.7	0.0
LnGrp LOS	D	D		D	D		F	C		D	C	
Approach Vol, veh/h		416	A		1105	A		147	A		1052	A
Approach Delay, s/veh		52.0			45.9			75.5			33.6	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.2	51.3		18.3	30.7	35.8		35.2				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	12.0	36.0		22.1	17.1	* 31		31.8				
Max Q Clear Time (g_c+I1), s	11.3	26.6		11.0	11.9	2.6		29.0				
Green Ext Time (p_c), s	0.0	4.4		1.1	0.1	0.0		1.6				

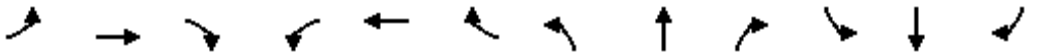
Intersection Summary		
HCM 6th Ctrl Delay	43.7	
HCM 6th LOS	D	

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	135	400	60	405	20	485	210	55	10	200	570
Future Volume (veh/h)	70	135	400	60	405	20	485	210	55	10	200	570
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.97	1.00		1.00	1.00		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1781	1781	1781	1811	1811	1811	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	74	148	147	64	431	17	516	223	0	11	213	420
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	8	8	8	6	6	6	9	9	9	4	4	4
Cap, veh/h	143	482	406	139	466	18	819	842		391	410	327
Arrive On Green	0.08	0.27	0.27	0.08	0.27	0.27	0.25	0.25	0.00	0.22	0.22	0.22
Sat Flow, veh/h	1697	1781	1484	1725	1728	68	3264	3445	0	1753	1841	1469
Grp Volume(v), veh/h	74	148	147	64	0	448	516	223	0	11	213	420
Grp Sat Flow(s),veh/h/ln	1697	1781	1484	1725	0	1796	1632	1678	0	1753	1841	1469
Q Serve(g_s), s	4.4	6.9	8.4	3.7	0.0	25.6	14.7	5.6	0.0	0.5	10.7	23.4
Cycle Q Clear(g_c), s	4.4	6.9	8.4	3.7	0.0	25.6	14.7	5.6	0.0	0.5	10.7	23.4
Prop In Lane	1.00		1.00	1.00		0.04	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	143	482	406	139	0	484	819	842		391	410	327
V/C Ratio(X)	0.52	0.31	0.36	0.46	0.00	0.93	0.63	0.26		0.03	0.52	1.28
Avail Cap(c_a), veh/h	179	492	410	182	0	496	832	855		391	410	327
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.73	0.73	0.73	1.00	0.00	1.00	0.94	0.94	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.0	31.7	30.8	46.1	0.0	37.3	35.0	31.6	0.0	31.9	35.9	40.8
Incr Delay (d2), s/veh	0.8	0.2	0.3	0.9	0.0	22.6	3.4	0.7	0.0	0.0	0.5	148.6
Initial Q Delay(d3),s/veh	0.0	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	5.4	3.0	1.6	0.0	14.0	6.1	2.3	0.0	0.2	4.8	21.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.8	39.4	31.1	47.0	0.0	59.9	38.4	32.3	0.0	31.9	36.4	189.4
LnGrp LOS	D	D	C	D	A	E	D	C		C	D	F
Approach Vol, veh/h		369			512			739	A		644	
Approach Delay, s/veh		37.6			58.3			36.6			136.1	
Approach LOS		D			E			D			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.5	32.9		31.4	12.8	32.5		28.3				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.0	4.6		4.9				
Max Green Setting (Gmax), s	11.1	29.0		23.4	11.1	29.0		23.4				
Max Q Clear Time (g_c+I1), s	5.7	10.4		16.7	6.4	27.6		25.4				
Green Ext Time (p_c), s	0.0	1.1		1.5	0.0	0.3		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		70.0	
HCM 6th LOS		E	

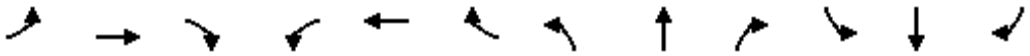
Notes
User approved volume balancing among the lanes for turning movement.
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	390	25	290	35	45	35	10	380	360	50	15	25
Future Volume (vph)	390	25	290	35	45	35	10	380	360	50	15	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00		1.00	0.95			1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	0.97		1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Frt	1.00	1.00	0.85		1.00	0.85		1.00	0.98			1.00
Flt Protected	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (prot)	1618	1631	2682		1754	1479		1703	3306			1703
Flt Permitted	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (perm)	1618	1631	2682		1754	1479		1703	3306			1703
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	406	26	302	36	47	36	10	396	375	52	16	26
RTOR Reduction (vph)	0	0	239	0	0	33	0	0	8	0	0	0
Lane Group Flow (vph)	207	225	63	0	83	3	0	406	419	0	0	42
Confl. Peds. (#/hr)	20					20				30		30
Confl. Bikes (#/hr)										5		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	Prot	NA		Prot	Prot
Protected Phases	4	4		3	3		5	5	2		1	1
Permitted Phases			4			3						
Actuated Green, G (s)	16.3	16.3	16.3		7.5	7.5		20.8	35.2			4.6
Effective Green, g (s)	16.3	16.3	16.3		7.5	7.5		20.8	35.2			4.6
Actuated g/C Ratio	0.21	0.21	0.21		0.10	0.10		0.27	0.45			0.06
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0			3.0
Lane Grp Cap (vph)	336	339	557		167	141		451	1484			99
v/s Ratio Prot	0.13	c0.14			c0.05			c0.24	0.13			0.02
v/s Ratio Perm			0.02			0.00						
v/c Ratio	0.62	0.66	0.11		0.50	0.02		0.90	0.28			0.42
Uniform Delay, d1	28.2	28.5	25.2		33.7	32.1		27.8	13.6			35.6
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Incremental Delay, d2	3.3	4.8	0.1		2.3	0.1		20.7	0.1			2.9
Delay (s)	31.5	33.4	25.3		36.0	32.2		48.5	13.7			38.5
Level of Service	C	C	C		D	C		D	B			D
Approach Delay (s)		29.5			34.8				30.7			
Approach LOS		C			C				C			

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	78.4	Sum of lost time (s)	14.8
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	515	185
Future Volume (vph)	515	185
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.1	4.1
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	0.97
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3406	1481
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3406	1481
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	536	193
RTOR Reduction (vph)	0	146
Lane Group Flow (vph)	536	47
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		5
Heavy Vehicles (%)	6%	6%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	19.0	19.0
Effective Green, g (s)	19.0	19.0
Actuated g/C Ratio	0.24	0.24
Clearance Time (s)	4.1	4.1
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	825	358
v/s Ratio Prot	c0.16	
v/s Ratio Perm		0.03
v/c Ratio	0.65	0.13
Uniform Delay, d1	26.7	23.2
Progression Factor	1.00	1.00
Incremental Delay, d2	1.8	0.2
Delay (s)	28.5	23.4
Level of Service	C	C
Approach Delay (s)	27.8	
Approach LOS	C	

Intersection Summary



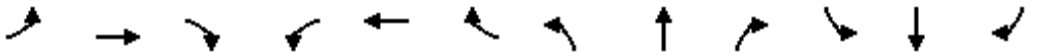
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	310	20	100	685	600	95	90	175	145	90	60
Future Volume (veh/h)	40	310	20	100	685	600	95	90	175	145	90	60
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	41	316	18	102	699	402	97	92	0	148	92	41
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	86	792	45	137	899	743	125	119		213	147	65
Arrive On Green	0.05	0.45	0.45	0.08	0.48	0.48	0.13	0.13	0.00	0.12	0.12	0.12
Sat Flow, veh/h	1795	1766	101	1795	1885	1559	943	895	1598	1795	1235	551
Grp Volume(v), veh/h	41	0	334	102	699	402	189	0	0	148	0	133
Grp Sat Flow(s),veh/h/ln	1795	0	1867	1795	1885	1559	1838	0	1598	1795	0	1786
Q Serve(g_s), s	1.5	0.0	8.0	3.7	20.6	12.2	6.7	0.0	0.0	5.3	0.0	4.7
Cycle Q Clear(g_c), s	1.5	0.0	8.0	3.7	20.6	12.2	6.7	0.0	0.0	5.3	0.0	4.7
Prop In Lane	1.00		0.05	1.00		1.00	0.51		1.00	1.00		0.31
Lane Grp Cap(c), veh/h	86	0	837	137	899	743	244	0		213	0	212
V/C Ratio(X)	0.48	0.00	0.40	0.75	0.78	0.54	0.78	0.00		0.70	0.00	0.63
Avail Cap(c_a), veh/h	537	0	1256	537	1268	1049	604	0		751	0	747
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	31.0	0.0	12.4	30.3	14.6	12.3	28.1	0.0	0.0	28.3	0.0	28.1
Incr Delay (d2), s/veh	1.5	0.0	0.4	3.0	2.6	0.9	2.0	0.0	0.0	1.5	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	3.1	1.6	7.8	3.6	2.9	0.0	0.0	2.3	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.6	0.0	12.8	33.3	17.1	13.2	30.1	0.0	0.0	29.9	0.0	29.2
LnGrp LOS	C	A	B	C	B	B	C	A		C	A	C
Approach Vol, veh/h		375			1203			189	A		281	
Approach Delay, s/veh		15.0			17.2			30.1			29.6	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.7	36.4		11.4	8.6	34.5		12.4				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	20.0	45.0		28.0	20.0	45.0		22.0				
Max Q Clear Time (g_c+I1), s	3.5	22.6		7.3	5.7	10.0		8.7				
Green Ext Time (p_c), s	0.0	9.3		0.7	0.1	3.2		0.5				

Intersection Summary			
HCM 6th Ctrl Delay		19.7	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	640	95	390	1000	0	385	0	180	0	5	5
Future Volume (veh/h)	5	640	95	390	1000	0	385	0	180	0	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	5	646	44	394	1010	0	395	0	14	0	5	3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	7	927	404	643	1350	0	546	0	240	0	14	8
Arrive On Green	0.25	0.25	0.25	0.36	0.36	0.00	0.15	0.00	0.15	0.00	0.01	0.01
Sat Flow, veh/h	27	3648	1588	1795	3770	0	3591	0	1582	0	1096	658
Grp Volume(v), veh/h	349	302	44	394	1010	0	395	0	14	0	0	8
Grp Sat Flow(s),veh/h/ln	1884	1791	1588	1795	1885	0	1795	0	1582	0	0	1753
Q Serve(g_s), s	11.5	10.3	1.4	12.3	16.0	0.0	7.1	0.0	0.5	0.0	0.0	0.3
Cycle Q Clear(g_c), s	11.5	10.3	1.4	12.3	16.0	0.0	7.1	0.0	0.5	0.0	0.0	0.3
Prop In Lane	0.01		1.00	1.00		0.00	1.00		1.00	0.00		0.37
Lane Grp Cap(c), veh/h	479	455	404	643	1350	0	546	0	240	0	0	22
V/C Ratio(X)	0.73	0.66	0.11	0.61	0.75	0.00	0.72	0.00	0.06	0.00	0.00	0.37
Avail Cap(c_a), veh/h	1136	1080	958	951	1996	0	1267	0	558	0	0	516
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	23.2	22.8	19.5	18.0	19.1	0.0	27.5	0.0	24.7	0.0	0.0	33.3
Incr Delay (d2), s/veh	1.6	1.2	0.1	0.7	0.7	0.0	0.7	0.0	0.0	0.0	0.0	3.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	4.1	0.5	4.6	6.2	0.0	2.9	0.0	0.2	0.0	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.8	24.0	19.5	18.7	19.8	0.0	28.2	0.0	24.7	0.0	0.0	37.1
LnGrp LOS	C	C	B	B	B	A	C	A	C	A	A	D
Approach Vol, veh/h		695			1404			409			8	
Approach Delay, s/veh		24.1			19.5			28.0			37.1	
Approach LOS		C			B			C			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		28.4		13.8		21.4		4.3				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		18.0		9.1		13.5		2.3				
Green Ext Time (p_c), s		6.4		0.7		3.2		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			22.2									
HCM 6th LOS			C									

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

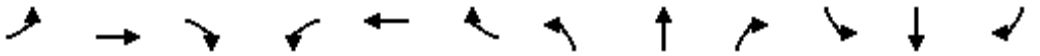
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	670	140	165	1015	320	185
Future Volume (veh/h)	670	140	165	1015	320	185
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	691	70	170	1046	330	49
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1
Cap, veh/h	1796	797	215	2525	504	231
Arrive On Green	0.50	0.50	0.12	0.70	0.14	0.14
Sat Flow, veh/h	3676	1590	1795	3676	3483	1598
Grp Volume(v), veh/h	691	70	170	1046	330	49
Grp Sat Flow(s),veh/h/ln	1791	1590	1795	1791	1742	1598
Q Serve(g_s), s	7.1	0.6	5.5	7.3	5.4	1.6
Cycle Q Clear(g_c), s	7.1	0.6	5.5	7.3	5.4	1.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1796	797	215	2525	504	231
V/C Ratio(X)	0.38	0.09	0.79	0.41	0.65	0.21
Avail Cap(c_a), veh/h	3651	1620	1050	5985	2153	988
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	9.2	1.3	25.6	3.7	24.2	22.6
Incr Delay (d2), s/veh	0.2	0.1	2.4	0.2	1.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.4	2.3	1.2	2.1	0.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	9.4	1.4	28.0	3.8	25.6	23.0
LnGrp LOS	A	A	C	A	C	C
Approach Vol, veh/h	761			1216	379	
Approach Delay, s/veh	8.7			7.2	25.3	
Approach LOS	A			A	C	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	12.2	35.0				47.2	12.7
Change Period (Y+Rc), s	5.0	* 5				5.0	4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0	37.0
Max Q Clear Time (g_c+I1), s	7.5	9.1				9.3	7.4
Green Ext Time (p_c), s	0.1	8.2				14.6	1.3

Intersection Summary	
HCM 6th Ctrl Delay	10.6
HCM 6th LOS	B

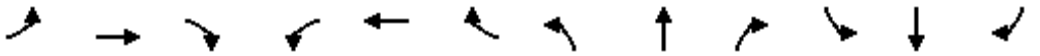
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



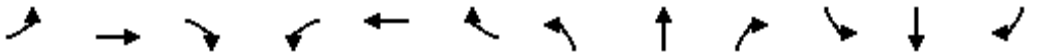
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	360	95	5	570	0	0	215	5	135	330	225
Future Volume (vph)	85	360	95	5	570	0	0	215	5	135	330	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7		3.7	2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00			1.00		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1770	3181		1770	3303			1856		1770	3263	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1770	3181		1770	3303			1856		1770	3263	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	89	379	100	5	600	0	0	226	5	142	347	237
RTOR Reduction (vph)	0	14	0	0	0	0	0	1	0	0	97	0
Lane Group Flow (vph)	89	465	0	5	600	0	0	230	0	142	487	0
Confl. Peds. (#/hr)	45		15	15					20	20		35
Confl. Bikes (#/hr)			5									5
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	7.1	32.4		1.0	26.3			15.5		11.0	30.2	
Effective Green, g (s)	7.1	33.4		1.0	27.3			15.5		11.0	30.2	
Actuated g/C Ratio	0.10	0.45		0.01	0.37			0.21		0.15	0.40	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	168	1422		23	1207			385		260	1319	
v/s Ratio Prot	c0.05	c0.15		0.00	c0.18			c0.12		c0.08	0.15	
v/s Ratio Perm												
v/c Ratio	0.53	0.33		0.22	0.50			0.60		0.55	0.37	
Uniform Delay, d1	32.2	13.4		36.5	18.4			26.8		29.5	15.6	
Progression Factor	1.00	1.00		1.47	0.42			1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.1		1.6	0.3			2.5		1.3	0.2	
Delay (s)	33.6	13.5		55.1	8.1			29.3		30.8	15.8	
Level of Service	C	B		E	A			C		C	B	
Approach Delay (s)		16.7			8.5			29.3			18.7	
Approach LOS		B			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	74.7	Sum of lost time (s)	14.8
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	355	0	180	550	80	10	20	180	0	40	200
Future Volume (vph)	80	355	0	180	550	80	10	20	180	0	40	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.98			1.00	0.85		0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.98	1.00		1.00	
Satd. Flow (prot)	1736	3471		1736	3395			1798	1518		1579	
Flt Permitted	0.95	1.00		0.95	1.00			0.92	1.00		1.00	
Satd. Flow (perm)	1736	3471		1736	3395			1686	1518		1579	
Peak-hour factor, PHF	0.97	0.97	0.92	0.97	0.97	0.97	0.97	0.97	0.97	0.92	0.97	0.97
Adj. Flow (vph)	82	366	0	186	567	82	10	21	186	0	41	206
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	111	0	120	0
Lane Group Flow (vph)	82	366	0	186	641	0	0	31	75	0	127	0
Confl. Peds. (#/hr)				10					15			
Confl. Bikes (#/hr)						5						5
Heavy Vehicles (%)	4%	4%	2%	4%	4%	4%	4%	4%	4%	2%	4%	4%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	6.9	20.6		12.8	26.5			30.2	30.2		30.2	
Effective Green, g (s)	6.9	20.6		12.8	27.5			31.2	30.2		31.2	
Actuated g/C Ratio	0.09	0.28		0.17	0.37			0.42	0.40		0.42	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	160	957		297	1249			704	613		659	
v/s Ratio Prot	0.05	0.11		c0.11	c0.19						c0.08	
v/s Ratio Perm								0.02	0.05			
v/c Ratio	0.51	0.38		0.63	0.51			0.04	0.12		0.19	
Uniform Delay, d1	32.3	21.9		28.7	18.4			12.9	13.9		13.8	
Progression Factor	1.26	0.90		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	1.1	0.2		3.0	0.4			0.0	0.1		0.1	
Delay (s)	41.8	19.9		31.7	18.7			12.9	14.0		13.9	
Level of Service	D	B		C	B			B	B		B	
Approach Delay (s)		23.9			21.6			13.9			13.9	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	74.7	Sum of lost time (s)	14.8
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	495	150	440	890	0	0	0	0	205	120	285
Future Volume (veh/h)	0	495	150	440	890	0	0	0	0	205	120	285
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	544	0	484	978	0				245	104	46
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1960		1285	2886	0				348	183	155
Arrive On Green	0.00	0.38	0.00	0.73	1.00	0.00				0.10	0.10	0.10
Sat Flow, veh/h	0	5358	1610	3510	3705	0				3619	1900	1610
Grp Volume(v), veh/h	0	544	0	484	978	0				245	104	46
Grp Sat Flow(s),veh/h/ln	0	1729	1610	1755	1805	0				1810	1900	1610
Q Serve(g_s), s	0.0	6.6	0.0	4.6	0.0	0.0				5.9	4.7	2.4
Cycle Q Clear(g_c), s	0.0	6.6	0.0	4.6	0.0	0.0				5.9	4.7	2.4
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1960		1285	2886	0				348	183	155
V/C Ratio(X)	0.00	0.28		0.38	0.34	0.00				0.70	0.57	0.30
Avail Cap(c_a), veh/h	0	1960		1285	2886	0				869	456	386
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.69	0.69	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	19.5	0.0	8.3	0.0	0.0				39.4	38.9	37.8
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.2	0.0				1.0	1.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.5	0.0	1.4	0.1	0.0				2.6	2.2	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	19.8	0.0	8.3	0.2	0.0				40.4	39.9	38.2
LnGrp LOS	A	B		A	A	A				D	D	D
Approach Vol, veh/h		544	A		1462						395	
Approach Delay, s/veh		19.8			2.9						40.0	
Approach LOS		B			A						D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	37.9	39.0		13.1		76.9
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	21.5	* 34		21.6		59.0
Max Q Clear Time (g_c+I1), s	6.6	8.6		7.9		2.0
Green Ext Time (p_c), s	0.8	5.0		0.7		13.1

Intersection Summary	
HCM 6th Ctrl Delay	12.8
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	18.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	35	15	25	165	0	125	10	0	325	160	95	595
Future Vol, veh/h	35	15	25	165	0	125	10	0	325	160	95	595
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	15	26	168	0	128	10	0	332	163	97	607
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	13.2	23.4	21.8	15.6
HCM LOS	B	C	C	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	47%	57%	100%	0%	0%
Vol Thru, %	100%	50%	20%	0%	0%	100%	100%
Vol Right, %	0%	50%	33%	43%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	173	323	75	290	95	298	298
LT Vol	0	0	35	165	95	0	0
Through Vol	173	163	15	0	0	298	298
RT Vol	0	160	25	125	0	0	0
Lane Flow Rate	176	329	77	296	97	304	304
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.384	0.686	0.182	0.64	0.205	0.598	0.448
Departure Headway (Hd)	7.861	7.503	8.552	7.781	7.604	7.091	5.311
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	456	480	419	465	471	507	674
Service Time	5.631	5.272	6.33	5.539	5.363	4.849	3.068
HCM Lane V/C Ratio	0.386	0.685	0.184	0.637	0.206	0.6	0.451
HCM Control Delay	15.5	25.2	13.2	23.4	12.3	19.9	12.4
HCM Lane LOS	C	D	B	C	B	C	B
HCM 95th-tile Q	1.8	5.1	0.7	4.4	0.8	3.9	2.3

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.98
Heavy Vehicles, %	2
Mvmt Flow	0
Number of Lanes	0

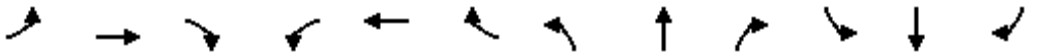
Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	430	370	30	420	710	0	0	0	0	175	0
Future Volume (vph)	0	430	370	30	420	710	0	0	0	0	175	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0					4.5	4.5
Lane Util. Factor		0.95			0.91	0.91					0.95	0.95
Frpb, ped/bikes		0.99			1.00	1.00					1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00					1.00	1.00
Frt		0.93			1.00	1.00					1.00	1.00
Flt Protected		1.00			0.95	1.00					0.95	0.95
Satd. Flow (prot)		3235			1595	3341					1665	1665
Flt Permitted		1.00			0.95	1.00					0.95	0.95
Satd. Flow (perm)		3235			1595	3341					1665	1665
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	453	389	32	442	747	0	0	0	0	184	0
RTOR Reduction (vph)	0	155	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	687	0	0	394	827	0	0	0	0	92	92
Confl. Peds. (#/hr)	10		5		5		10					
Confl. Bikes (#/hr)							10					
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type		NA		Split	Split	NA					Split	NA
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		21.6			24.6	24.6					7.5	7.5
Effective Green, g (s)		21.6			24.6	24.6					7.5	7.5
Actuated g/C Ratio		0.32			0.36	0.36					0.11	0.11
Clearance Time (s)		5.0			5.0	5.0					4.5	4.5
Vehicle Extension (s)		3.0			3.0	3.0					3.0	3.0
Lane Grp Cap (vph)		1024			575	1205					183	183
v/s Ratio Prot		c0.21			0.25	c0.25					c0.06	0.06
v/s Ratio Perm												
v/c Ratio		0.67			0.69	0.69					0.50	0.50
Uniform Delay, d1		20.2			18.5	18.5					28.6	28.6
Progression Factor		1.00			1.00	1.00					1.00	1.00
Incremental Delay, d2		1.7			3.4	1.6					2.2	2.2
Delay (s)		22.0			21.9	20.2					30.8	30.8
Level of Service		C			C	C					C	C
Approach Delay (s)		22.0				20.7			0.0			20.3
Approach LOS		C				C			A			C

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	68.2	Sum of lost time (s)	14.5
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

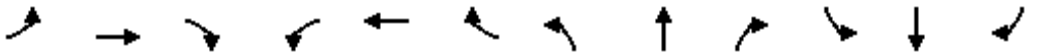
Movement	SBR
Lane Configurations	
Traffic Volume (vph)	330
Future Volume (vph)	330
Ideal Flow (vphpl)	1900
Total Lost time (s)	5.0
Lane Util. Factor	1.00
Frpb, ped/bikes	1.00
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	347
RTOR Reduction (vph)	13
Lane Group Flow (vph)	334
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	3%
Turn Type	custom
Protected Phases	5
Permitted Phases	4
Actuated Green, G (s)	29.1
Effective Green, g (s)	29.1
Actuated g/C Ratio	0.43
Clearance Time (s)	5.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	669
v/s Ratio Prot	0.16
v/s Ratio Perm	0.05
v/c Ratio	0.50
Uniform Delay, d1	14.2
Progression Factor	1.00
Incremental Delay, d2	0.6
Delay (s)	14.8
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	215	410	0	0	710	370	380	0	350	105	0	75
Future Volume (vph)	215	410	0	0	710	370	380	0	350	105	0	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.97		1.00	1.00	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3367	1827			3471	1509		1736	1553	1736		1553
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3367	1827			3471	1509		1736	1553	1736		1553
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	231	441	0	0	763	398	409	0	376	113	0	81
RTOR Reduction (vph)	0	0	0	0	0	291	0	0	240	0	0	72
Lane Group Flow (vph)	231	441	0	0	763	107	0	409	136	113	0	9
Confl. Peds. (#/hr)	10		5	5		10						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	11.7	38.5			22.3	22.3		23.6	23.6	9.2		9.2
Effective Green, g (s)	11.7	38.5			22.3	22.3		23.6	23.6	9.2		9.2
Actuated g/C Ratio	0.14	0.46			0.27	0.27		0.29	0.29	0.11		0.11
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	475	849			934	406		494	442	192		172
v/s Ratio Prot	0.07	c0.24			c0.22					c0.07		0.01
v/s Ratio Perm						0.07		0.24	0.09			
v/c Ratio	0.49	0.52			0.82	0.26		0.83	0.31	0.59		0.05
Uniform Delay, d1	32.8	15.6			28.3	23.8		27.7	23.2	35.0		32.9
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	0.8	0.2			5.3	0.1		10.4	0.1	3.0		0.0
Delay (s)	33.6	15.8			33.7	23.9		38.1	23.4	38.0		32.9
Level of Service	C	B			C	C		D	C	D		C
Approach Delay (s)		21.9			30.3			31.1			35.9	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	28.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	82.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	215	510	130	75	1165	160	105	130	45	130	130	425
Future Volume (veh/h)	215	510	130	75	1165	160	105	130	45	130	130	425
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945
Adj Flow Rate, veh/h	231	548	121	81	1253	172	113	140	48	140	140	457
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	399	1522	335	104	1098	150	91	378	130	200	161	828
Arrive On Green	0.22	0.53	0.53	0.06	0.35	0.35	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1781	2894	637	1781	3138	428	819	1321	453	511	562	1605
Grp Volume(v), veh/h	231	336	333	81	707	718	113	0	188	280	0	457
Grp Sat Flow(s),veh/h/ln	1781	1777	1754	1781	1777	1790	819	0	1774	1073	0	1605
Q Serve(g_s), s	11.6	11.0	11.1	4.5	35.0	35.0	2.3	0.0	8.5	17.8	0.0	0.0
Cycle Q Clear(g_c), s	11.6	11.0	11.1	4.5	35.0	35.0	28.6	0.0	8.5	26.3	0.0	0.0
Prop In Lane	1.00		0.36	1.00		0.24	1.00		0.26	0.50		1.00
Lane Grp Cap(c), veh/h	399	935	922	104	622	626	91	0	507	361	0	828
V/C Ratio(X)	0.58	0.36	0.36	0.78	1.14	1.15	1.25	0.00	0.37	0.78	0.00	0.55
Avail Cap(c_a), veh/h	410	935	922	143	622	626	91	0	507	367	0	835
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	0.92	0.59	0.59	0.59	1.00	0.00	1.00	0.92	0.00	0.92
Uniform Delay (d), s/veh	34.6	13.9	13.9	46.5	32.5	32.5	49.8	0.0	28.5	38.2	0.0	16.6
Incr Delay (d2), s/veh	1.1	1.0	1.0	7.1	73.2	77.4	174.4	0.0	0.2	8.3	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	4.3	4.3	2.2	26.9	27.9	6.7	0.0	3.6	7.5	0.0	7.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.7	14.8	14.9	53.6	105.7	109.9	224.2	0.0	28.7	46.5	0.0	17.0
LnGrp LOS	D	B	B	D	F	F	F	A	C	D	A	B
Approach Vol, veh/h		900			1506			301			737	
Approach Delay, s/veh		20.2			104.9			102.1			28.2	
Approach LOS		C			F			F			C	

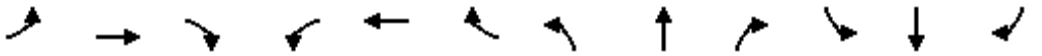
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	27.4	40.0		32.6	9.8	57.6		32.6				
Change Period (Y+Rc), s	5.0	* 5		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	23.0	* 35		29.0	8.0	46.0		25.0				
Max Q Clear Time (g_c+I1), s	13.6	37.0		28.3	6.5	13.1		30.6				
Green Ext Time (p_c), s	0.2	0.0		0.2	0.0	6.3		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		66.1	
HCM 6th LOS		E	

Notes

User approved pedestrian interval to be less than phase max green.

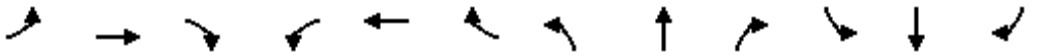
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	480	0	1180	0	1690	360	0	1795	410
Future Volume (vph)	0	0	0	480	0	1180	0	1690	360	0	1795	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.6		4.6		4.4	4.4		4.4	4.4
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.93		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3467		2814		5136	1487		5136	1557
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3467		2814		5136	1487		5136	1557
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	500	0	1229	0	1760	375	0	1870	427
RTOR Reduction (vph)	0	0	0	0	0	6	0	0	196	0	0	108
Lane Group Flow (vph)	0	0	0	500	0	1223	0	1760	179	0	1870	319
Confl. Peds. (#/hr)							10		15	15		10
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				28.8		69.4		71.6	71.6		112.2	112.2
Effective Green, g (s)				28.8		65.8		71.6	71.6		112.2	112.2
Actuated g/C Ratio				0.19		0.44		0.48	0.48		0.75	0.75
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				665		1234		2451	709		3841	1164
v/s Ratio Prot				0.14		c0.43		c0.34			0.36	
v/s Ratio Perm									0.12			0.21
v/c Ratio				0.75		0.99		0.72	0.25		0.49	0.27
Uniform Delay, d1				57.2		41.8		31.2	23.3		7.5	6.0
Progression Factor				1.00		1.00		0.88	2.01		1.00	1.00
Incremental Delay, d2				4.3		23.4		1.4	0.6		0.4	0.6
Delay (s)				61.5		65.2		28.7	47.6		7.9	6.6
Level of Service				E		E		C	D		A	A
Approach Delay (s)		0.0			64.2			32.0			7.7	
Approach LOS		A			E			C			A	

Intersection Summary			
HCM 2000 Control Delay	32.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		

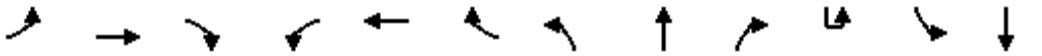
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	310	0	380	0	0	0	0	1740	520	0	1555	745
Future Volume (vph)	310	0	380	0	0	0	0	1740	520	0	1555	745
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5					4.5			4.5	4.5
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.90	0.85					0.97			1.00	0.85
Flt Protected	0.95	0.98	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1698	1511	1519					4761			5136	1553
Flt Permitted	0.95	0.98	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1698	1511	1519					4761			5136	1553
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	326	0	400	0	0	0	0	1832	547	0	1637	784
RTOR Reduction (vph)	0	45	45	0	0	0	0	0	0	0	0	175
Lane Group Flow (vph)	251	198	187	0	0	0	0	2379	0	0	1637	609
Confl. Peds. (#/hr)	5					5	10		15	15		10
Confl. Bikes (#/hr)												5
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	24.4	24.4	24.4					116.6			116.6	116.6
Effective Green, g (s)	24.4	24.4	24.4					116.6			116.6	116.6
Actuated g/C Ratio	0.16	0.16	0.16					0.78			0.78	0.78
Clearance Time (s)	4.5	4.5	4.5					4.5			4.5	4.5
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	276	245	247					3700			3992	1207
v/s Ratio Prot	c0.15	0.13						c0.50			0.32	
v/s Ratio Perm			0.12									0.39
v/c Ratio	0.91	0.81	0.76					0.64			0.41	0.50
Uniform Delay, d1	61.7	60.5	60.0					7.4			5.5	6.1
Progression Factor	1.00	1.00	1.00					2.04			1.39	5.15
Incremental Delay, d2	30.6	16.5	11.1					0.7			0.3	1.3
Delay (s)	92.4	77.1	71.0					15.9			7.8	32.8
Level of Service	F	E	E					B			A	C
Approach Delay (s)		80.4			0.0			15.9			15.9	
Approach LOS		F			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	190	300	245	290	455	240	325	1365	120	70	295	1240
Future Volume (vph)	190	300	245	290	455	240	325	1365	120	70	295	1240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.97	0.91	1.00		0.97	0.91
Frpb, ped/bikes	1.00	1.00	0.97	1.00	0.98		1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85		1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	3574	1544	3467	3332		3467	5136	1523		3467	5136
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	3574	1544	3467	3332		3467	5136	1523		3467	5136
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	202	319	261	309	484	255	346	1452	128	74	314	1319
RTOR Reduction (vph)	0	0	125	0	45	0	0	0	58	0	0	0
Lane Group Flow (vph)	202	319	136	309	694	0	346	1452	70	0	388	1319
Confl. Peds. (#/hr)	30		15	15		30	5		20		20	
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	3	8		7	4		1	6		5	5	2
Permitted Phases			8						6			
Actuated Green, G (s)	22.3	40.4	40.4	18.1	37.6		19.3	55.5	55.5		19.8	55.5
Effective Green, g (s)	22.3	40.4	40.4	18.1	37.6		19.3	55.5	55.5		19.8	55.5
Actuated g/C Ratio	0.15	0.27	0.27	0.12	0.25		0.13	0.37	0.37		0.13	0.37
Clearance Time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	265	962	415	418	835		446	1900	563		457	1900
v/s Ratio Prot	c0.11	0.09		0.09	c0.21		0.10	c0.28			c0.11	0.26
v/s Ratio Perm			0.09						0.05			
v/c Ratio	0.76	0.33	0.33	0.74	0.83		0.78	0.76	0.12		0.85	0.69
Uniform Delay, d1	61.3	44.0	43.9	63.7	53.2		63.3	41.5	31.2		63.6	40.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.20	1.04
Incremental Delay, d2	12.2	0.2	0.5	6.7	7.1		8.2	3.0	0.5		12.5	1.9
Delay (s)	73.5	44.2	44.4	70.4	60.3		71.5	44.5	31.7		88.9	43.6
Level of Service	E	D	D	E	E		E	D	C		F	D
Approach Delay (s)		51.8			63.3			48.5				51.7
Approach LOS		D			E			D				D

Intersection Summary			
HCM 2000 Control Delay	52.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.7
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	205
Future Volume (vph)	205
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.6
Lane Util. Factor	1.00
Frpb, ped/bikes	0.98
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1566
Flt Permitted	1.00
Satd. Flow (perm)	1566
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	218
RTOR Reduction (vph)	58
Lane Group Flow (vph)	160
Confl. Peds. (#/hr)	5
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	1%
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	55.5
Effective Green, g (s)	55.5
Actuated g/C Ratio	0.37
Clearance Time (s)	4.6
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	579
v/s Ratio Prot	
v/s Ratio Perm	0.10
v/c Ratio	0.28
Uniform Delay, d1	33.2
Progression Factor	1.01
Incremental Delay, d2	1.1
Delay (s)	34.4
Level of Service	C
Approach Delay (s)	
Approach LOS	

Intersection Summary

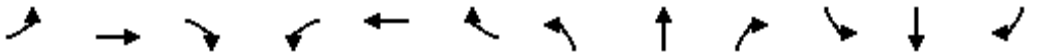
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	90	60	60	350	145	340	115	220	1790	255	60	180
Future Volume (veh/h)	90	60	60	350	145	340	115	220	1790	255	60	180
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.98		0.96		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885		1885	1885	1885		1885
Adj Flow Rate, veh/h	95	63	36	260	303	110		232	1884	156		189
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	1	1	1	1	1	1		1	1	1		1
Cap, veh/h	161	263	150	317	488	397		259	2818	870		215
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26		0.14	0.55	0.55		0.12
Sat Flow, veh/h	438	1015	580	1283	1885	1536		1795	5147	1589		1795
Grp Volume(v), veh/h	95	0	99	260	303	110		232	1884	156		189
Grp Sat Flow(s),veh/h/ln	438	0	1595	1283	1885	1536		1795	1716	1589		1795
Q Serve(g_s), s	14.4	0.0	7.4	30.1	21.3	8.6		19.1	39.2	7.4		15.5
Cycle Q Clear(g_c), s	35.7	0.0	7.4	37.5	21.3	8.6		19.1	39.2	7.4		15.5
Prop In Lane	1.00		0.36	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	161	0	413	317	488	397		259	2818	870		215
V/C Ratio(X)	0.59	0.00	0.24	0.82	0.62	0.28		0.90	0.67	0.18		0.88
Avail Cap(c_a), veh/h	260	0	574	317	488	397		431	2818	870		395
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	64.9	0.0	43.9	58.8	49.1	44.4		63.1	24.2	17.0		64.9
Incr Delay (d2), s/veh	3.4	0.0	0.3	15.6	2.4	0.4		13.0	1.3	0.5		10.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	3.7	0.0	3.0	11.2	10.4	3.4		9.7	16.2	2.9		7.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.3	0.0	44.2	74.4	51.5	44.8		76.1	25.5	17.5		75.9
LnGrp LOS	E	A	D	E	D	D		E	C	B		E
Approach Vol, veh/h		194			673				2272			
Approach Delay, s/veh		56.0			59.3				30.1			
Approach LOS		E			E				C			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	24.6	82.9		42.5	21.0	86.5		42.5				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	36.0	48.9		36.0	33.0	27.6		54.0				
Max Q Clear Time (g_c+I1), s	21.1	23.0		39.5	17.5	41.2		37.7				
Green Ext Time (p_c), s	0.6	9.2		0.0	0.4	0.0		1.1				

Intersection Summary		
HCM 6th Ctrl Delay		35.6
HCM 6th LOS		D

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1020	110
Future Volume (veh/h)	1020	110
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		0.99
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1885	1885
Adj Flow Rate, veh/h	1074	110
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	1	1
Cap, veh/h	2481	254
Arrive On Green	0.52	0.52
Sat Flow, veh/h	4741	485
Grp Volume(v), veh/h	777	407
Grp Sat Flow(s),veh/h/ln	1716	1795
Q Serve(g_s), s	20.9	21.0
Cycle Q Clear(g_c), s	20.9	21.0
Prop In Lane		0.27
Lane Grp Cap(c), veh/h	1795	939
V/C Ratio(X)	0.43	0.43
Avail Cap(c_a), veh/h	1795	939
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	22.0	22.0
Incr Delay (d2), s/veh	0.8	1.5
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.7	9.3
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	22.8	23.5
LnGrp LOS	C	C
Approach Vol, veh/h	1373	
Approach Delay, s/veh	30.3	
Approach LOS	C	
Timer - Assigned Phs		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	545	0	0	1060	650	275	525	315	0	0	0
Future Volume (veh/h)	155	545	0	0	1060	650	275	525	315	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1885	1885	1885			
Adj Flow Rate, veh/h	168	592	0	0	1152	0	299	571	342			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	1	1	1			
Cap, veh/h	232	2037	0	0	1639		575	603	509			
Arrive On Green	0.13	1.00	0.00	0.00	0.46	0.00	0.32	0.32	0.32			
Sat Flow, veh/h	3483	3676	0	0	3676	1598	1795	1885	1590			
Grp Volume(v), veh/h	168	592	0	0	1152	0	299	571	342			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1791	1598	1795	1885	1590			
Q Serve(g_s), s	4.2	0.0	0.0	0.0	23.1	0.0	12.2	26.6	16.8			
Cycle Q Clear(g_c), s	4.2	0.0	0.0	0.0	23.1	0.0	12.2	26.6	16.8			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	232	2037	0	0	1639		575	603	509			
V/C Ratio(X)	0.72	0.29	0.00	0.00	0.70		0.52	0.95	0.67			
Avail Cap(c_a), veh/h	232	2037	0	0	1639		579	607	512			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.95	0.95	0.00	0.00	0.46	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	38.2	0.0	0.0	0.0	19.5	0.0	25.0	29.8	26.5			
Incr Delay (d2), s/veh	8.8	0.3	0.0	0.0	1.2	0.0	0.4	23.6	2.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.9	0.1	0.0	0.0	9.1	0.0	5.0	15.3	6.4			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.0	0.3	0.0	0.0	20.7	0.0	25.3	53.5	29.3			
LnGrp LOS	D	A	A	A	C		C	D	C			
Approach Vol, veh/h		760			1152	A		1212				
Approach Delay, s/veh		10.7			20.7			39.7				
Approach LOS		B			C			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		56.2			10.0	46.2		33.8				
Change Period (Y+Rc), s		5.0			4.0	5.0		5.0				
Max Green Setting (Gmax), s		51.0			6.0	41.0		29.0				
Max Q Clear Time (g_c+I1), s		2.0			6.2	25.1		28.6				
Green Ext Time (p_c), s		6.3			0.0	9.3		0.2				

Intersection Summary	
HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2: Scott St Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0
Total Del/Veh (s)	1.5	6.2	3.8	3.8
Vehicles Entered	154	145	9	308
Vehicles Exited	154	145	9	308
Hourly Exit Rate	154	145	9	308
Input Volume	155	152	9	316
% of Volume	99	96	97	97
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.4	0.3	0.3	0.2	0.3	0.2
Total Del/Veh (s)	5.5	8.4	3.6	4.2	3.6	3.1	8.6	9.7	6.5	8.9	7.7	6.5
Vehicles Entered	15	10	6	110	8	23	5	188	87	58	180	12
Vehicles Exited	15	10	6	110	8	23	5	188	87	57	179	12
Hourly Exit Rate	15	10	6	110	8	23	5	188	87	57	179	12
Input Volume	15	10	5	115	7	25	5	190	85	60	180	10
% of Volume	98	98	120	95	119	93	100	99	103	95	100	117
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	7.4
Vehicles Entered	702
Vehicles Exited	700
Hourly Exit Rate	700
Input Volume	707
% of Volume	99
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.2	0.2	0.3	0.3	0.2
Total Del/Veh (s)	5.0	3.6	5.5	5.9	7.4	5.1	5.8
Vehicles Entered	51	82	28	137	183	113	594
Vehicles Exited	51	82	28	137	183	112	593
Hourly Exit Rate	51	82	28	137	183	112	593
Input Volume	50	85	30	135	190	115	606
% of Volume	101	96	93	101	96	97	98
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	10.9
Vehicles Entered	1078
Vehicles Exited	1073
Hourly Exit Rate	1073
Input Volume	2888
% of Volume	37
Denied Entry Before	0
Denied Entry After	0

Intersection: 2: Scott St

Movement	EB	WB	SB
Directions Served	T	T	T
Maximum Queue (ft)	85	96	16
Average Queue (ft)	16	26	1
95th Queue (ft)	60	75	11
Link Distance (ft)	8	138	482
Upstream Blk Time (%)	4	0	
Queuing Penalty (veh)	7	0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Dollar Ave/Herman Ave & Scott St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	45	61	140	156
Average Queue (ft)	20	34	60	76
95th Queue (ft)	45	46	105	126
Link Distance (ft)	516	8	947	1729
Upstream Blk Time (%)		11		
Queuing Penalty (veh)		16		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

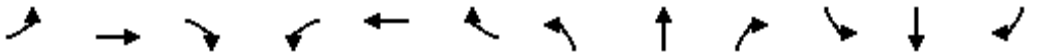
Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	89	95	138
Average Queue (ft)	44	50	68
95th Queue (ft)	73	81	106
Link Distance (ft)	186	939	1415
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 23

2040 No Project (CNP) AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	60	515	155	5	45	155	0	0	405	35
Future Volume (vph)	0	0	60	515	155	5	45	155	0	0	405	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.6	4.0	4.0			4.6			4.6	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.99	
Flt Protected			1.00	0.95	0.97			0.99			1.00	
Satd. Flow (prot)			1580	1649	1687			3433			3414	
Flt Permitted			1.00	0.95	0.97			0.99			1.00	
Satd. Flow (perm)			1580	1649	1687			3433			3414	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	0	68	585	176	6	51	176	0	0	460	40
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	0	68	380	387	0	0	227	0	0	494	0
Confl. Peds. (#/hr)							10					10
Confl. Bikes (#/hr)									5			5
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	2%	4%	4%	4%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			13.0	45.4	45.4			13.0			28.4	
Effective Green, g (s)			13.0	45.4	45.4			13.0			28.4	
Actuated g/C Ratio			0.13	0.45	0.45			0.13			0.28	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			205	748	765			446			969	
v/s Ratio Prot			0.04					c0.07			c0.14	
v/s Ratio Perm				c0.23	0.23							
v/c Ratio			0.33	0.51	0.51			0.51			0.51	
Uniform Delay, d1			39.6	19.4	19.3			40.5			30.0	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			1.3	2.5	2.4			1.2			1.9	
Delay (s)			40.9	21.8	21.7			41.8			31.9	
Level of Service			D	C	C			D			C	
Approach Delay (s)		40.9			21.8			41.8			31.9	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	28.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/24/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	615	285	30	145	190	5	400	220
Future Volume (veh/h)	615	285	30	145	190	5	400	220
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.95
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1590	1710		1590	1590		1590	1590
Adj Flow Rate, veh/h	428	444		151	198		417	42
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	9	0		9	9		9	9
Cap, veh/h	507	485		1067	1750		514	219
Arrive On Green	0.33	0.33		0.36	0.58		0.17	0.17
Sat Flow, veh/h	1514	1449		2938	3100		3100	1287
Grp Volume(v), veh/h	428	444		151	198		417	42
Grp Sat Flow(s),veh/h/ln	1514	1449		1469	1510		1510	1287
Q Serve(g_s), s	26.2	29.4		3.4	3.0		13.3	2.8
Cycle Q Clear(g_c), s	26.2	29.4		3.4	3.0		13.3	2.8
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	507	485		1067	1750		514	219
V/C Ratio(X)	0.84	0.92		0.14	0.11		0.81	0.19
Avail Cap(c_a), veh/h	636	609		1067	1750		767	327
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.89	0.89		0.67	0.67		0.69	0.69
Uniform Delay (d), s/veh	30.9	31.9		21.4	9.5		40.0	35.6
Incr Delay (d2), s/veh	6.3	13.3		0.0	0.1		9.4	1.3
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	10.3	11.9		1.2	0.9		5.5	0.9
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	37.1	45.2		21.4	9.6		49.4	37.0
LnGrp LOS	D	D		C	A		D	D
Approach Vol, veh/h	872				349		459	
Approach Delay, s/veh	41.3				14.7		48.2	
Approach LOS	D				B		D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	40.9	21.6				62.5		37.5
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	20.0	* 25				39.4		42.0
Max Q Clear Time (g_c+I1), s	5.4	15.3				5.0		31.4
Green Ext Time (p_c), s	0.3	1.3				0.8		2.1

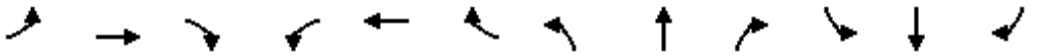
Intersection Summary	
HCM 6th Ctrl Delay	37.6
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

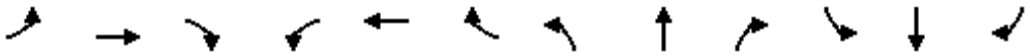
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	275	85	245	130	80	35	350	405	540	395	125
Future Volume (vph)	190	275	85	245	130	80	35	350	405	540	395	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.99		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00
Satd. Flow (prot)		3014		2814	1527	1298	1464	2927	1309	1421	2946	1264
Flt Permitted		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00
Satd. Flow (perm)		3014		2814	1527	1298	1464	2927	1309	1421	2946	1264
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	289	89	258	137	84	37	368	426	568	416	132
RTOR Reduction (vph)	0	15	0	0	0	74	0	0	0	0	0	90
Lane Group Flow (vph)	0	563	0	258	137	10	37	368	426	375	609	42
Confl. Peds. (#/hr)			70									25
Heavy Vehicles (%)	2%	2%	2%	12%	12%	12%	11%	11%	11%	4%	4%	4%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		23.1		13.1	13.1	13.1	16.3	16.3	73.0	33.8	33.8	33.8
Effective Green, g (s)		23.1		13.1	13.1	13.1	16.3	16.3	73.0	33.8	33.8	33.8
Actuated g/C Ratio		0.22		0.12	0.12	0.12	0.16	0.16	0.70	0.32	0.32	0.32
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		663		351	190	161	227	454	910	457	948	406
v/s Ratio Prot		c0.19		c0.09	0.09		0.03	c0.13	0.33	c0.26	0.21	
v/s Ratio Perm						0.01						0.03
v/c Ratio		0.85		0.74	0.72	0.07	0.16	0.81	0.47	0.82	0.64	0.10
Uniform Delay, d1		39.3		44.3	44.2	40.5	38.4	42.9	7.2	32.8	30.4	25.0
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		9.6		7.8	12.6	0.2	0.2	10.3	0.3	15.2	3.3	0.5
Delay (s)		48.8		52.1	56.8	40.7	38.7	53.1	7.5	48.0	33.8	25.5
Level of Service		D		D	E	D	D	D	A	D	C	C
Approach Delay (s)		48.8			51.4			29.1			37.6	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	39.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

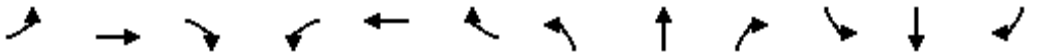
! Phase conflict between lane groups.
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	405	45	250	85	15	10	150	460	45	240	15
Future Volume (vph)	40	405	45	250	85	15	10	150	460	45	240	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		3.5	3.5			3.0	3.0		3.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		1.00		1.00	0.99			1.00	1.00		1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.98			1.00	0.85		0.99	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2764		1413	1443			1482	2224		1462	
Flt Permitted		1.00		0.95	1.00			0.98	1.00		0.94	
Satd. Flow (perm)		2764		1413	1443			1455	2224		1379	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	43	435	48	269	91	16	11	161	495	48	258	16
RTOR Reduction (vph)	0	10	0	0	9	0	0	0	124	0	3	0
Lane Group Flow (vph)	0	516	0	269	98	0	0	172	371	0	319	0
Confl. Peds. (#/hr)			15			15			15			25
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		26.1		17.0	17.0			19.9	40.4		19.9	
Effective Green, g (s)		26.1		17.0	17.0			19.9	36.9		19.9	
Actuated g/C Ratio		0.36		0.23	0.23			0.27	0.51		0.27	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		988		329	336			396	1124		375	
v/s Ratio Prot		c0.19		c0.19	0.07				0.17			
v/s Ratio Perm								0.12			c0.23	
v/c Ratio		0.52		0.82	0.29			0.43	0.33		0.85	
Uniform Delay, d1		18.5		26.5	23.0			21.9	10.7		25.1	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		2.0		13.8	0.2			0.3	0.1		16.1	
Delay (s)		20.5		40.3	23.2			22.2	10.8		41.3	
Level of Service		C		D	C			C	B		D	
Approach Delay (s)		20.5			35.5			13.7			41.3	
Approach LOS		C			D			B			D	

Intersection Summary			
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	225	160	315	185	200	170	45	450	235	655	110
Future Volume (veh/h)	155	225	160	315	185	200	170	45	450	235	655	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1441	1441	1441	1618	1618	1618	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	133	279	0	332	195	0	179	47	0	247	689	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	31	31	31	19	19	19	7	7	7	6	6	6
Cap, veh/h	178	373		508	267		209	709		547	1415	
Arrive On Green	0.13	0.13	0.00	0.05	0.05	0.00	0.12	0.21	0.00	0.32	0.41	0.00
Sat Flow, veh/h	1372	2881	1221	3083	1618	1372	1711	3503	0	1725	3441	1535
Grp Volume(v), veh/h	133	279	0	332	195	0	179	47	0	247	689	0
Grp Sat Flow(s),veh/h/ln	1372	1441	1221	1541	1618	1372	1711	1706	0	1725	1721	1535
Q Serve(g_s), s	9.8	9.8	0.0	11.1	12.5	0.0	10.8	1.2	0.0	12.0	15.5	0.0
Cycle Q Clear(g_c), s	9.8	9.8	0.0	11.1	12.5	0.0	10.8	1.2	0.0	12.0	15.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	178	373		508	267		209	709		547	1415	
V/C Ratio(X)	0.75	0.75		0.65	0.73		0.86	0.07		0.45	0.49	
Avail Cap(c_a), veh/h	287	604		628	330		261	709		547	1415	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.91	0.91	0.00	0.83	0.83	0.00	1.00	1.00	0.00	0.77	0.77	0.00
Uniform Delay (d), s/veh	44.1	44.1	0.0	46.7	47.4	0.0	45.2	33.4	0.0	28.6	22.7	0.0
Incr Delay (d2), s/veh	2.2	1.0	0.0	1.4	5.2	0.0	17.3	0.0	0.0	0.2	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	3.5	0.0	4.7	5.8	0.0	5.5	0.5	0.0	4.9	6.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.2	45.1	0.0	48.1	52.6	0.0	62.5	33.4	0.0	28.8	23.7	0.0
LnGrp LOS	D	D		D	D		E	C		C	C	
Approach Vol, veh/h		412	A		527	A		226	A		936	A
Approach Delay, s/veh		45.5			49.8			56.5			25.0	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	16.8	48.1		18.2	38.2	26.7		21.9				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	16.0	27.5		22.0	22.4	* 21		21.4				
Max Q Clear Time (g_c+I1), s	12.8	17.5		11.8	14.0	3.2		14.5				
Green Ext Time (p_c), s	0.1	3.6		1.1	0.3	0.1		1.6				

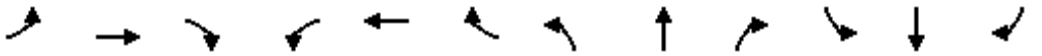
Intersection Summary			
HCM 6th Ctrl Delay		38.6	
HCM 6th LOS		D	

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	385	370	30	165	30	330	695	360	35	135	255
Future Volume (veh/h)	175	385	370	30	165	30	330	695	360	35	135	255
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.95	1.00		1.00	1.00		0.93
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1722	1722	1722	1574	1574	1574	1811	1811	1811	1663	1663	1663
Adj Flow Rate, veh/h	188	414	118	32	177	28	355	747	0	38	145	86
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	12	12	12	22	22	22	6	6	6	16	16	16
Cap, veh/h	234	441	366	87	218	35	1303	1340		197	206	162
Arrive On Green	0.05	0.08	0.08	0.06	0.17	0.17	0.39	0.39	0.00	0.12	0.12	0.12
Sat Flow, veh/h	1640	1722	1427	1499	1317	208	3346	3532	0	1584	1663	1305
Grp Volume(v), veh/h	188	414	118	32	0	205	355	747	0	38	145	86
Grp Sat Flow(s),veh/h/ln	1640	1722	1427	1499	0	1525	1673	1721	0	1584	1663	1305
Q Serve(g_s), s	11.9	25.1	8.2	2.2	0.0	13.6	7.6	17.8	0.0	2.3	8.8	6.5
Cycle Q Clear(g_c), s	11.9	25.1	8.2	2.2	0.0	13.6	7.6	17.8	0.0	2.3	8.8	6.5
Prop In Lane	1.00		1.00	1.00		0.14	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	234	441	366	87	0	253	1303	1340		197	206	162
V/C Ratio(X)	0.80	0.94	0.32	0.37	0.00	0.81	0.27	0.56		0.19	0.70	0.53
Avail Cap(c_a), veh/h	234	441	366	143	0	347	1303	1340		348	366	287
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.84	0.84	1.00	0.00	1.00	0.70	0.70	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.6	48.1	39.5	47.6	0.0	42.2	21.9	25.0	0.0	41.3	44.1	43.1
Incr Delay (d2), s/veh	14.6	24.7	0.3	1.0	0.0	7.0	0.4	1.2	0.0	0.2	1.6	1.0
Initial Q Delay(d3),s/veh	0.0	78.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.2	25.0	3.1	0.8	0.0	5.6	3.0	7.2	0.0	0.9	3.7	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.2	151.1	39.8	48.6	0.0	49.2	22.3	26.2	0.0	41.4	45.8	44.1
LnGrp LOS	E	F	D	D	A	D	C	C		D	D	D
Approach Vol, veh/h		720			237			1102	A		269	
Approach Delay, s/veh		109.9			49.1			24.9			44.6	
Approach LOS		F			D			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.1	31.5		45.5	19.6	22.0		17.9				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.6	* 4.6		4.9				
Max Green Setting (Gmax), s	10.0	26.9		26.9	13.0	* 24		23.1				
Max Q Clear Time (g_c+I1), s	4.2	27.1		19.8	13.9	15.6		10.8				
Green Ext Time (p_c), s	0.0	0.0		2.7	0.0	0.4		0.7				

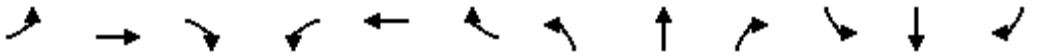
Intersection Summary		
HCM 6th Ctrl Delay		55.9
HCM 6th LOS		E

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



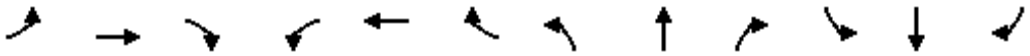
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	900	20	700	15	10	15	240	355	25	25	440	120
Future Volume (vph)	900	20	700	15	10	15	240	355	25	25	440	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	0.95	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1633	1641	2707		1693	1482	1656	3280		1626	3252	1455
Flt Permitted	0.95	0.95	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1633	1641	2707		1693	1482	1656	3280		1626	3252	1455
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	947	21	737	16	11	16	253	374	26	26	463	126
RTOR Reduction (vph)	0	0	528	0	0	15	0	4	0	0	0	96
Lane Group Flow (vph)	483	485	209	0	27	1	253	396	0	26	463	30
Heavy Vehicles (%)	5%	5%	5%	9%	9%	9%	9%	9%	9%	11%	11%	11%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	20.8	20.8	20.8		4.0	4.0	16.2	31.3		2.7	17.8	17.8
Effective Green, g (s)	20.8	20.8	20.8		4.0	4.0	16.2	31.3		2.7	17.8	17.8
Actuated g/C Ratio	0.28	0.28	0.28		0.05	0.05	0.22	0.43		0.04	0.24	0.24
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	461	463	765		92	80	364	1394		59	786	351
v/s Ratio Prot	c0.30	0.30			c0.02		c0.15	0.12		0.02	c0.14	
v/s Ratio Perm			0.08			0.00						0.02
v/c Ratio	1.05	1.05	0.27		0.29	0.01	0.70	0.28		0.44	0.59	0.09
Uniform Delay, d1	26.4	26.4	20.5		33.4	32.9	26.4	13.8		34.7	24.7	21.6
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	55.0	54.8	0.2		1.8	0.1	5.7	0.1		5.2	1.1	0.1
Delay (s)	81.4	81.2	20.7		35.2	33.0	32.1	13.9		39.9	25.8	21.7
Level of Service	F	F	C		D	C	C	B		D	C	C
Approach Delay (s)		55.1			34.4			21.0			25.6	
Approach LOS		E			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	41.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	73.6	Sum of lost time (s)	14.8
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	15	50	5	45	5	160	130	85	160	5
Future Volume (vph)	10	10	15	50	5	45	5	160	130	85	160	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.94			0.94			0.94			1.00	
Flt Protected		0.99			0.98			1.00			0.98	
Satd. Flow (prot)		1559			1535			1576			1644	
Flt Permitted		0.94			0.87			1.00			0.82	
Satd. Flow (perm)		1481			1367			1569			1375	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	11	16	54	5	49	5	174	141	92	174	5
RTOR Reduction (vph)	0	10	0	0	29	0	0	63	0	0	2	0
Lane Group Flow (vph)	0	28	0	0	79	0	0	257	0	0	269	0
Parking (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		592			546			627			550	
v/s Ratio Prot												
v/s Ratio Perm		0.02			c0.06			0.16			c0.20	
v/c Ratio		0.05			0.14			0.41			0.49	
Uniform Delay, d1		8.3			8.6			9.7			10.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.6			2.0			3.1	
Delay (s)		8.4			9.1			11.7			13.2	
Level of Service		A			A			B			B	
Approach Delay (s)		8.4			9.1			11.7			13.2	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



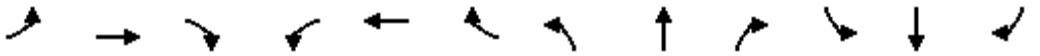
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	765	325	50	375	215	50	25	215	395	365	35
Future Volume (veh/h)	65	765	325	50	375	215	50	25	215	395	365	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	71	841	347	55	412	107	55	27	0	434	401	37
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	89	738	304	70	1078	910	68	34		386	366	34
Arrive On Green	0.05	0.59	0.59	0.04	0.58	0.58	0.06	0.06	0.00	0.22	0.22	0.22
Sat Flow, veh/h	1781	1256	518	1781	1870	1578	1214	596	1585	1781	1686	156
Grp Volume(v), veh/h	71	0	1188	55	412	107	82	0	0	434	0	438
Grp Sat Flow(s),veh/h/ln	1781	0	1774	1781	1870	1578	1810	0	1585	1781	0	1841
Q Serve(g_s), s	5.9	0.0	88.0	4.6	17.9	4.6	6.7	0.0	0.0	32.5	0.0	32.5
Cycle Q Clear(g_c), s	5.9	0.0	88.0	4.6	17.9	4.6	6.7	0.0	0.0	32.5	0.0	32.5
Prop In Lane	1.00		0.29	1.00		1.00	0.67		1.00	1.00		0.08
Lane Grp Cap(c), veh/h	89	0	1042	70	1078	910	102	0		386	0	399
V/C Ratio(X)	0.79	0.00	1.14	0.78	0.38	0.12	0.81	0.00		1.12	0.00	1.10
Avail Cap(c_a), veh/h	149	0	1042	71	1078	910	103	0		386	0	399
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	70.4	0.0	30.9	71.3	17.2	14.4	69.9	0.0	0.0	58.7	0.0	58.7
Incr Delay (d2), s/veh	5.9	0.0	74.8	38.2	0.3	0.1	33.5	0.0	0.0	83.7	0.0	73.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	0.0	57.8	2.8	7.6	1.7	4.1	0.0	0.0	23.7	0.0	23.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.3	0.0	105.8	109.5	17.5	14.5	103.4	0.0	0.0	142.3	0.0	132.4
LnGrp LOS	E	A	F	F	B	B	F	A		F	A	F
Approach Vol, veh/h		1259			574			82	A		872	
Approach Delay, s/veh		104.1			25.8			103.4			137.4	
Approach LOS		F			C			F			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.0	90.9		36.0	9.4	92.5		11.9				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	12.5	81.5		32.5	6.0	88.0		8.5				
Max Q Clear Time (g_c+I1), s	7.9	19.9		34.5	6.6	90.0		8.7				
Green Ext Time (p_c), s	0.0	4.6		0.0	0.0	0.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		98.4	
HCM 6th LOS		F	

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

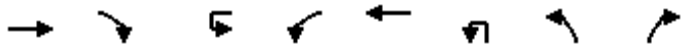


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1175	190	175	500	5	135	5	265	0	5	5
Future Volume (veh/h)	5	1175	190	175	500	5	135	5	265	0	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	5	1291	169	192	549	5	165	0	34	0	5	4
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	6	1660	711	381	791	7	313	0	139	0	13	11
Arrive On Green	0.46	0.46	0.46	0.21	0.21	0.21	0.09	0.00	0.09	0.00	0.01	0.01
Sat Flow, veh/h	13	3633	1557	1781	3700	34	3563	0	1585	0	962	770
Grp Volume(v), veh/h	695	601	169	192	277	277	165	0	34	0	0	9
Grp Sat Flow(s),veh/h/ln	1870	1777	1557	1781	1870	1864	1781	0	1585	0	0	1732
Q Serve(g_s), s	21.4	18.5	4.4	6.3	9.1	9.1	3.0	0.0	1.3	0.0	0.0	0.3
Cycle Q Clear(g_c), s	21.4	18.5	4.4	6.3	9.1	9.1	3.0	0.0	1.3	0.0	0.0	0.3
Prop In Lane	0.01		1.00	1.00		0.02	1.00		1.00	0.00		0.44
Lane Grp Cap(c), veh/h	854	812	711	381	400	398	313	0	139	0	0	24
V/C Ratio(X)	0.81	0.74	0.24	0.50	0.69	0.69	0.53	0.00	0.24	0.00	0.00	0.38
Avail Cap(c_a), veh/h	1150	1092	957	962	1010	1006	1282	0	570	0	0	519
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	15.7	14.9	11.0	23.1	24.2	24.2	29.1	0.0	28.4	0.0	0.0	32.6
Incr Delay (d2), s/veh	3.0	1.5	0.1	0.8	1.6	1.6	0.5	0.0	0.3	0.0	0.0	3.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.2	6.5	1.3	2.5	3.8	3.8	1.2	0.0	0.5	0.0	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.6	16.4	11.2	23.9	25.8	25.8	29.6	0.0	28.7	0.0	0.0	36.2
LnGrp LOS	B	B	B	C	C	C	C	A	C	A	A	D
Approach Vol, veh/h		1465			746			199			9	
Approach Delay, s/veh		16.9			25.3			29.5			36.2	
Approach LOS		B			C			C			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		18.4		9.3		34.6		4.4				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		11.1		5.0		23.4		2.3				
Green Ext Time (p_c), s		2.9		0.3		7.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			20.6									
HCM 6th LOS			C									

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



Movement	EBT	EBR	WBU	WBL	WBT	NBU	NBL	NBR
Lane Configurations								
Traffic Volume (veh/h)	955	505	5	140	495	10	185	190
Future Volume (veh/h)	955	505	5	140	495	10	185	190
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)		0.97		1.00			1.00	1.00
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870		1870	1870
Adj Flow Rate, veh/h	995	421		146	516		193	58
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	2	2		2	2		2	2
Cap, veh/h	1920	832		188	2615		353	162
Arrive On Green	0.54	0.54		0.11	0.74		0.10	0.10
Sat Flow, veh/h	3647	1541		1781	3647		3456	1585
Grp Volume(v), veh/h	995	421		146	516		193	58
Grp Sat Flow(s),veh/h/ln	1777	1541		1781	1777		1728	1585
Q Serve(g_s), s	9.9	4.1		4.4	2.5		2.9	1.9
Cycle Q Clear(g_c), s	9.9	4.1		4.4	2.5		2.9	1.9
Prop In Lane		1.00		1.00			1.00	1.00
Lane Grp Cap(c), veh/h	1920	832		188	2615		353	162
V/C Ratio(X)	0.52	0.51		0.78	0.20		0.55	0.36
Avail Cap(c_a), veh/h	3904	1693		1123	6400		2303	1056
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	8.1	1.5		24.2	2.3		23.7	23.2
Incr Delay (d2), s/veh	0.3	0.7		2.6	0.1		1.3	1.3
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	1.8		1.8	0.2		1.2	0.7
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	8.5	2.1		26.8	2.3		25.0	24.6
LnGrp LOS	A	A		C	A		C	C
Approach Vol, veh/h	1416				662		251	
Approach Delay, s/veh	6.6				7.7		24.9	
Approach LOS	A				A		C	

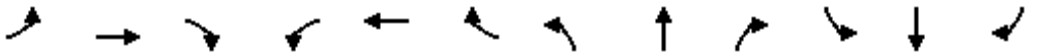
Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	10.9	35.0				45.9		9.7
Change Period (Y+Rc), s	5.0	* 5				5.0		4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0		37.0
Max Q Clear Time (g_c+I1), s	6.4	11.9				4.5		4.9
Green Ext Time (p_c), s	0.1	17.4				5.4		0.8

Intersection Summary	
HCM 6th Ctrl Delay	8.9
HCM 6th LOS	A

Notes

User approved ignoring U-Turning movement.

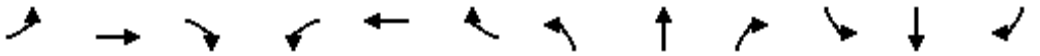
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	460	60	10	345	0	0	235	10	95	160	140
Future Volume (vph)	90	460	60	10	345	0	0	235	10	95	160	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7		3.7	2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			0.99		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1719	3143		1719	3209			1796		1719	3150	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1719	3143		1719	3209			1796		1719	3150	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	500	65	11	375	0	0	255	11	103	174	152
RTOR Reduction (vph)	0	6	0	0	0	0	0	2	0	0	93	0
Lane Group Flow (vph)	98	559	0	11	375	0	0	264	0	103	233	0
Confl. Peds. (#/hr)	25		15	15					15	15		20
Confl. Bikes (#/hr)			5						5			5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	2%	2%	5%	5%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	7.3	32.4		1.0	26.1			16.8		7.5	28.0	
Effective Green, g (s)	7.3	33.4		1.0	27.1			16.8		7.5	28.0	
Actuated g/C Ratio	0.10	0.46		0.01	0.37			0.23		0.10	0.39	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	173	1447		23	1199			416		177	1216	
v/s Ratio Prot	c0.06	c0.18		0.01	0.12			c0.15		c0.06	0.07	
v/s Ratio Perm												
v/c Ratio	0.57	0.39		0.48	0.31			0.64		0.58	0.19	
Uniform Delay, d1	31.1	12.8		35.5	16.1			25.1		31.0	14.7	
Progression Factor	1.00	1.00		1.39	0.50			1.00		1.00	1.00	
Incremental Delay, d2	2.5	0.2		5.5	0.1			3.2		3.1	0.1	
Delay (s)	33.6	13.0		54.9	8.2			28.3		34.1	14.8	
Level of Service	C	B		D	A			C		C	B	
Approach Delay (s)		16.0			9.6			28.3			19.5	
Approach LOS		B			A			C			B	

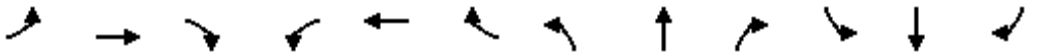
Intersection Summary			
HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	72.5	Sum of lost time (s)	14.8
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	415	0	70	310	120	5	130	135	0	45	110
Future Volume (vph)	150	415	0	70	310	120	5	130	135	0	45	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.96			1.00	0.85		0.89	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1687	3374		1687	3201			1773	1472		1566	
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (perm)	1687	3374		1687	3201			1764	1472		1566	
Peak-hour factor, PHF	0.91	0.91	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.91	0.91
Adj. Flow (vph)	165	456	0	77	341	132	5	143	148	0	49	121
RTOR Reduction (vph)	0	0	0	0	31	0	0	0	91	0	73	0
Lane Group Flow (vph)	165	456	0	77	442	0	0	148	57	0	97	0
Confl. Peds. (#/hr)	10			10		10	5		10			5
Confl. Bikes (#/hr)									10			5
Heavy Vehicles (%)	7%	7%	2%	7%	7%	7%	7%	7%	7%	2%	7%	7%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	12.9	26.7		6.7	20.5			28.0	28.0		28.0	
Effective Green, g (s)	12.9	26.7		6.7	21.5			29.0	28.0		29.0	
Actuated g/C Ratio	0.18	0.37		0.09	0.30			0.40	0.39		0.40	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	300	1242		155	949			705	568		626	
v/s Ratio Prot	c0.10	0.14		0.05	c0.14						0.06	
v/s Ratio Perm								c0.08	0.04			
v/c Ratio	0.55	0.37		0.50	0.47			0.21	0.10		0.16	
Uniform Delay, d1	27.2	16.7		31.3	20.8			14.2	14.2		13.9	
Progression Factor	1.14	0.66		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	1.2	0.2		0.9	0.4			0.1	0.1		0.1	
Delay (s)	32.2	11.2		32.2	21.2			14.4	14.3		14.0	
Level of Service	C	B		C	C			B	B		B	
Approach Delay (s)		16.8			22.7			14.3			14.0	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	72.5	Sum of lost time (s)	14.8
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	885	365	285	470	0	0	0	0	395	415	180
Future Volume (veh/h)	0	885	365	285	470	0	0	0	0	395	415	180
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1885	1885	1885	1885	0				1885	1885	1885
Adj Flow Rate, veh/h	0	932	0	300	495	0				277	631	68
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	1	1	1	1	0				1	1	1
Cap, veh/h	0	2001		835	2450	0				380	797	338
Arrive On Green	0.00	0.39	0.00	0.48	1.00	0.00				0.21	0.21	0.21
Sat Flow, veh/h	0	5316	1598	3483	3676	0				1795	3770	1598
Grp Volume(v), veh/h	0	932	0	300	495	0				277	631	68
Grp Sat Flow(s),veh/h/ln	0	1716	1598	1742	1791	0				1795	1885	1598
Q Serve(g_s), s	0.0	12.2	0.0	4.9	0.0	0.0				12.9	14.3	3.2
Cycle Q Clear(g_c), s	0.0	12.2	0.0	4.9	0.0	0.0				12.9	14.3	3.2
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2001		835	2450	0				380	797	338
V/C Ratio(X)	0.00	0.47		0.36	0.20	0.00				0.73	0.79	0.20
Avail Cap(c_a), veh/h	0	2001		835	2450	0				571	1198	508
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.70	0.70	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	20.5	0.0	19.1	0.0	0.0				33.1	33.6	29.2
Incr Delay (d2), s/veh	0.0	0.8	0.0	0.1	0.1	0.0				1.0	1.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.7	0.0	1.7	0.0	0.0				5.5	6.4	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	21.3	0.0	19.2	0.1	0.0				34.1	34.7	29.3
LnGrp LOS	A	C		B	A	A				C	C	C
Approach Vol, veh/h		932	A		795						976	
Approach Delay, s/veh		21.3			7.3						34.2	
Approach LOS		C			A						C	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	26.6	40.0		23.4		66.6
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	13.5	* 35		28.6		52.0
Max Q Clear Time (g_c+I1), s	6.9	14.2		16.3		2.0
Green Ext Time (p_c), s	0.3	8.4		2.8		5.3

Intersection Summary	
HCM 6th Ctrl Delay	21.8
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	13.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	25	20	20	150	0	85	5	0	250	145	165	215
Future Vol, veh/h	25	20	20	150	0	85	5	0	250	145	165	215
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	27	22	22	163	0	92	5	0	272	158	179	234
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	11.5	16.5	15	11.3
HCM LOS	B	C	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	38%	64%	100%	0%	0%
Vol Thru, %	100%	46%	31%	0%	0%	100%	100%
Vol Right, %	0%	54%	31%	36%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	130	270	65	235	165	108	108
LT Vol	0	0	25	150	165	0	0
Through Vol	130	125	20	0	0	108	108
RT Vol	0	145	20	85	0	0	0
Lane Flow Rate	141	293	71	255	179	117	117
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.269	0.527	0.147	0.495	0.347	0.21	0.151
Departure Headway (Hd)	6.848	6.464	7.475	6.972	6.968	6.458	4.655
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	520	552	483	513	513	552	761
Service Time	4.647	4.262	5.175	4.761	4.759	4.249	2.444
HCM Lane V/C Ratio	0.271	0.531	0.147	0.497	0.349	0.212	0.154
HCM Control Delay	12.2	16.3	11.5	16.5	13.5	11	8.3
HCM Lane LOS	B	C	B	C	B	B	A
HCM 95th-tile Q	1.1	3.1	0.5	2.7	1.5	0.8	0.5

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.92
Heavy Vehicles, %	4
Mvmt Flow	0
Number of Lanes	0

Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	0	490	350	5	150	395	0	0	0	0	5	245
Future Volume (vph)	0	490	350	5	150	395	0	0	0	0	5	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0						4.5
Lane Util. Factor		0.95			0.91	0.91						0.95
Frpb, ped/bikes		0.99			1.00	1.00						1.00
Flpb, ped/bikes		1.00			1.00	1.00						1.00
Frt		0.94			1.00	1.00						1.00
Flt Protected		1.00			0.95	1.00						0.95
Satd. Flow (prot)		3130			1535	3226						1603
Flt Permitted		1.00			0.95	1.00						0.95
Satd. Flow (perm)		3130			1535	3226						1603
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	510	365	5	156	411	0	0	0	0	5	255
RTOR Reduction (vph)	0	135	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	740	0	0	145	427	0	0	0	0	0	132
Confl. Peds. (#/hr)	5		5		5		5					
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type		NA		Split	Split	NA					Split	Split
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		22.2			20.3	20.3						11.0
Effective Green, g (s)		22.2			20.3	20.3						11.0
Actuated g/C Ratio		0.33			0.30	0.30						0.16
Clearance Time (s)		5.0			5.0	5.0						4.5
Vehicle Extension (s)		3.0			3.0	3.0						3.0
Lane Grp Cap (vph)		1021			458	963						259
v/s Ratio Prot		c0.24			0.09	c0.13						0.08
v/s Ratio Perm												
v/c Ratio		0.72			0.32	0.44						0.51
Uniform Delay, d1		20.2			18.5	19.3						26.0
Progression Factor		1.00			1.00	1.00						1.00
Incremental Delay, d2		2.6			0.4	0.3						1.6
Delay (s)		22.8			18.9	19.6						27.6
Level of Service		C			B	B						C
Approach Delay (s)		22.8				19.4			0.0			
Approach LOS		C				B			A			

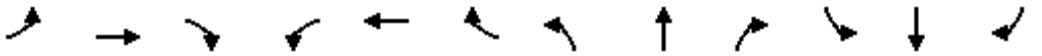
Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	5	155
Future Volume (vph)	5	155
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.5	5.0
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	1.00
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	0.95	1.00
Satd. Flow (prot)	1609	1509
Flt Permitted	0.95	1.00
Satd. Flow (perm)	1609	1509
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	5	161
RTOR Reduction (vph)	0	77
Lane Group Flow (vph)	133	84
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	7%	7%
Turn Type	NA	custom
Protected Phases	4	5
Permitted Phases		4
Actuated Green, G (s)	11.0	33.2
Effective Green, g (s)	11.0	33.2
Actuated g/C Ratio	0.16	0.49
Clearance Time (s)	4.5	5.0
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	260	736
v/s Ratio Prot	c0.08	0.04
v/s Ratio Perm		0.02
v/c Ratio	0.51	0.11
Uniform Delay, d1	26.0	9.4
Progression Factor	1.00	1.00
Incremental Delay, d2	1.7	0.1
Delay (s)	27.7	9.5
Level of Service	C	A
Approach Delay (s)	20.8	
Approach LOS	C	

Intersection Summary

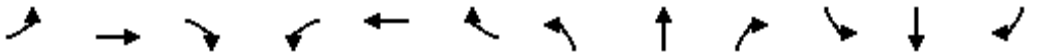
HCM Signalized Intersection Capacity Analysis
23: US 101 NB Off Ramp/US 101 NB On Ramp & San Bruno Ave/San Bruno Avenue

01/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	215	525	0	0	220	130	270	0	415	115	0	60
Future Volume (vph)	215	525	0	0	220	130	270	0	415	115	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00	0.98	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3242	1759			3343	1467		1671	1471	1671		1495
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3242	1759			3343	1467		1671	1471	1671		1495
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	250	610	0	0	256	151	314	0	483	134	0	70
RTOR Reduction (vph)	0	0	0	0	0	118	0	0	165	0	0	61
Lane Group Flow (vph)	250	610	0	0	256	33	0	314	318	134	0	9
Confl. Peds. (#/hr)	10		5	5		10			5	5		
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	12.0	32.5			16.0	16.0		19.7	19.7	9.7		9.7
Effective Green, g (s)	12.0	32.5			16.0	16.0		19.7	19.7	9.7		9.7
Actuated g/C Ratio	0.16	0.44			0.22	0.22		0.27	0.27	0.13		0.13
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	530	778			728	319		448	394	220		197
v/s Ratio Prot	0.08	c0.35			0.08					c0.08		0.01
v/s Ratio Perm						0.02		0.19	c0.22			
v/c Ratio	0.47	0.78			0.35	0.10		0.70	0.81	0.61		0.05
Uniform Delay, d1	27.8	17.5			24.3	23.0		24.2	25.1	30.1		27.8
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	0.7	4.8			0.1	0.1		4.0	10.9	3.3		0.0
Delay (s)	28.5	22.3			24.4	23.0		28.2	36.0	33.3		27.8
Level of Service	C	C			C	C		C	D	C		C
Approach Delay (s)		24.1			23.9			32.9			31.4	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	73.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



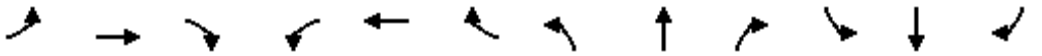
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	445	1005	65	25	700	120	145	105	40	180	80	160
Future Volume (veh/h)	445	1005	65	25	700	120	145	105	40	180	80	160
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.97	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1930
Adj Flow Rate, veh/h	464	1047	64	26	729	110	151	109	42	188	83	167
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	373	1612	99	79	987	149	95	351	135	266	87	795
Arrive On Green	0.07	0.16	0.16	0.04	0.32	0.32	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1767	3373	206	1767	3064	462	1116	1265	487	712	315	1618
Grp Volume(v), veh/h	464	547	564	26	419	420	151	0	151	271	0	167
Grp Sat Flow(s),veh/h/ln	1767	1763	1817	1767	1763	1764	1116	0	1752	1027	0	1618
Q Serve(g_s), s	19.0	26.2	26.2	1.3	19.0	19.1	1.2	0.0	6.1	17.7	0.0	5.3
Cycle Q Clear(g_c), s	19.0	26.2	26.2	1.3	19.0	19.1	25.0	0.0	6.1	23.8	0.0	5.3
Prop In Lane	1.00		0.11	1.00		0.26	1.00		0.28	0.69		1.00
Lane Grp Cap(c), veh/h	373	842	868	79	568	568	95	0	487	353	0	795
V/C Ratio(X)	1.24	0.65	0.65	0.33	0.74	0.74	1.60	0.00	0.31	0.77	0.00	0.21
Avail Cap(c_a), veh/h	373	842	868	98	568	568	95	0	487	353	0	795
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.79	0.79	0.64	0.64	0.64	1.00	0.00	1.00	0.82	0.00	0.82
Uniform Delay (d), s/veh	41.9	30.8	30.8	41.7	27.1	27.1	44.9	0.0	25.7	35.1	0.0	13.1
Incr Delay (d2), s/veh	126.5	3.1	3.0	0.6	5.5	5.5	312.1	0.0	0.1	7.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	22.0	12.9	13.2	0.6	8.5	8.5	10.3	0.0	2.6	6.5	0.0	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	168.4	33.9	33.8	42.3	32.6	32.6	357.0	0.0	25.8	42.5	0.0	13.1
LnGrp LOS	F	C	C	D	C	C	F	A	C	D	A	B
Approach Vol, veh/h		1575			865			302			438	
Approach Delay, s/veh		73.5			32.9			191.4			31.3	
Approach LOS		E			C			F			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	38.0		29.0	13.0	48.0		29.0				
Change Period (Y+Rc), s	4.0	9.0		4.0	9.0	* 5		4.0				
Max Green Setting (Gmax), s	19.0	29.0		25.0	5.0	* 43		25.0				
Max Q Clear Time (g_c+I1), s	21.0	21.1		25.8	3.3	28.2		27.0				
Green Ext Time (p_c), s	0.0	4.0		0.0	0.0	8.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		67.8	
HCM 6th LOS		E	

Notes

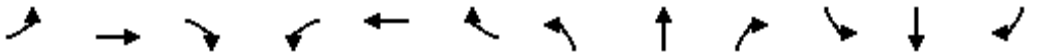
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	515	0	760	0	1080	415	0	2390	300
Future Volume (vph)	0	0	0	515	0	760	0	1080	415	0	2390	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.6		3.6		4.4	4.4		4.4	4.4
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.93		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3400		2760		5036	1465		5036	1517
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3400		2760		5036	1465		5036	1517
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	531	0	784	0	1113	428	0	2464	309
RTOR Reduction (vph)	0	0	0	0	0	539	0	0	213	0	0	73
Lane Group Flow (vph)	0	0	0	531	0	245	0	1113	215	0	2464	236
Confl. Peds. (#/hr)							20		15	15		20
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type				Prot		Prot		NA	Perm		NA	Perm
Protected Phases				4		5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				24.3		32.4		69.1	69.1		105.1	105.1
Effective Green, g (s)				24.3		32.4		69.1	69.1		105.1	105.1
Actuated g/C Ratio				0.18		0.24		0.50	0.50		0.76	0.76
Clearance Time (s)				3.6		3.6		4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2		0.2		0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				601		650		2532	736		3852	1160
v/s Ratio Prot				c0.16		0.09		0.22			c0.49	
v/s Ratio Perm									0.15			0.16
v/c Ratio				0.88		0.38		0.44	0.29		0.64	0.20
Uniform Delay, d1				55.2		44.0		21.8	19.9		7.4	4.5
Progression Factor				1.00		1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2				14.0		0.1		0.6	1.0		0.8	0.4
Delay (s)				69.2		44.2		22.3	20.9		8.3	4.9
Level of Service				E		D		C	C		A	A
Approach Delay (s)		0.0			54.3			22.0			7.9	
Approach LOS		A			D			C			A	

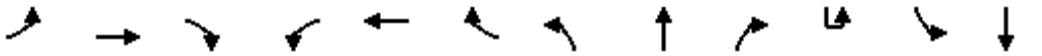
Intersection Summary			
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	137.4	Sum of lost time (s)	11.6
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	0	265	0	0	0	0	1370	575	0	1830	1075
Future Volume (vph)	125	0	265	0	0	0	0	1370	575	0	1830	1075
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.86	0.85					0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1665	1443	1490					4612			5036	1467
Flt Permitted	0.95	1.00	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1665	1443	1490					4612			5036	1467
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	133	0	282	0	0	0	0	1457	612	0	1947	1144
RTOR Reduction (vph)	0	32	32	0	0	0	0	0	0	0	0	191
Lane Group Flow (vph)	120	116	115	0	0	0	0	2069	0	0	1947	953
Confl. Peds. (#/hr)	10					10	15		15	15		15
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	12.0	12.0	12.0					99.0			99.0	99.0
Effective Green, g (s)	12.0	12.0	12.0					99.0			99.0	99.0
Actuated g/C Ratio	0.10	0.10	0.10					0.82			0.82	0.82
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	166	144	149					3804			4154	1210
v/s Ratio Prot	0.07	c0.08						0.45			0.39	
v/s Ratio Perm			0.08									c0.65
v/c Ratio	0.72	0.80	0.77					0.54			0.47	0.79
Uniform Delay, d1	52.4	52.8	52.6					3.3			3.0	5.2
Progression Factor	1.00	1.00	1.00					0.86			1.00	1.00
Incremental Delay, d2	12.4	25.3	19.0					0.4			0.4	5.2
Delay (s)	64.7	78.2	71.7					3.3			3.4	10.5
Level of Service	E	E	E					A			A	B
Approach Delay (s)		72.0			0.0			3.3			6.0	
Approach LOS		E			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	270	455	190	205	340	125	350	1280	145	15	230	1040
Future Volume (vph)	270	455	190	205	340	125	350	1280	145	15	230	1040
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.97	0.91	1.00		0.97	0.91
Frpb, ped/bikes	1.00	1.00	0.95	1.00	0.99		1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85		1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1752	3505	1482	3400	3326		3400	5036	1494		3400	5036
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1752	3505	1482	3400	3326		3400	5036	1494		3400	5036
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	284	479	200	216	358	132	368	1347	153	16	242	1095
RTOR Reduction (vph)	0	0	78	0	35	0	0	0	71	0	0	0
Lane Group Flow (vph)	284	479	122	216	455	0	368	1347	82	0	258	1095
Confl. Peds. (#/hr)	25		40	40		25	15		25		25	
Confl. Bikes (#/hr)			5			5						
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	3	8		7	4		1	6		5	5	2
Permitted Phases			8						6			
Actuated Green, G (s)	20.0	34.5	34.5	10.1	26.0		13.0	45.7	45.7		13.5	45.7
Effective Green, g (s)	20.0	34.5	34.5	10.1	26.0		13.0	45.7	45.7		13.5	45.7
Actuated g/C Ratio	0.17	0.29	0.29	0.08	0.22		0.11	0.38	0.38		0.11	0.38
Clearance Time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)	292	1007	426	286	720		368	1917	568		382	1917
v/s Ratio Prot	c0.16	0.14		0.06	c0.14		c0.11	c0.27			0.08	0.22
v/s Ratio Perm			0.08						0.05			
v/c Ratio	0.97	0.48	0.29	0.76	0.63		1.00	0.70	0.14		0.68	0.57
Uniform Delay, d1	49.7	35.3	33.2	53.7	42.7		53.5	31.4	24.3		51.1	29.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.95	0.87
Incremental Delay, d2	44.7	0.1	0.1	9.6	1.3		46.9	2.2	0.5		3.3	1.1
Delay (s)	94.5	35.4	33.3	63.4	44.0		100.4	33.6	24.9		52.0	26.8
Level of Service	F	D	C	E	D		F	C	C		D	C
Approach Delay (s)		52.4			49.9			46.0				29.8
Approach LOS		D			D			D				C

Intersection Summary			
HCM 2000 Control Delay	42.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.7
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	245
Future Volume (vph)	245
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.6
Lane Util. Factor	1.00
Frpb, ped/bikes	0.97
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1516
Flt Permitted	1.00
Satd. Flow (perm)	1516
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	258
RTOR Reduction (vph)	85
Lane Group Flow (vph)	173
Confl. Peds. (#/hr)	15
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	3%
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	45.7
Effective Green, g (s)	45.7
Actuated g/C Ratio	0.38
Clearance Time (s)	4.6
Vehicle Extension (s)	0.2
Lane Grp Cap (vph)	577
v/s Ratio Prot	
v/s Ratio Perm	0.11
v/c Ratio	0.30
Uniform Delay, d1	26.0
Progression Factor	0.74
Incremental Delay, d2	1.2
Delay (s)	20.4
Level of Service	C
Approach Delay (s)	
Approach LOS	

Intersection Summary

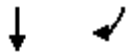
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	75	120	55	240	80	345	25	65	1085	375	35	480
Future Volume (veh/h)	75	120	55	240	80	345	25	65	1085	375	35	480
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.96	0.98		0.97		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856		1856	1856	1856		1856
Adj Flow Rate, veh/h	79	126	30	168	202	161		68	1142	154		505
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	3	3	3	3	3	3		3	3	3		3
Cap, veh/h	172	337	86	259	434	358		87	1863	574		540
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23		0.05	0.37	0.37		0.31
Sat Flow, veh/h	511	1441	368	1199	1856	1532		1767	5066	1560		1767
Grp Volume(v), veh/h	104	0	131	168	202	161		68	1142	154		505
Grp Sat Flow(s),veh/h/ln	717	0	1603	1199	1856	1532		1767	1689	1560		1767
Q Serve(g_s), s	9.4	0.0	8.2	16.3	11.2	10.8		4.6	22.1	8.3		33.3
Cycle Q Clear(g_c), s	20.6	0.0	8.2	24.5	11.2	10.8		4.6	22.1	8.3		33.3
Prop In Lane	0.76		0.23	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	220	0	375	259	434	358		87	1863	574		540
V/C Ratio(X)	0.47	0.00	0.35	0.65	0.47	0.45		0.78	0.61	0.27		0.93
Avail Cap(c_a), veh/h	285	0	468	328	541	447		177	1863	574		692
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	46.9	0.0	38.3	48.5	39.5	39.4		56.4	31.0	26.6		40.5
Incr Delay (d2), s/veh	1.6	0.0	0.6	3.0	0.8	0.9		13.8	1.5	1.1		17.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	3.1	0.0	3.3	5.1	5.2	4.2		2.4	9.2	3.3		16.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.5	0.0	38.9	51.5	40.3	40.2		70.2	32.5	27.8		57.7
LnGrp LOS	D	A	D	D	D	D		E	C	C		E
Approach Vol, veh/h		235			531				1364			
Approach Delay, s/veh		43.2			43.8				33.8			
Approach LOS		D			D				C			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.9	79.3		31.8	39.7	48.5		31.8				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	12.0	61.9		35.0	47.0	26.9		35.0				
Max Q Clear Time (g_c+I1), s	6.6	20.6		26.5	35.3	24.1		22.6				
Green Ext Time (p_c), s	0.0	15.2		1.6	1.4	2.0		1.2				

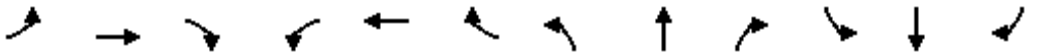
Intersection Summary		
HCM 6th Ctrl Delay		30.9
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1380	60
Future Volume (veh/h)	1380	60
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		1.00
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1856	1856
Adj Flow Rate, veh/h	1453	61
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	3	3
Cap, veh/h	3111	131
Arrive On Green	0.62	0.62
Sat Flow, veh/h	4985	209
Grp Volume(v), veh/h	984	530
Grp Sat Flow(s),veh/h/ln	1689	1817
Q Serve(g_s), s	18.6	18.6
Cycle Q Clear(g_c), s	18.6	18.6
Prop In Lane		0.12
Lane Grp Cap(c), veh/h	2108	1134
V/C Ratio(X)	0.47	0.47
Avail Cap(c_a), veh/h	2108	1134
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	12.0	12.0
Incr Delay (d2), s/veh	0.7	1.4
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.9	7.6
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	12.7	13.3
LnGrp LOS	B	B
Approach Vol, veh/h	2019	
Approach Delay, s/veh	24.1	
Approach LOS	C	
Timer - Assigned Phs		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	320	960	0	0	635	300	130	230	545	0	0	0
Future Volume (veh/h)	320	960	0	0	635	300	130	230	545	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	330	990	0	0	655	0	134	389	400			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	1173	2154	0	0	750		504	529	448			
Arrive On Green	0.68	1.00	0.00	0.00	0.07	0.00	0.28	0.28	0.28			
Sat Flow, veh/h	3456	3647	0	0	3647	1585	1781	1870	1585			
Grp Volume(v), veh/h	330	990	0	0	655	0	134	389	400			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1777	1585	1781	1870	1585			
Q Serve(g_s), s	3.4	0.0	0.0	0.0	16.4	0.0	5.3	17.0	21.8			
Cycle Q Clear(g_c), s	3.4	0.0	0.0	0.0	16.4	0.0	5.3	17.0	21.8			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1173	2154	0	0	750		504	529	448			
V/C Ratio(X)	0.28	0.46	0.00	0.00	0.87		0.27	0.74	0.89			
Avail Cap(c_a), veh/h	1173	2154	0	0	750		614	644	546			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.88	0.88	0.00	0.00	0.80	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	10.1	0.0	0.0	0.0	40.7	0.0	25.0	29.2	31.0			
Incr Delay (d2), s/veh	0.0	0.6	0.0	0.0	11.1	0.0	0.1	2.5	13.3			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.1	0.2	0.0	0.0	8.9	0.0	2.2	7.7	9.6			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.1	0.6	0.0	0.0	51.7	0.0	25.1	31.8	44.3			
LnGrp LOS	B	A	A	A	D		C	C	D			
Approach Vol, veh/h		1320			655	A		923				
Approach Delay, s/veh		3.0			51.7			36.2				
Approach LOS		A			D			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		59.6			35.6	24.0		30.4				
Change Period (Y+Rc), s		5.0			5.0	* 5		5.0				
Max Green Setting (Gmax), s		49.0			26.0	* 19		31.0				
Max Q Clear Time (g_c+I1), s		2.0			5.4	18.4		23.8				
Green Ext Time (p_c), s		12.4			0.6	0.3		1.7				

Intersection Summary	
HCM 6th Ctrl Delay	24.6
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

1: Train & Scott Street Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0
Total Del/Veh (s)	3.0	8.8	4.8	4.8
Vehicles Entered	229	104	25	358
Vehicles Exited	230	104	25	359
Hourly Exit Rate	230	104	25	359
Input Volume	226	106	24	355
% of Volume	102	98	105	101
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott Street Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.3	0.3	0.3	0.2	0.3	0.4
Total Del/Veh (s)	6.9	11.7	4.4	4.1	6.0	3.0	9.9	14.3	12.6	12.1	9.6	8.3
Vehicles Entered	9	11	14	47	4	46	5	158	136	83	156	5
Vehicles Exited	9	11	14	47	4	46	5	158	136	82	157	5
Hourly Exit Rate	9	11	14	47	4	46	5	158	136	82	157	5
Input Volume	10	10	15	50	5	45	5	160	130	85	160	5
% of Volume	88	107	92	94	76	102	100	99	105	96	98	100
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott Street Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	10.7
Vehicles Entered	674
Vehicles Exited	674
Hourly Exit Rate	674
Input Volume	681
% of Volume	99
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	0.4	0.3	0.3	0.2
Total Del/Veh (s)	7.3	1.4	5.5	7.4	7.9	7.6	5.2	7.1
Vehicles Entered	116	14	109	55	254	202	42	792
Vehicles Exited	116	14	109	55	254	203	42	793
Hourly Exit Rate	116	14	109	55	254	203	42	793
Input Volume	120	13	105	60	255	205	40	798
% of Volume	97	106	104	92	100	99	105	99
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	14.4
Vehicles Entered	1173
Vehicles Exited	1171
Hourly Exit Rate	1171
Input Volume	3323
% of Volume	35
Denied Entry Before	0
Denied Entry After	0

Intersection: 1: Train & Scott Street

Movement	EB	WB	SB
Directions Served	T	T	T
Maximum Queue (ft)	92	96	48
Average Queue (ft)	59	27	12
95th Queue (ft)	78	72	39
Link Distance (ft)	4	139	475
Upstream Blk Time (%)	16		
Queuing Penalty (veh)	36		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Dollar Ave/Herman Ave & Scott Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	60	52	243	182
Average Queue (ft)	23	33	85	82
95th Queue (ft)	50	45	186	148
Link Distance (ft)	525	4	1115	1863
Upstream Blk Time (%)		6		
Queuing Penalty (veh)		6		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

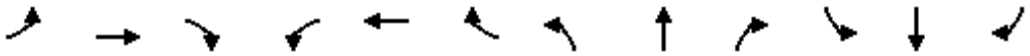
Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	135	157	138
Average Queue (ft)	63	74	66
95th Queue (ft)	107	122	109
Link Distance (ft)	184	938	791
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 42

2040 No Project (CNP) PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	85	370	360	5	125	450	0	0	340	105
Future Volume (vph)	0	0	85	370	360	5	125	450	0	0	340	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			0.99	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.96	
Flt Protected			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)			1565	1633	1739			3489			3283	
Flt Permitted			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (perm)			1565	1633	1739			3489			3283	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	93	407	396	5	137	495	0	0	374	115
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	65	0
Lane Group Flow (vph)	0	0	93	366	442	0	0	632	0	0	424	0
Confl. Peds. (#/hr)												15
Heavy Vehicles (%)	0%	0%	5%	5%	3%	0%	0%	3%	0%	0%	5%	5%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			12.4	12.6	12.6			12.4			11.8	
Effective Green, g (s)			13.0	12.6	12.6			13.0			12.4	
Actuated g/C Ratio			0.26	0.25	0.25			0.26			0.25	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			406	411	438			907			814	
v/s Ratio Prot			0.06					c0.18			c0.13	
v/s Ratio Perm				0.22	0.25							
v/c Ratio			0.23	0.89	1.01			0.70			0.52	
Uniform Delay, d1			14.6	18.0	18.7			16.7			16.2	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			0.4	24.0	45.3			2.5			0.6	
Delay (s)			15.0	42.0	64.0			19.3			16.8	
Level of Service			B	D	E			B			B	
Approach Delay (s)		15.0			54.0			19.3			16.8	
Approach LOS		B			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	32.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/28/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	400	225	20	315	375	5	930	530
Future Volume (veh/h)	400	225	20	315	375	5	930	530
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.99
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1657	1710		1657	1657		1657	1657
Adj Flow Rate, veh/h	515	0		335	399		989	270
Peak Hour Factor	0.94	0.94		0.94	0.94		0.94	0.94
Percent Heavy Veh, %	4	0		4	4		4	4
Cap, veh/h	602	276		1235	2277		862	381
Arrive On Green	0.19	0.00		0.40	0.72		0.27	0.27
Sat Flow, veh/h	3156	1449		3061	3230		3230	1391
Grp Volume(v), veh/h	515	0		335	399		989	270
Grp Sat Flow(s),veh/h/ln	1578	1449		1530	1574		1574	1391
Q Serve(g_s), s	15.8	0.0		7.3	4.0		27.4	17.5
Cycle Q Clear(g_c), s	15.8	0.0		7.3	4.0		27.4	17.5
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	602	276		1235	2277		862	381
V/C Ratio(X)	0.86	0.00		0.27	0.18		1.15	0.71
Avail Cap(c_a), veh/h	915	420		1235	2277		862	381
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.95	0.00		0.83	0.83		0.12	0.12
Uniform Delay (d), s/veh	39.1	0.0		20.0	4.4		36.3	32.7
Incr Delay (d2), s/veh	3.2	0.0		0.0	0.1		67.9	1.4
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	6.4	0.0		2.5	1.1		18.3	5.9
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	42.3	0.0		20.0	4.5		104.2	34.1
LnGrp LOS	D	A		C	A		F	C
Approach Vol, veh/h	515				734		1259	
Approach Delay, s/veh	42.3				11.6		89.2	
Approach LOS	D				B		F	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	44.9	32.0				76.9		23.1
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	31.0	* 27				52.4		29.0
Max Q Clear Time (g_c+I1), s	9.3	29.4				6.0		17.8
Green Ext Time (p_c), s	0.9	0.0				1.7		1.3

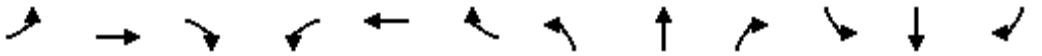
Intersection Summary	
HCM 6th Ctrl Delay	56.8
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

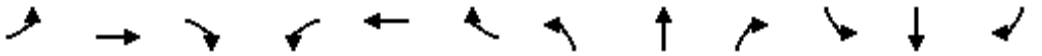


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	70	85	800	285	340	60	510	170	195	530	120
Future Volume (vph)	170	70	85	800	285	340	60	510	170	195	530	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.96		1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.95
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (prot)		2896		3060	1660	1381	1547	3094	1384	1408	2948	1309
Flt Permitted		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (perm)		2896		3060	1660	1381	1547	3094	1384	1408	2948	1309
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	175	72	88	825	294	351	62	526	175	201	546	124
RTOR Reduction (vph)	0	31	0	0	0	266	0	0	0	0	0	93
Lane Group Flow (vph)	0	304	0	825	294	85	62	526	175	133	614	31
Confl. Peds. (#/hr)			95									10
Confl. Bikes (#/hr)			5			10			5			
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	5%	5%	5%	5%	5%	5%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		20.8		29.1	29.1	29.1	21.1	21.1	90.3	30.3	30.3	30.3
Effective Green, g (s)		20.8		29.1	29.1	29.1	21.1	21.1	90.3	30.3	30.3	30.3
Actuated g/C Ratio		0.17		0.24	0.24	0.24	0.18	0.18	0.75	0.25	0.25	0.25
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		501		742	402	334	272	544	1041	355	744	330
v/s Ratio Prot		c0.10		c0.27	0.18		0.04	c0.17	0.13	0.09	c0.21	
v/s Ratio Perm						0.06						0.02
v/c Ratio		0.61		1.11	0.73	0.25	0.23	0.97	0.17	0.37	0.83	0.09
Uniform Delay, d1		45.8		45.5	41.9	36.7	42.5	49.1	4.2	37.0	42.4	34.3
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.4		68.1	6.7	0.4	0.3	30.0	0.1	3.0	10.1	0.6
Delay (s)		47.2		113.6	48.6	37.1	42.8	79.1	4.3	40.0	52.5	34.9
Level of Service		D		F	D	D	D	E	A	D	D	C
Approach Delay (s)		47.2			82.3			59.0			48.1	
Approach LOS		D			F			E			D	

Intersection Summary			
HCM 2000 Control Delay	65.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	94.2%	ICU Level of Service	F
Analysis Period (min)	15		

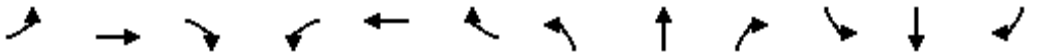
! Phase conflict between lane groups.

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	200	35	425	275	40	20	225	430	50	270	45
Future Volume (vph)	40	200	35	425	275	40	20	225	430	50	270	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		0.99		1.00	0.99			1.00	1.00		0.99	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	0.98			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2727		1413	1448			1481	2224		1437	
Flt Permitted		0.99		0.95	1.00			0.93	1.00		0.80	
Satd. Flow (perm)		2727		1413	1448			1382	2224		1151	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	43	215	38	457	296	43	22	242	462	54	290	48
RTOR Reduction (vph)	0	13	0	0	6	0	0	0	182	0	5	0
Lane Group Flow (vph)	0	283	0	457	333	0	0	264	280	0	387	0
Confl. Peds. (#/hr)			20			15			15			25
Confl. Bikes (#/hr)			5			5			5			10
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		23.5		32.7	32.7			23.8	60.0		23.8	
Effective Green, g (s)		23.0		32.2	32.2			22.8	54.5		22.8	
Actuated g/C Ratio		0.26		0.36	0.36			0.25	0.61		0.25	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		696		505	518			350	1346		291	
v/s Ratio Prot		c0.10		c0.32	0.23				0.13			
v/s Ratio Perm								0.19			c0.34	
v/c Ratio		0.41		0.90	0.64			0.75	0.21		1.33	
Uniform Delay, d1		27.8		27.4	24.1			31.0	8.0		33.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.8		19.2	2.1			8.0	0.0		169.9	
Delay (s)		29.6		46.7	26.2			39.0	8.0		203.5	
Level of Service		C		D	C			D	A		F	
Approach Delay (s)		29.6			37.9			19.3			203.5	
Approach LOS		C			D			B			F	

Intersection Summary				
HCM 2000 Control Delay	60.1	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	0.89			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.5	
Intersection Capacity Utilization	96.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	185	210	880	275	425	105	15	270	180	885	150
Future Volume (veh/h)	170	185	210	880	275	425	105	15	270	180	885	150
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1811	1811	1811	1811	1811	1678	1678	1678	1856	1856	1856
Adj Flow Rate, veh/h	125	271	0	926	289	0	111	16	0	189	932	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	6	6	6	15	15	15	3	3	3
Cap, veh/h	192	402		996	523		143	651		420	1269	
Arrive On Green	0.11	0.11	0.00	0.29	0.29	0.00	0.09	0.20	0.00	0.24	0.36	0.00
Sat Flow, veh/h	1725	3622	1535	3450	1811	1535	1598	3272	0	1767	3526	1572
Grp Volume(v), veh/h	125	271	0	926	289	0	111	16	0	189	932	0
Grp Sat Flow(s),veh/h/ln	1725	1811	1535	1725	1811	1535	1598	1594	0	1767	1763	1572
Q Serve(g_s), s	8.3	8.6	0.0	31.3	16.2	0.0	8.2	0.5	0.0	11.0	27.6	0.0
Cycle Q Clear(g_c), s	8.3	8.6	0.0	31.3	16.2	0.0	8.2	0.5	0.0	11.0	27.6	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	192	402		996	523		143	651		420	1269	
V/C Ratio(X)	0.65	0.67		0.93	0.55		0.78	0.02		0.45	0.73	
Avail Cap(c_a), veh/h	316	664		1018	534		146	651		420	1269	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.89	0.89	0.00	0.09	0.09	0.00	1.00	1.00	0.00	0.15	0.15	0.00
Uniform Delay (d), s/veh	51.1	51.2	0.0	41.5	36.1	0.0	53.5	38.2	0.0	39.0	33.4	0.0
Incr Delay (d2), s/veh	1.3	0.7	0.0	1.7	0.1	0.0	20.3	0.1	0.0	0.5	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	4.0	0.0	13.6	7.2	0.0	4.1	0.2	0.0	4.8	11.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.4	51.9	0.0	43.2	36.2	0.0	73.7	38.3	0.0	39.6	34.0	0.0
LnGrp LOS	D	D		D	D		E	D		D	C	
Approach Vol, veh/h		396	A		1215	A		127	A		1121	A
Approach Delay, s/veh		52.1			41.6			69.3			34.9	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.7	48.1		17.9	33.4	29.4		39.3				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	11.0	33.5		22.0	20.0	* 25		35.4				
Max Q Clear Time (g_c+I1), s	10.2	29.6		10.6	13.0	2.5		33.3				
Green Ext Time (p_c), s	0.0	2.3		1.1	0.2	0.0		1.3				

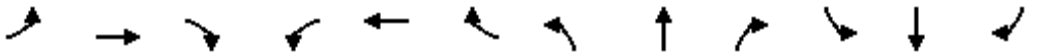
Intersection Summary		
HCM 6th Ctrl Delay		41.6
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	140	395	105	415	25	490	295	125	15	405	725
Future Volume (veh/h)	55	140	395	105	415	25	490	295	125	15	405	725
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		1.00	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1781	1781	1781	1811	1811	1811	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	59	149	143	112	441	23	521	314	0	16	431	585
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	8	8	8	6	6	6	9	9	9	4	4	4
Cap, veh/h	133	411	351	158	428	23	720	740		486	510	410
Arrive On Green	0.08	0.23	0.23	0.09	0.24	0.24	0.23	0.23	0.00	0.28	0.28	0.28
Sat Flow, veh/h	1697	1781	1470	1725	1702	89	3264	3445	0	1753	1841	1481
Grp Volume(v), veh/h	59	149	143	112	0	464	521	314	0	16	431	585
Grp Sat Flow(s),veh/h/ln	1697	1781	1470	1725	0	1791	1632	1678	0	1753	1841	1481
Q Serve(g_s), s	3.5	7.4	8.7	6.6	0.0	25.4	15.3	8.3	0.0	0.7	23.2	29.1
Cycle Q Clear(g_c), s	3.5	7.4	8.7	6.6	0.0	25.4	15.3	8.3	0.0	0.7	23.2	29.1
Prop In Lane	1.00		1.00	1.00		0.05	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	133	411	351	158	0	457	720	740		486	510	410
V/C Ratio(X)	0.44	0.36	0.41	0.71	0.00	1.01	0.72	0.42		0.03	0.84	1.43
Avail Cap(c_a), veh/h	162	431	356	164	0	433	752	773		486	510	410
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.78	0.78	0.78	1.00	0.00	1.00	0.89	0.89	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.2	35.2	33.7	46.3	0.0	39.1	38.0	35.2	0.0	27.7	35.8	37.9
Incr Delay (d2), s/veh	0.7	0.3	0.4	10.6	0.0	45.9	5.6	1.6	0.0	0.0	11.8	205.2
Initial Q Delay(d3),s/veh	0.0	11.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	5.9	3.1	3.3	0.0	17.4	6.6	3.6	0.0	0.3	11.9	33.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.9	46.7	34.2	57.0	0.0	85.0	43.5	36.8	0.0	27.7	47.6	243.2
LnGrp LOS	D	D	C	E	A	F	D	D		C	D	F
Approach Vol, veh/h		351			576			835	A		1032	
Approach Delay, s/veh		41.6			79.5			41.0			158.1	
Approach LOS		D			E			D			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.6	28.6		28.8	12.2	30.0		34.0				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.0	4.6		4.9				
Max Green Setting (Gmax), s	10.0	25.4		22.4	10.0	25.4		29.1				
Max Q Clear Time (g_c+I1), s	8.6	10.7		17.3	5.5	27.4		31.1				
Green Ext Time (p_c), s	0.0	1.0		1.5	0.0	0.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	92.3	
HCM 6th LOS	F	

Notes

User approved volume balancing among the lanes for turning movement.

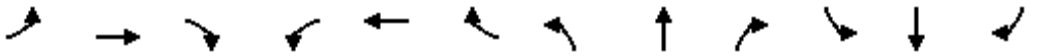
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	460	25	310	35	45	30	5	400	390	45	20	25
Future Volume (vph)	460	25	310	35	45	30	5	400	390	45	20	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00		1.00	0.95			1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	0.96		1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Frt	1.00	1.00	0.85		1.00	0.85		1.00	0.98			1.00
Flt Protected	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (prot)	1618	1629	2682		1754	1467		1703	3312			1703
Flt Permitted	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (perm)	1618	1629	2682		1754	1467		1703	3312			1703
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	479	26	323	36	47	31	5	417	406	47	21	26
RTOR Reduction (vph)	0	0	260	0	0	26	0	0	7	0	0	0
Lane Group Flow (vph)	244	261	63	0	83	5	0	422	446	0	0	47
Confl. Peds. (#/hr)	25					25				35		35
Confl. Bikes (#/hr)										5		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	Prot	NA		Prot	Prot
Protected Phases	4	4		3	3		5	5	2		1	1
Permitted Phases			4			3						
Actuated Green, G (s)	18.0	18.0	18.0		16.1	16.1		20.7	37.9			5.1
Effective Green, g (s)	18.0	18.0	18.0		16.1	16.1		20.7	37.9			5.1
Actuated g/C Ratio	0.20	0.20	0.20		0.18	0.18		0.23	0.41			0.06
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0			3.0
Lane Grp Cap (vph)	316	319	525		307	257		383	1365			94
v/s Ratio Prot	0.15	c0.16			c0.05			c0.25	0.13			0.03
v/s Ratio Perm			0.02			0.00						
v/c Ratio	0.77	0.82	0.12		0.27	0.02		1.10	0.33			0.50
Uniform Delay, d1	35.0	35.4	30.4		32.8	31.4		35.6	18.3			42.2
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Incremental Delay, d2	11.1	14.9	0.1		0.5	0.0		76.3	0.1			4.1
Delay (s)	46.1	50.3	30.5		33.3	31.4		111.9	18.5			46.3
Level of Service	D	D	C		C	C		F	B			D
Approach Delay (s)		41.4			32.8				63.6			
Approach LOS		D			C				E			

Intersection Summary			
HCM 2000 Control Delay	46.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	91.9	Sum of lost time (s)	15.8
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	680	250
Future Volume (vph)	680	250
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.1	4.1
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	0.97
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3406	1481
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3406	1481
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	708	260
RTOR Reduction (vph)	0	197
Lane Group Flow (vph)	708	63
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		5
Heavy Vehicles (%)	6%	6%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	22.3	22.3
Effective Green, g (s)	22.3	22.3
Actuated g/C Ratio	0.24	0.24
Clearance Time (s)	4.1	4.1
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	826	359
v/s Ratio Prot	c0.21	
v/s Ratio Perm		0.04
v/c Ratio	0.86	0.18
Uniform Delay, d1	33.3	27.5
Progression Factor	1.00	1.00
Incremental Delay, d2	8.7	0.2
Delay (s)	42.0	27.8
Level of Service	D	C
Approach Delay (s)	38.6	
Approach LOS	D	

Intersection Summary



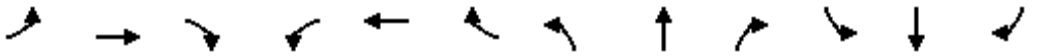
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	365	25	85	685	735	95	90	280	235	105	80
Future Volume (veh/h)	45	365	25	85	685	735	95	90	280	235	105	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	46	372	24	87	699	540	97	92	0	240	107	62
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	78	752	49	112	845	699	113	108		291	182	105
Arrive On Green	0.04	0.43	0.42	0.06	0.45	0.45	0.12	0.12	0.00	0.16	0.16	0.17
Sat Flow, veh/h	1795	1752	113	1795	1885	1559	943	895	1598	1795	1120	649
Grp Volume(v), veh/h	46	0	396	87	699	540	189	0	0	240	0	169
Grp Sat Flow(s),veh/h/ln	1795	0	1865	1795	1885	1559	1838	0	1598	1795	0	1768
Q Serve(g_s), s	1.8	0.0	10.9	3.4	23.0	20.7	7.1	0.0	0.0	9.2	0.0	6.3
Cycle Q Clear(g_c), s	1.8	0.0	10.9	3.4	23.0	20.7	7.1	0.0	0.0	9.2	0.0	6.3
Prop In Lane	1.00		0.06	1.00		1.00	0.51		1.00	1.00		0.37
Lane Grp Cap(c), veh/h	78	0	800	112	845	699	221	0		291	0	287
V/C Ratio(X)	0.59	0.00	0.49	0.78	0.83	0.77	0.86	0.00		0.82	0.00	0.59
Avail Cap(c_a), veh/h	139	0	824	251	950	786	267	0		570	0	562
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	33.3	0.0	14.7	32.7	17.1	16.5	30.6	0.0	0.0	28.7	0.0	27.4
Incr Delay (d2), s/veh	2.6	0.0	0.7	4.3	6.0	4.7	17.5	0.0	0.0	2.3	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	4.4	1.5	9.7	7.1	4.1	0.0	0.0	4.0	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.9	0.0	15.3	37.0	23.1	21.2	48.0	0.0	0.0	30.9	0.0	28.1
LnGrp LOS	D	A	B	D	C	C	D	A		C	A	C
Approach Vol, veh/h		442			1326			189	A		409	
Approach Delay, s/veh		17.5			23.3			48.0			29.8	
Approach LOS		B			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.1	35.7		15.5	8.4	34.4		12.5				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	6.0	35.2		23.0	10.4	30.8		10.8				
Max Q Clear Time (g_c+I1), s	3.8	25.0		11.2	5.4	12.9		9.1				
Green Ext Time (p_c), s	0.0	6.2		0.8	0.0	3.2		0.1				

Intersection Summary			
HCM 6th Ctrl Delay		25.3	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	775	100	400	1075	0	425	0	215	0	5	5
Future Volume (veh/h)	5	775	100	400	1075	0	425	0	215	0	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	5	783	49	404	1086	0	446	0	37	0	5	3
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	6	1039	452	643	1350	0	553	0	244	0	7	4
Arrive On Green	0.28	0.28	0.28	0.36	0.36	0.00	0.15	0.00	0.15	0.00	0.01	0.01
Sat Flow, veh/h	22	3653	1589	1795	3770	0	3591	0	1582	0	1094	657
Grp Volume(v), veh/h	423	365	49	404	1086	0	446	0	37	0	0	8
Grp Sat Flow(s),veh/h/ln	1884	1791	1589	1795	1885	0	1795	0	1582	0	0	1751
Q Serve(g_s), s	16.8	14.9	1.8	15.1	21.0	0.0	9.7	0.0	1.6	0.0	0.0	0.4
Cycle Q Clear(g_c), s	16.8	14.9	1.8	15.1	21.0	0.0	9.7	0.0	1.6	0.0	0.0	0.4
Prop In Lane	0.01		1.00	1.00		0.00	1.00		1.00	0.00		0.37
Lane Grp Cap(c), veh/h	536	510	452	643	1350	0	553	0	244	0	0	11
V/C Ratio(X)	0.79	0.72	0.11	0.63	0.80	0.00	0.81	0.00	0.15	0.00	0.00	0.76
Avail Cap(c_a), veh/h	955	908	806	800	1680	0	1041	0	459	0	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	26.7	26.1	21.4	21.6	23.5	0.0	33.1	0.0	29.7	0.0	0.0	40.1
Incr Delay (d2), s/veh	2.0	1.4	0.1	0.8	2.2	0.0	1.1	0.0	0.1	0.0	0.0	32.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	6.0	0.7	5.9	8.9	0.0	4.1	0.0	0.6	0.0	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.7	27.5	21.5	22.3	25.6	0.0	34.2	0.0	29.8	0.0	0.0	72.9
LnGrp LOS	C	C	C	C	C	A	C	A	C	A	A	E
Approach Vol, veh/h		837			1490			483			8	
Approach Delay, s/veh		27.7			24.7			33.9			72.9	
Approach LOS		C			C			C			E	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		33.0		16.5		27.1		4.5				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		23.0		11.7		18.8		2.4				
Green Ext Time (p_c), s		5.9		0.8		3.8		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			27.3									
HCM 6th LOS			C									

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

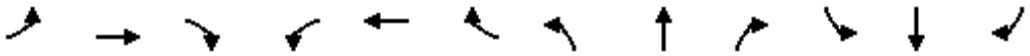
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	740	230	155	925	525	180
Future Volume (veh/h)	740	230	155	925	525	180
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.99	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	763	163	160	954	541	44
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1
Cap, veh/h	1711	759	202	2391	728	334
Arrive On Green	0.48	0.48	0.11	0.67	0.21	0.21
Sat Flow, veh/h	3676	1589	1795	3676	3483	1598
Grp Volume(v), veh/h	763	163	160	954	541	44
Grp Sat Flow(s),veh/h/ln	1791	1589	1795	1791	1742	1598
Q Serve(g_s), s	9.2	1.2	5.6	7.8	9.4	1.5
Cycle Q Clear(g_c), s	9.2	1.2	5.6	7.8	9.4	1.5
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1711	759	202	2391	728	334
V/C Ratio(X)	0.45	0.21	0.79	0.40	0.74	0.13
Avail Cap(c_a), veh/h	3423	1519	969	5576	1986	911
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.2	1.1	28.0	4.9	24.0	20.9
Incr Delay (d2), s/veh	0.3	0.2	2.6	0.2	1.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	1.1	2.4	1.8	3.7	0.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	11.5	1.3	30.6	5.0	25.5	21.0
LnGrp LOS	B	A	C	A	C	C
Approach Vol, veh/h	926			1114	585	
Approach Delay, s/veh	9.7			8.7	25.2	
Approach LOS	A			A	C	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	12.3	35.0				47.3	17.6
Change Period (Y+Rc), s	5.0	* 5				5.0	4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0	37.0
Max Q Clear Time (g_c+I1), s	7.6	11.2				9.8	11.4
Green Ext Time (p_c), s	0.1	10.0				12.5	2.1

Intersection Summary	
HCM 6th Ctrl Delay	12.7
HCM 6th LOS	B

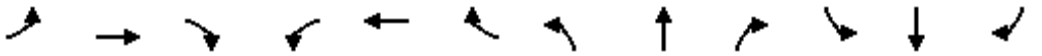
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



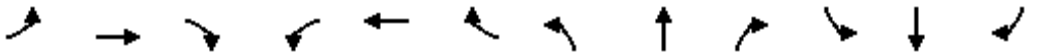
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	530	95	15	605	0	0	270	15	190	290	220
Future Volume (vph)	100	530	95	15	605	0	0	270	15	190	290	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7		3.7	2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1770	3210		1770	3303			1845		1770	3229	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1770	3210		1770	3303			1845		1770	3229	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	105	558	100	16	637	0	0	284	16	200	305	232
RTOR Reduction (vph)	0	9	0	0	0	0	0	2	0	0	105	0
Lane Group Flow (vph)	105	649	0	16	637	0	0	298	0	200	432	0
Confl. Peds. (#/hr)	50		20	20					25	25		40
Confl. Bikes (#/hr)			5									5
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	8.2	38.8		1.1	31.7			20.1		14.2	38.0	
Effective Green, g (s)	8.2	39.8		1.1	32.7			20.1		14.2	38.0	
Actuated g/C Ratio	0.09	0.45		0.01	0.37			0.23		0.16	0.43	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	163	1435		21	1213			416		282	1378	
v/s Ratio Prot	c0.06	c0.20		0.01	c0.19			c0.16		c0.11	0.13	
v/s Ratio Perm												
v/c Ratio	0.64	0.45		0.76	0.53			0.72		0.71	0.31	
Uniform Delay, d1	39.0	17.0		43.8	22.1			31.8		35.4	16.9	
Progression Factor	1.00	1.00		1.39	0.48			1.00		1.00	1.00	
Incremental Delay, d2	6.4	0.2		78.5	0.4			5.8		6.5	0.1	
Delay (s)	45.4	17.3		139.5	11.0			37.6		42.0	17.0	
Level of Service	D	B		F	B			D		D	B	
Approach Delay (s)		21.1			14.1			37.6			23.8	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	89.0	Sum of lost time (s)	14.8
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	165	530	0	160	610	60	10	70	145	0	120	215
Future Volume (vph)	165	530	0	160	610	60	10	70	145	0	120	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.99			1.00	0.85		0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)	1736	3471		1736	3417			1816	1515		1636	
Flt Permitted	0.95	1.00		0.95	1.00			0.96	1.00		1.00	
Satd. Flow (perm)	1736	3471		1736	3417			1752	1515		1636	
Peak-hour factor, PHF	0.97	0.97	0.92	0.97	0.97	0.97	0.97	0.97	0.97	0.92	0.97	0.97
Adj. Flow (vph)	170	546	0	165	629	62	10	72	149	0	124	222
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	85	0	72	0
Lane Group Flow (vph)	170	546	0	165	686	0	0	82	64	0	274	0
Confl. Peds. (#/hr)				10					15			
Confl. Bikes (#/hr)						5						5
Heavy Vehicles (%)	4%	4%	2%	4%	4%	4%	4%	4%	4%	2%	4%	4%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	12.4	26.9		13.0	27.5			38.0	38.0		38.0	
Effective Green, g (s)	12.4	26.9		13.0	28.5			39.0	38.0		39.0	
Actuated g/C Ratio	0.14	0.30		0.15	0.32			0.44	0.43		0.44	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	241	1049		253	1094			767	646		716	
v/s Ratio Prot	c0.10	0.16		c0.10	c0.20						c0.17	
v/s Ratio Perm								0.05	0.04			
v/c Ratio	0.71	0.52		0.65	0.63			0.11	0.10		0.38	
Uniform Delay, d1	36.6	25.7		35.9	25.7			14.7	15.3		16.9	
Progression Factor	1.16	0.84		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	6.8	0.4		4.5	1.1			0.1	0.1		0.3	
Delay (s)	49.3	22.1		40.4	26.9			14.8	15.3		17.2	
Level of Service	D	C		D	C			B	B		B	
Approach Delay (s)		28.5			29.5			15.1			17.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	89.0	Sum of lost time (s)	14.8
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	575	215	455	940	0	0	0	0	200	130	315
Future Volume (veh/h)	0	575	215	455	940	0	0	0	0	200	130	315
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	632	0	500	1033	0				147	285	53
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1037		1875	2870	0				210	441	187
Arrive On Green	0.00	0.20	0.00	1.00	1.00	0.00				0.12	0.12	0.12
Sat Flow, veh/h	0	5358	1610	3510	3705	0				1810	3800	1610
Grp Volume(v), veh/h	0	632	0	500	1033	0				147	285	53
Grp Sat Flow(s),veh/h/ln	0	1729	1610	1755	1805	0				1810	1900	1610
Q Serve(g_s), s	0.0	10.0	0.0	0.0	0.0	0.0				7.0	6.5	2.7
Cycle Q Clear(g_c), s	0.0	10.0	0.0	0.0	0.0	0.0				7.0	6.5	2.7
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1037		1875	2870	0				210	441	187
V/C Ratio(X)	0.00	0.61		0.27	0.36	0.00				0.70	0.65	0.28
Avail Cap(c_a), veh/h	0	1037		1875	2870	0				362	760	322
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.63	0.63	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	32.8	0.0	0.0	0.0	0.0				38.3	38.0	36.4
Incr Delay (d2), s/veh	0.0	2.7	0.0	0.0	0.2	0.0				1.6	0.6	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.2	0.0	0.0	0.1	0.0				3.1	3.0	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	35.5	0.0	0.0	0.2	0.0				39.9	38.6	36.7
LnGrp LOS	A	D		A	A	A				D	D	D
Approach Vol, veh/h		632	A		1533						485	
Approach Delay, s/veh		35.5			0.2						38.8	
Approach LOS		D			A						D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	53.6	22.0		14.4		75.6
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	42.5	* 17		17.6		63.0
Max Q Clear Time (g_c+I1), s	2.0	12.0		9.0		2.0
Green Ext Time (p_c), s	0.9	2.2		1.0		14.4

Intersection Summary	
HCM 6th Ctrl Delay	15.6
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	32.1
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	30	20	20	185	0	210	10	0	445	125	175	560
Future Vol, veh/h	30	20	20	185	0	210	10	0	445	125	175	560
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	31	20	20	189	0	214	10	0	454	128	179	571
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	14.7	55	35.2	18.9
HCM LOS	B	F	E	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	43%	47%	100%	0%	0%
Vol Thru, %	100%	64%	29%	0%	0%	100%	100%
Vol Right, %	0%	36%	29%	53%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	233	348	70	395	175	280	280
LT Vol	0	0	30	185	175	0	0
Through Vol	233	223	20	0	0	280	280
RT Vol	0	125	20	210	0	0	0
Lane Flow Rate	237	355	71	403	179	286	286
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.581	0.843	0.191	0.924	0.423	0.636	0.494
Departure Headway (Hd)	8.822	8.559	9.649	8.254	8.536	8.017	6.219
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	410	422	372	439	423	451	580
Service Time	6.572	6.309	7.403	5.971	6.26	5.741	3.942
HCM Lane V/C Ratio	0.578	0.841	0.191	0.918	0.423	0.634	0.493
HCM Control Delay	23.2	43.2	14.7	55	17.4	23.8	14.9
HCM Lane LOS	C	E	B	F	C	C	B
HCM 95th-tile Q	3.6	8.1	0.7	10.4	2.1	4.3	2.7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.98
Heavy Vehicles, %	2
Mvmt Flow	0
Number of Lanes	0

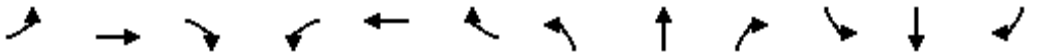
Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	490	410	35	450	765	0	0	0	0	180	0
Future Volume (vph)	0	490	410	35	450	765	0	0	0	0	180	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0					4.0	4.0
Lane Util. Factor		0.95			0.91	0.91					0.95	0.95
Frpb, ped/bikes		0.99			1.00	1.00					1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00					1.00	1.00
Frt		0.93			1.00	1.00					1.00	1.00
Flt Protected		1.00			0.95	0.99					0.95	0.95
Satd. Flow (prot)		3238			1595	3327					1665	1665
Flt Permitted		1.00			0.95	0.99					0.95	0.95
Satd. Flow (perm)		3238			1595	3327					1665	1665
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	516	432	37	474	805	0	0	0	0	189	0
RTOR Reduction (vph)	0	147	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	801	0	0	331	985	0	0	0	0	94	95
Confl. Peds. (#/hr)	10		5		5		10					
Confl. Bikes (#/hr)							10					
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type		NA		Split	Split	NA					Split	NA
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		23.4			25.6	25.6					7.8	7.8
Effective Green, g (s)		24.4			26.6	26.6					8.3	8.3
Actuated g/C Ratio		0.34			0.37	0.37					0.12	0.12
Clearance Time (s)		5.0			5.0	5.0					4.5	4.5
Vehicle Extension (s)		3.0			3.0	3.0					3.0	3.0
Lane Grp Cap (vph)		1108			595	1241					193	193
v/s Ratio Prot		c0.25			0.21	c0.30					0.06	0.06
v/s Ratio Perm												
v/c Ratio		0.72			0.56	0.79					0.49	0.49
Uniform Delay, d1		20.5			17.7	19.9					29.5	29.5
Progression Factor		1.00			1.00	1.00					1.00	1.00
Incremental Delay, d2		2.4			1.1	3.6					1.9	2.0
Delay (s)		22.9			18.8	23.5					31.4	31.5
Level of Service		C			B	C					C	C
Approach Delay (s)		22.9				22.3			0.0			19.8
Approach LOS		C				C			A			B

Intersection Summary			
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	71.3	Sum of lost time (s)	13.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

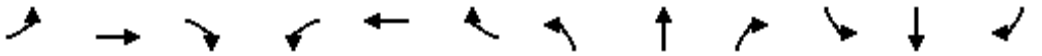
Movement	SBR
Lane Configurations	
Traffic Volume (vph)	335
Future Volume (vph)	335
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frpb, ped/bikes	1.00
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	353
RTOR Reduction (vph)	12
Lane Group Flow (vph)	341
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	3%
Turn Type	custom
Protected Phases	5
Permitted Phases	4
Actuated Green, G (s)	31.2
Effective Green, g (s)	33.2
Actuated g/C Ratio	0.47
Clearance Time (s)	5.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	730
v/s Ratio Prot	c0.16
v/s Ratio Perm	0.06
v/c Ratio	0.47
Uniform Delay, d1	13.0
Progression Factor	1.00
Incremental Delay, d2	0.5
Delay (s)	13.5
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	255	450	0	0	700	365	475	0	490	105	0	75
Future Volume (vph)	255	450	0	0	700	365	475	0	490	105	0	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.97		1.00	1.00	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3367	1827			3471	1507		1736	1553	1736		1553
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3367	1827			3471	1507		1736	1553	1736		1553
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	274	484	0	0	753	392	511	0	527	113	0	81
RTOR Reduction (vph)	0	0	0	0	0	294	0	0	204	0	0	73
Lane Group Flow (vph)	274	484	0	0	753	98	0	511	323	113	0	8
Confl. Peds. (#/hr)	10		5	5		10						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	13.1	40.3			22.7	22.7		31.5	31.5	9.3		9.3
Effective Green, g (s)	13.6	40.8			23.2	23.2		31.0	31.0	8.8		8.8
Actuated g/C Ratio	0.15	0.44			0.25	0.25		0.33	0.33	0.10		0.10
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	494	804			869	377		581	519	164		147
v/s Ratio Prot	0.08	c0.26			c0.22					c0.07		0.00
v/s Ratio Perm						0.07		0.29	0.21			
v/c Ratio	0.55	0.60			0.87	0.26		0.88	0.62	0.69		0.05
Uniform Delay, d1	36.7	19.7			33.2	27.8		29.0	25.9	40.6		38.1
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	1.4	0.9			8.8	0.1		13.8	1.7	9.2		0.1
Delay (s)	38.0	20.6			42.0	28.0		42.8	27.6	49.8		38.2
Level of Service	D	C			D	C		D	C	D		D
Approach Delay (s)		26.9			37.2			35.1			44.9	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	92.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	270	645	130	70	1155	185	100	125	45	170	125	470
Future Volume (veh/h)	270	645	130	70	1155	185	100	125	45	170	125	470
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945
Adj Flow Rate, veh/h	290	694	121	75	1242	199	108	134	48	183	134	505
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	594	2175	379	96	1319	210	72	378	135	226	124	1013
Arrive On Green	0.33	0.72	0.71	0.05	0.43	0.42	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1781	3024	527	1781	3068	488	790	1302	467	584	428	1597
Grp Volume(v), veh/h	290	408	407	75	716	725	108	0	182	317	0	505
Grp Sat Flow(s),veh/h/ln	1781	1777	1774	1781	1777	1779	790	0	1769	1012	0	1597
Q Serve(g_s), s	13.0	8.4	8.4	4.2	38.5	39.2	0.0	0.0	8.1	20.9	0.0	0.0
Cycle Q Clear(g_c), s	13.0	8.4	8.4	4.2	38.5	39.2	29.0	0.0	8.1	29.0	0.0	0.0
Prop In Lane	1.00		0.30	1.00		0.27	1.00		0.26	0.58		1.00
Lane Grp Cap(c), veh/h	594	1278	1276	96	764	765	72	0	513	350	0	1013
V/C Ratio(X)	0.49	0.32	0.32	0.78	0.94	0.95	1.50	0.00	0.35	0.91	0.00	0.50
Avail Cap(c_a), veh/h	594	1278	1276	160	764	765	72	0	513	350	0	1013
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.85	0.85	0.85	0.52	0.52	0.52	1.00	0.00	1.00	0.92	0.00	0.92
Uniform Delay (d), s/veh	26.5	5.1	5.2	46.7	27.2	27.6	50.0	0.0	28.1	40.3	0.0	10.2
Incr Delay (d2), s/veh	0.2	0.6	0.6	2.7	12.6	13.9	284.3	0.0	0.2	23.9	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	2.5	2.6	1.9	17.9	18.6	7.5	0.0	3.5	10.2	0.0	5.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.7	5.7	5.7	49.4	39.8	41.5	334.3	0.0	28.3	64.3	0.0	10.4
LnGrp LOS	C	A	A	D	D	D	F	A	C	E	A	B
Approach Vol, veh/h		1105			1516			290			822	
Approach Delay, s/veh		11.2			41.1			142.2			31.1	
Approach LOS		B			D			F			C	

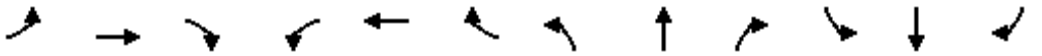
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	38.4	47.0		33.0	9.4	75.9		33.0				
Change Period (Y+Rc), s	5.0	* 5		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	16.0	* 42		29.0	9.0	49.0		29.0				
Max Q Clear Time (g_c+I1), s	15.0	41.2		31.0	6.2	10.4		31.0				
Green Ext Time (p_c), s	0.1	0.7		0.0	0.0	8.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		37.9	
HCM 6th LOS		D	

Notes

User approved pedestrian interval to be less than phase max green.

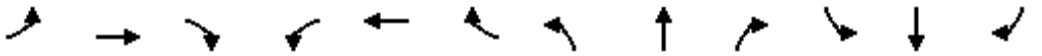
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	480	0	1215	0	1915	430	0	1890	470
Future Volume (vph)	0	0	0	480	0	1215	0	1915	430	0	1890	470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		4.0	4.0		4.0	4.0
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.91		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3467		2814		5136	1461		5136	1557
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3467		2814		5136	1461		5136	1557
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	500	0	1266	0	1995	448	0	1969	490
RTOR Reduction (vph)	0	0	0	0	0	680	0	0	145	0	0	88
Lane Group Flow (vph)	0	0	0	500	0	586	0	1995	303	0	1969	402
Confl. Peds. (#/hr)							10		15	15		10
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot		Prot		NA	Perm		NA	Perm
Protected Phases				4		5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				32.3		64.4		91.1	91.1		159.1	159.1
Effective Green, g (s)				31.9		64.0		91.5	91.5		159.5	159.5
Actuated g/C Ratio				0.16		0.32		0.46	0.46		0.80	0.80
Clearance Time (s)				3.6		3.6		4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2		0.2		0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				554		903		2356	670		4108	1245
v/s Ratio Prot				c0.14		c0.21		c0.39			0.38	
v/s Ratio Perm									0.21			0.26
v/c Ratio				0.90		0.65		0.85	0.45		0.48	0.32
Uniform Delay, d1				82.2		58.1		47.7	36.8		6.5	5.4
Progression Factor				1.00		1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2				17.6		1.2		4.0	2.2		0.4	0.7
Delay (s)				99.8		59.3		51.7	39.0		6.9	6.1
Level of Service				F		E		D	D		A	A
Approach Delay (s)		0.0			70.8			49.4			6.7	
Approach LOS		A			E			D			A	

Intersection Summary			
HCM 2000 Control Delay	39.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	199.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		

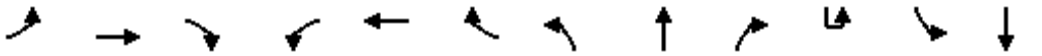
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	315	0	400	0	0	0	0	2030	570	0	1600	770
Future Volume (vph)	315	0	400	0	0	0	0	2030	570	0	1600	770
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1					3.9			3.9	3.9
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.89	0.85					0.97			1.00	0.85
Flt Protected	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1698	1508	1519					4767			5136	1515
Flt Permitted	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1698	1508	1519					4767			5136	1515
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	332	0	421	0	0	0	0	2137	600	0	1684	811
RTOR Reduction (vph)	0	30	30	0	0	0	0	0	0	0	0	198
Lane Group Flow (vph)	259	220	214	0	0	0	0	2737	0	0	1684	613
Confl. Peds. (#/hr)	5					5	10		20	20		10
Confl. Bikes (#/hr)												5
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	21.8	21.8	21.8					93.2			93.2	93.2
Effective Green, g (s)	22.3	22.3	22.3					93.7			93.7	93.7
Actuated g/C Ratio	0.18	0.18	0.18					0.76			0.76	0.76
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	305	271	273					3602			3880	1144
v/s Ratio Prot	c0.15	0.15						c0.57			0.33	
v/s Ratio Perm			0.14									0.40
v/c Ratio	0.85	0.81	0.78					0.76			0.43	0.54
Uniform Delay, d1	49.2	48.8	48.5					8.7			5.5	6.2
Progression Factor	1.00	1.00	1.00					1.00			1.00	1.00
Incremental Delay, d2	18.6	15.8	12.6					1.6			0.4	1.8
Delay (s)	67.8	64.6	61.2					10.3			5.9	8.0
Level of Service	E	E	E					B			A	A
Approach Delay (s)		64.6			0.0			10.3			6.6	
Approach LOS		E			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	124.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	325	460	305	300	445	205	320	1410	125	80	325	1260
Future Volume (vph)	325	460	305	300	445	205	320	1410	125	80	325	1260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.6	4.6	3.0	3.2		3.0	3.6	3.6		3.0	4.1
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.97	0.91	1.00		0.97	0.91
Frpb, ped/bikes	1.00	1.00	0.96	1.00	0.98		1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85		1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	3574	1535	3467	3346		3467	5136	1523		3467	5136
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	3574	1535	3467	3346		3467	5136	1523		3467	5136
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	346	489	324	319	473	218	340	1500	133	85	346	1340
RTOR Reduction (vph)	0	0	92	0	37	0	0	0	59	0	0	0
Lane Group Flow (vph)	346	489	232	319	654	0	340	1500	74	0	431	1340
Confl. Peds. (#/hr)	35		20	20		35	5		20		20	
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	3	8		7	4		1	6		5	5	2
Permitted Phases			8						6			
Actuated Green, G (s)	29.9	44.6	44.6	16.3	32.4		16.7	53.2	53.2		19.7	55.7
Effective Green, g (s)	30.4	45.1	45.1	16.8	32.9		17.2	53.7	53.7		20.2	56.2
Actuated g/C Ratio	0.20	0.30	0.30	0.11	0.22		0.11	0.36	0.36		0.13	0.37
Clearance Time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)	362	1074	461	388	733		397	1838	545		466	1924
v/s Ratio Prot	c0.19	0.14		0.09	c0.20		0.10	c0.29			c0.12	0.26
v/s Ratio Perm			0.15						0.05			
v/c Ratio	0.96	0.46	0.50	0.82	0.89		0.86	0.82	0.14		0.92	0.70
Uniform Delay, d1	59.1	42.5	43.2	65.1	56.8		65.2	43.7	32.5		64.2	39.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	35.3	0.1	0.3	12.5	12.9		15.9	4.1	0.5		23.9	2.1
Delay (s)	94.4	42.6	43.5	77.7	69.8		81.0	47.8	33.0		88.0	41.8
Level of Service	F	D	D	E	E		F	D	C		F	D
Approach Delay (s)		58.3			72.3			52.5				50.8
Approach LOS		E			E			D				D

Intersection Summary			
HCM 2000 Control Delay	56.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	97.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

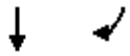
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	95	85	55	380	165	420	100	210	1805	390	75	285
Future Volume (veh/h)	95	85	55	380	165	420	100	210	1805	390	75	285
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.98		0.96		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885		1885	1885	1885		1885
Adj Flow Rate, veh/h	100	89	31	287	332	194		221	1900	299		300
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	1	1	1	1	1	1		1	1	1		1
Cap, veh/h	183	366	128	360	572	465		238	2282	703		311
Arrive On Green	0.30	0.30	0.31	0.30	0.30	0.30		0.13	0.44	0.44		0.17
Sat Flow, veh/h	446	1207	420	1260	1885	1534		1795	5147	1587		1795
Grp Volume(v), veh/h	100	0	120	287	332	194		221	1900	299		300
Grp Sat Flow(s),veh/h/ln	446	0	1627	1260	1885	1534		1795	1716	1587		1795
Q Serve(g_s), s	16.3	0.0	8.3	33.3	22.3	15.1		18.3	48.9	19.4		24.9
Cycle Q Clear(g_c), s	38.7	0.0	8.3	41.6	22.3	15.1		18.3	48.9	19.4		24.9
Prop In Lane	1.00		0.26	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	183	0	494	360	572	465		238	2282	703		311
V/C Ratio(X)	0.55	0.00	0.24	0.80	0.58	0.42		0.93	0.83	0.43		0.96
Avail Cap(c_a), veh/h	210	0	542	398	628	511		455	2282	703		323
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	60.5	0.0	39.3	54.9	44.2	41.7		64.4	36.8	28.6		61.5
Incr Delay (d2), s/veh	2.5	0.0	0.3	9.9	1.1	0.6		14.9	3.7	1.9		39.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	3.8	0.0	3.4	11.6	10.7	5.9		9.4	21.2	7.8		14.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.0	0.0	39.5	64.9	45.3	42.3		79.2	40.6	30.5		101.4
LnGrp LOS	E	A	D	E	D	D		E	D	C		F
Approach Vol, veh/h		220			813				2420			
Approach Delay, s/veh		50.2			51.5				42.9			
Approach LOS		D			D				D			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.8	76.7		49.5	30.0	70.5		49.5				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	39.0	49.6		50.3	28.0	60.6		50.3				
Max Q Clear Time (g_c+I1), s	20.3	33.0		43.6	26.9	50.9		40.7				
Green Ext Time (p_c), s	0.6	9.6		2.2	0.1	8.2		1.0				

Intersection Summary		
HCM 6th Ctrl Delay		44.2
HCM 6th LOS		D

Notes

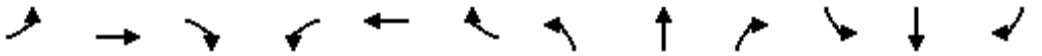
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1285	140
Future Volume (veh/h)	1285	140
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		0.99
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1885	1885
Adj Flow Rate, veh/h	1353	141
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	1	1
Cap, veh/h	2291	239
Arrive On Green	0.48	0.48
Sat Flow, veh/h	4731	493
Grp Volume(v), veh/h	981	513
Grp Sat Flow(s),veh/h/ln	1716	1793
Q Serve(g_s), s	31.0	31.0
Cycle Q Clear(g_c), s	31.0	31.0
Prop In Lane		0.27
Lane Grp Cap(c), veh/h	1662	868
V/C Ratio(X)	0.59	0.59
Avail Cap(c_a), veh/h	1662	868
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	27.9	28.0
Incr Delay (d2), s/veh	1.5	2.9
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.1	14.1
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	29.5	30.9
LnGrp LOS	C	C
Approach Vol, veh/h	1794	
Approach Delay, s/veh	41.9	
Approach LOS	D	
Timer - Assigned Phs		

HCM 6th Signalized Intersection Summary
31: 280 NB Off Ramp/280 NB On Ramp & San Bruno Avenue W

01/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	610	0	0	1075	685	330	630	445	0	0	0
Future Volume (veh/h)	150	610	0	0	1075	685	330	630	445	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1885	1885	1885			
Adj Flow Rate, veh/h	163	663	0	0	1168	0	359	685	484			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	1	1	1			
Cap, veh/h	194	1878	0	0	1520		694	729	615			
Arrive On Green	0.11	1.00	0.00	0.00	0.42	0.00	0.39	0.39	0.39			
Sat Flow, veh/h	3483	3676	0	0	3676	1598	1795	1885	1591			
Grp Volume(v), veh/h	163	663	0	0	1168	0	359	685	484			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1791	1598	1795	1885	1591			
Q Serve(g_s), s	4.1	0.0	0.0	0.0	25.1	0.0	13.8	31.5	24.1			
Cycle Q Clear(g_c), s	4.1	0.0	0.0	0.0	25.1	0.0	13.8	31.5	24.1			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	194	1878	0	0	1520		694	729	615			
V/C Ratio(X)	0.84	0.35	0.00	0.00	0.77		0.52	0.94	0.79			
Avail Cap(c_a), veh/h	194	1878	0	0	1520		698	733	619			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.82	0.82	0.00	0.00	0.39	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	39.6	0.0	0.0	0.0	22.1	0.0	21.2	26.6	24.3			
Incr Delay (d2), s/veh	22.1	0.4	0.0	0.0	1.5	0.0	0.3	19.6	6.1			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.2	0.1	0.0	0.0	10.1	0.0	5.5	17.1	9.5			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.7	0.4	0.0	0.0	23.6	0.0	21.4	46.2	30.4			
LnGrp LOS	E	A	A	A	C		C	D	C			
Approach Vol, veh/h		826			1168	A		1528				
Approach Delay, s/veh		12.5			23.6			35.4				
Approach LOS		B			C			D				

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		51.2			9.0	42.2		38.8				
Change Period (Y+Rc), s		5.0			4.0	5.0		5.0				
Max Green Setting (Gmax), s		46.0			5.0	37.0		34.0				
Max Q Clear Time (g_c+I1), s		2.0			6.1	27.1		33.5				
Green Ext Time (p_c), s		7.1			0.0	6.6		0.3				

Intersection Summary												
HCM 6th Ctrl Delay			26.1									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2: Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.6	0.1	0.3
Total Del/Veh (s)	3.3	18.7	4.5	12.1
Vehicles Entered	162	238	22	422
Vehicles Exited	162	238	22	422
Hourly Exit Rate	162	238	22	422
Input Volume	161	240	24	425
% of Volume	100	99	93	99
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.4
Total Del/Veh (s)	6.3	10.2	3.8	4.9	1.4	3.3	12.1	14.6	13.1	14.0	11.4	10.8
Vehicles Entered	4	10	10	168	1	59	11	198	92	61	214	11
Vehicles Exited	4	10	10	169	1	59	11	198	91	61	214	10
Hourly Exit Rate	4	10	10	169	1	59	11	198	91	61	214	10
Input Volume	5	10	10	170	1	60	10	200	90	60	215	10
% of Volume	80	98	98	100	80	98	107	99	101	101	100	98
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	10.5
Vehicles Entered	839
Vehicles Exited	838
Hourly Exit Rate	838
Input Volume	842
% of Volume	99
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.3	0.4	0.4	0.4	0.3
Total Del/Veh (s)	6.3	0.9	4.5	7.1	7.2	9.4	7.4	7.5
Vehicles Entered	57	6	103	98	204	257	128	853
Vehicles Exited	56	6	103	99	203	257	129	853
Hourly Exit Rate	56	6	103	99	203	257	129	853
Input Volume	60	6	100	100	205	255	130	856
% of Volume	94	92	103	99	99	101	99	100
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.4
Total Del/Veh (s)	17.4
Vehicles Entered	1337
Vehicles Exited	1337
Hourly Exit Rate	1337
Input Volume	3838
% of Volume	35
Denied Entry Before	0
Denied Entry After	0

Intersection: 2:

Movement	EB	WB	B92	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	80	203	45	40
Average Queue (ft)	46	81	2	16
95th Queue (ft)	87	174	25	43
Link Distance (ft)	5	136	184	371
Upstream Blk Time (%)	12	6		
Queuing Penalty (veh)	20	14		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: Dollar Ave/Herman Ave

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	41	57	208	203
Average Queue (ft)	17	33	86	94
95th Queue (ft)	43	47	170	163
Link Distance (ft)	540	5	1103	1825
Upstream Blk Time (%)		21		
Queuing Penalty (veh)		48		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	103	141	192
Average Queue (ft)	48	69	88
95th Queue (ft)	82	110	147
Link Distance (ft)	184	938	1398
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 82

2040 Plus Project (CPP) AM

HCM Signalized Intersection Capacity Analysis
1: Airport Blvd. & Miller Ave

09/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	95	625	180	5	50	165	0	0	400	40
Future Volume (vph)	0	0	95	625	180	5	50	165	0	0	400	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.6	4.0	4.0			4.6			4.6	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			0.99	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.99	
Flt Protected			1.00	0.95	0.97			0.99			1.00	
Satd. Flow (prot)			1580	1649	1686			3431			3407	
Flt Permitted			1.00	0.95	0.97			0.99			1.00	
Satd. Flow (perm)			1580	1649	1686			3431			3407	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	0	108	710	205	6	57	188	0	0	455	45
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	0	108	454	467	0	0	245	0	0	493	0
Confl. Peds. (#/hr)							10					10
Confl. Bikes (#/hr)									5			5
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	2%	4%	4%	4%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			14.0	44.4	44.4			14.0			28.4	
Effective Green, g (s)			14.0	44.4	44.4			14.0			28.4	
Actuated g/C Ratio			0.14	0.44	0.44			0.14			0.28	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			221	732	748			480			967	
v/s Ratio Prot			0.07					c0.07			c0.14	
v/s Ratio Perm				0.28	0.28							
v/c Ratio			0.49	0.62	0.62			0.51			0.51	
Uniform Delay, d1			39.7	21.3	21.4			39.8			30.0	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			2.3	3.9	3.9			1.2			1.9	
Delay (s)			42.0	25.3	25.3			41.0			31.9	
Level of Service			D	C	C			D			C	
Approach Delay (s)		42.0			25.3			41.0			31.9	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	30.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/28/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	600	290	35	145	210	10	505	245
Future Volume (veh/h)	600	290	35	145	210	10	505	245
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.96
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1590	1710		1590	1590		1590	1590
Adj Flow Rate, veh/h	423	437		151	219		526	68
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	9	0		9	9		9	9
Cap, veh/h	500	478		983	1764		614	263
Arrive On Green	0.33	0.33		0.33	0.58		0.20	0.20
Sat Flow, veh/h	1514	1449		2938	3100		3100	1292
Grp Volume(v), veh/h	423	437		151	219		526	68
Grp Sat Flow(s),veh/h/ln	1514	1449		1469	1510		1510	1292
Q Serve(g_s), s	26.0	28.9		3.6	3.3		16.8	4.4
Cycle Q Clear(g_c), s	26.0	28.9		3.6	3.3		16.8	4.4
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	500	478		983	1764		614	263
V/C Ratio(X)	0.85	0.91		0.15	0.12		0.86	0.26
Avail Cap(c_a), veh/h	636	609		983	1764		767	328
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.87	0.87		0.67	0.67		0.57	0.57
Uniform Delay (d), s/veh	31.1	32.1		23.3	9.3		38.4	33.5
Incr Delay (d2), s/veh	6.1	12.6		0.0	0.1		8.8	1.4
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	10.2	11.6		1.2	1.0		6.8	1.5
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	37.2	44.7		23.3	9.4		47.2	34.9
LnGrp LOS	D	D		C	A		D	C
Approach Vol, veh/h	860				370		594	
Approach Delay, s/veh	41.1				15.1		45.8	
Approach LOS	D				B		D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	38.1	24.9				63.0		37.0
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	20.0	* 25				39.4		42.0
Max Q Clear Time (g_c+I1), s	5.6	18.8				5.3		30.9
Green Ext Time (p_c), s	0.3	1.4				0.9		2.1

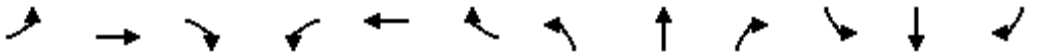
Intersection Summary	
HCM 6th Ctrl Delay	37.3
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	230	235	145	275	115	90	40	345	415	560	440	200
Future Volume (vph)	230	235	145	275	115	90	40	345	415	560	440	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.98		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (prot)		2946		2814	1527	1298	1464	2927	1309	1421	2948	1264
Flt Permitted		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (perm)		2946		2814	1527	1298	1464	2927	1309	1421	2948	1264
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	242	247	153	289	121	95	42	363	437	589	463	211
RTOR Reduction (vph)	0	29	0	0	0	83	0	0	0	0	0	145
Lane Group Flow (vph)	0	613	0	289	121	12	42	363	437	389	663	66
Confl. Peds. (#/hr)			70									25
Heavy Vehicles (%)	2%	2%	2%	12%	12%	12%	11%	11%	11%	4%	4%	4%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		24.4		13.1	13.1	13.1	16.2	16.2	71.7	32.6	32.6	32.6
Effective Green, g (s)		24.4		13.1	13.1	13.1	16.2	16.2	71.7	32.6	32.6	32.6
Actuated g/C Ratio		0.23		0.12	0.12	0.12	0.15	0.15	0.68	0.31	0.31	0.31
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		684		351	190	161	225	451	893	441	915	392
v/s Ratio Prot		c0.21		c0.10	0.08		0.03	c0.12	0.33	c0.27	0.22	
v/s Ratio Perm						0.01						0.05
v/c Ratio		0.90		0.82	0.64	0.07	0.19	0.80	0.49	0.88	0.72	0.17
Uniform Delay, d1		39.1		44.8	43.7	40.6	38.7	42.9	7.9	34.4	32.2	26.3
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		14.0		14.4	6.8	0.2	0.3	9.8	0.3	21.7	5.0	0.9
Delay (s)		53.1		59.2	50.5	40.8	39.0	52.7	8.2	56.1	37.2	27.2
Level of Service		D		E	D	D	D	D	A	E	D	C
Approach Delay (s)		53.1			53.7			28.9			41.3	
Approach LOS		D			D			C			D	

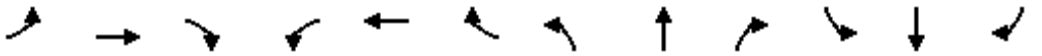
Intersection Summary			
HCM 2000 Control Delay	42.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	420	50	265	95	20	10	175	435	45	305	20
Future Volume (vph)	45	420	50	265	95	20	10	175	435	45	305	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		3.5	3.5			3.0	3.0		3.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		1.00		1.00	0.99			1.00	1.00		1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.99		1.00	0.97			1.00	0.85		0.99	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2760		1413	1435			1483	2224		1462	
Flt Permitted		1.00		0.95	1.00			0.98	1.00		0.95	
Satd. Flow (perm)		2760		1413	1435			1456	2224		1390	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	48	452	54	285	102	22	11	188	468	48	328	22
RTOR Reduction (vph)	0	11	0	0	11	0	0	0	107	0	3	0
Lane Group Flow (vph)	0	543	0	285	113	0	0	199	361	0	395	0
Confl. Peds. (#/hr)			15			15			15			25
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		23.6		17.3	17.3			22.1	42.9		22.1	
Effective Green, g (s)		23.6		17.3	17.3			22.1	39.4		22.1	
Actuated g/C Ratio		0.32		0.24	0.24			0.30	0.54		0.30	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		892		334	340			440	1200		420	
v/s Ratio Prot		c0.20		c0.20	0.08				0.16			
v/s Ratio Perm								0.14			c0.28	
v/c Ratio		0.61		0.85	0.33			0.45	0.30		0.94	
Uniform Delay, d1		20.8		26.6	23.1			20.6	9.2		24.8	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		3.1		18.0	0.2			0.3	0.1		29.1	
Delay (s)		23.9		44.6	23.3			20.8	9.3		53.9	
Level of Service		C		D	C			C	A		D	
Approach Delay (s)		23.9			38.2			12.7			53.9	
Approach LOS		C			D			B			D	

Intersection Summary			
HCM 2000 Control Delay	29.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	255	160	310	225	200	205	50	430	240	645	230
Future Volume (veh/h)	175	255	160	310	225	200	205	50	430	240	645	230
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1441	1441	1441	1618	1618	1618	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	151	315	0	326	237	0	216	53	0	253	679	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	31	31	31	19	19	19	7	7	7	6	6	6
Cap, veh/h	195	409		559	293		245	547		579	1243	
Arrive On Green	0.14	0.14	0.00	0.06	0.06	0.00	0.14	0.16	0.00	0.34	0.36	0.00
Sat Flow, veh/h	1372	2881	1221	3083	1618	1372	1711	3503	0	1725	3441	1535
Grp Volume(v), veh/h	151	315	0	326	237	0	216	53	0	253	679	0
Grp Sat Flow(s),veh/h/ln	1372	1441	1221	1541	1618	1372	1711	1706	0	1725	1721	1535
Q Serve(g_s), s	11.1	11.1	0.0	10.8	15.2	0.0	13.0	1.4	0.0	12.0	16.5	0.0
Cycle Q Clear(g_c), s	11.1	11.1	0.0	10.8	15.2	0.0	13.0	1.4	0.0	12.0	16.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	195	409		559	293		245	547		579	1243	
V/C Ratio(X)	0.78	0.77		0.58	0.81		0.88	0.10		0.44	0.55	
Avail Cap(c_a), veh/h	287	604		628	330		261	686		579	1243	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.82	0.00	0.81	0.81	0.00	1.00	1.00	0.00	0.70	0.70	0.00
Uniform Delay (d), s/veh	43.4	43.4	0.0	45.5	47.6	0.0	44.1	37.6	0.0	27.2	26.7	0.0
Incr Delay (d2), s/veh	3.2	1.4	0.0	0.9	10.4	0.0	25.5	0.0	0.0	0.1	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	4.0	0.0	4.6	7.5	0.0	7.1	0.6	0.0	4.8	6.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.6	44.8	0.0	46.4	58.0	0.0	69.6	37.6	0.0	27.3	27.9	0.0
LnGrp LOS	D	D		D	E		E	D		C	C	
Approach Vol, veh/h		466	A		563	A		269	A		932	A
Approach Delay, s/veh		45.4			51.3			63.3			27.7	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.0	42.8		19.5	40.1	21.7		23.6				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	16.0	27.5		22.0	22.4	* 21		21.4				
Max Q Clear Time (g_c+I1), s	15.0	18.5		13.1	14.0	3.4		17.2				
Green Ext Time (p_c), s	0.0	3.3		1.2	0.4	0.1		1.2				

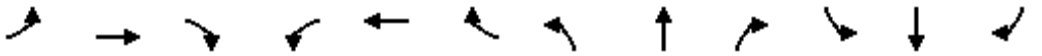
Intersection Summary		
HCM 6th Ctrl Delay		41.7
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	165	405	375	35	175	35	325	705	340	40	135	285
Future Volume (veh/h)	165	405	375	35	175	35	325	705	340	40	135	285
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.96	1.00		1.00	1.00		0.93
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1722	1722	1722	1574	1574	1574	1811	1811	1811	1663	1663	1663
Adj Flow Rate, veh/h	177	435	123	38	188	34	349	758	0	43	145	118
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	12	12	12	22	22	22	6	6	6	16	16	16
Cap, veh/h	228	441	366	96	225	41	1272	1308		202	212	167
Arrive On Green	0.05	0.08	0.08	0.06	0.18	0.18	0.38	0.38	0.00	0.13	0.13	0.13
Sat Flow, veh/h	1640	1722	1427	1499	1287	233	3346	3532	0	1584	1663	1307
Grp Volume(v), veh/h	177	435	123	38	0	222	349	758	0	43	145	118
Grp Sat Flow(s),veh/h/ln	1640	1722	1427	1499	0	1520	1673	1721	0	1584	1663	1307
Q Serve(g_s), s	11.2	26.5	8.5	2.6	0.0	14.8	7.6	18.4	0.0	2.6	8.8	9.1
Cycle Q Clear(g_c), s	11.2	26.5	8.5	2.6	0.0	14.8	7.6	18.4	0.0	2.6	8.8	9.1
Prop In Lane	1.00		1.00	1.00		0.15	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	228	441	366	96	0	266	1272	1308		202	212	167
V/C Ratio(X)	0.78	0.99	0.34	0.40	0.00	0.83	0.27	0.58		0.21	0.68	0.71
Avail Cap(c_a), veh/h	228	441	366	143	0	346	1272	1308		348	366	288
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.81	0.81	1.00	0.00	1.00	0.72	0.72	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.5	48.1	39.7	47.2	0.0	41.8	22.5	25.9	0.0	41.1	43.8	43.9
Incr Delay (d2), s/veh	11.6	34.8	0.3	1.0	0.0	10.2	0.4	1.4	0.0	0.2	1.5	2.1
Initial Q Delay(d3),s/veh	0.0	99.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.7	28.9	3.2	1.0	0.0	6.3	3.0	7.5	0.0	1.0	3.7	3.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.1	182.6	40.0	48.2	0.0	52.1	22.9	27.2	0.0	41.3	45.3	46.0
LnGrp LOS	E	F	D	D	A	D	C	C		D	D	D
Approach Vol, veh/h		735			260			1107	A		306	
Approach Delay, s/veh		129.2			51.5			25.9			45.0	
Approach LOS		F			D			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.7	31.5		44.5	19.2	23.0		18.3				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.6	* 4.6		4.9				
Max Green Setting (Gmax), s	10.0	26.9		26.9	13.0	* 24		23.1				
Max Q Clear Time (g_c+I1), s	4.6	28.5		20.4	13.2	16.8		11.1				
Green Ext Time (p_c), s	0.0	0.0		2.5	0.0	0.4		0.7				

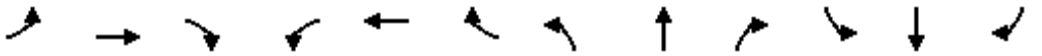
Intersection Summary			
HCM 6th Ctrl Delay		62.6	
HCM 6th LOS		E	

Notes

User approved volume balancing among the lanes for turning movement.

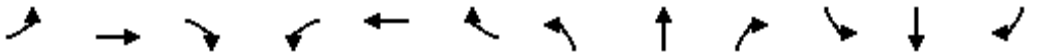
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	875	25	705	20	15	20	245	360	30	30	440	125
Future Volume (vph)	875	25	705	20	15	20	245	360	30	30	440	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	0.95	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1633	1641	2707		1695	1482	1656	3273		1626	3252	1455
Flt Permitted	0.95	0.95	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1633	1641	2707		1695	1482	1656	3273		1626	3252	1455
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	921	26	742	21	16	21	258	379	32	32	463	132
RTOR Reduction (vph)	0	0	534	0	0	20	0	5	0	0	0	100
Lane Group Flow (vph)	470	477	208	0	37	1	258	406	0	32	463	32
Heavy Vehicles (%)	5%	5%	5%	9%	9%	9%	9%	9%	9%	11%	11%	11%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	20.8	20.8	20.8		4.3	4.3	16.4	31.5		2.9	18.0	18.0
Effective Green, g (s)	20.8	20.8	20.8		4.3	4.3	16.4	31.5		2.9	18.0	18.0
Actuated g/C Ratio	0.28	0.28	0.28		0.06	0.06	0.22	0.42		0.04	0.24	0.24
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	457	459	757		98	85	365	1387		63	787	352
v/s Ratio Prot	0.29	c0.29			c0.02		c0.16	0.12		0.02	c0.14	
v/s Ratio Perm			0.08			0.00						0.02
v/c Ratio	1.03	1.04	0.27		0.38	0.01	0.71	0.29		0.51	0.59	0.09
Uniform Delay, d1	26.8	26.8	20.9		33.7	33.0	26.7	14.1		35.0	24.9	21.8
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	49.6	52.5	0.2		2.4	0.1	6.1	0.1		6.3	1.1	0.1
Delay (s)	76.3	79.3	21.1		36.1	33.1	32.9	14.2		41.3	26.0	21.9
Level of Service	E	E	C		D	C	C	B		D	C	C
Approach Delay (s)		52.9			35.0			21.4			25.9	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	40.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	74.3	Sum of lost time (s)	14.8
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



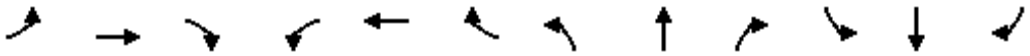
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	880	250	55	390	220	55	30	255	535	380	40
Future Volume (veh/h)	70	880	250	55	390	220	55	30	255	535	380	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	77	967	265	60	429	113	60	33	0	588	418	43
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	96	745	204	72	962	811	74	41		476	445	46
Arrive On Green	0.05	0.53	0.53	0.04	0.51	0.51	0.06	0.06	0.00	0.27	0.27	0.27
Sat Flow, veh/h	1781	1412	387	1781	1870	1577	1169	643	1585	1781	1667	171
Grp Volume(v), veh/h	77	0	1232	60	429	113	93	0	0	588	0	461
Grp Sat Flow(s),veh/h/ln	1781	0	1799	1781	1870	1577	1812	0	1585	1781	0	1838
Q Serve(g_s), s	6.3	0.0	78.0	4.9	21.4	5.5	7.5	0.0	0.0	39.5	0.0	36.3
Cycle Q Clear(g_c), s	6.3	0.0	78.0	4.9	21.4	5.5	7.5	0.0	0.0	39.5	0.0	36.3
Prop In Lane	1.00		0.22	1.00		1.00	0.65		1.00	1.00		0.09
Lane Grp Cap(c), veh/h	96	0	949	72	962	811	114	0		476	0	491
V/C Ratio(X)	0.80	0.00	1.30	0.83	0.45	0.14	0.81	0.00		1.24	0.00	0.94
Avail Cap(c_a), veh/h	157	0	949	72	962	811	141	0		476	0	491
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	69.1	0.0	34.9	70.4	22.6	18.8	68.4	0.0	0.0	54.2	0.0	53.0
Incr Delay (d2), s/veh	5.6	0.0	142.0	50.3	0.5	0.1	20.7	0.0	0.0	123.0	0.0	25.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	0.0	70.6	3.2	9.4	2.0	4.1	0.0	0.0	34.1	0.0	20.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.8	0.0	176.9	120.7	23.1	18.9	89.0	0.0	0.0	177.2	0.0	78.7
LnGrp LOS	E	A	F	F	C	B	F	A		F	A	E
Approach Vol, veh/h		1309			602			93	A		1049	
Approach Delay, s/veh		170.9			32.0			89.0			133.9	
Approach LOS		F			C			F			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.5	80.5		43.0	9.5	82.5		12.8				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	13.0	71.0		39.5	6.0	78.0		11.5				
Max Q Clear Time (g_c+I1), s	8.3	23.4		41.5	6.9	80.0		9.5				
Green Ext Time (p_c), s	0.0	4.8		0.0	0.0	0.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		128.3
HCM 6th LOS		F

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



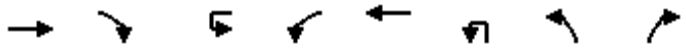
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	1460	190	175	520	10	140	10	290	0	10	10
Future Volume (veh/h)	10	1460	190	175	520	10	140	10	290	0	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	1604	169	192	571	11	182	0	55	0	11	10
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	12	1796	772	373	766	15	280	0	125	0	25	23
Arrive On Green	0.50	0.50	0.50	0.21	0.21	0.21	0.08	0.00	0.08	0.00	0.03	0.03
Sat Flow, veh/h	24	3622	1558	1781	3657	70	3563	0	1585	0	902	820
Grp Volume(v), veh/h	866	749	169	192	292	290	182	0	55	0	0	21
Grp Sat Flow(s),veh/h/ln	1869	1777	1558	1781	1870	1857	1781	0	1585	0	0	1723
Q Serve(g_s), s	35.2	29.7	5.0	7.7	11.8	11.8	4.0	0.0	2.7	0.0	0.0	1.0
Cycle Q Clear(g_c), s	35.2	29.7	5.0	7.7	11.8	11.8	4.0	0.0	2.7	0.0	0.0	1.0
Prop In Lane	0.01		1.00	1.00		0.04	1.00		1.00	0.00		0.48
Lane Grp Cap(c), veh/h	927	881	772	373	392	389	280	0	125	0	0	48
V/C Ratio(X)	0.93	0.85	0.22	0.51	0.74	0.75	0.65	0.00	0.44	0.00	0.00	0.44
Avail Cap(c_a), veh/h	949	902	791	794	833	827	1058	0	471	0	0	426
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	19.1	17.8	11.5	28.3	29.9	29.9	36.1	0.0	35.5	0.0	0.0	38.6
Incr Delay (d2), s/veh	15.5	7.5	0.1	0.8	2.1	2.1	1.0	0.0	0.9	0.0	0.0	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.9	12.2	1.5	3.2	5.2	5.2	1.7	0.0	1.0	0.0	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.7	25.2	11.6	29.1	32.0	32.0	37.1	0.0	36.4	0.0	0.0	41.0
LnGrp LOS	C	C	B	C	C	C	D	A	D	A	A	D
Approach Vol, veh/h		1784			774			237			21	
Approach Delay, s/veh		28.5			31.3			36.9			41.0	
Approach LOS		C			C			D			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.0		9.9		44.2		5.8				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		13.8		6.0		37.2		3.0				
Green Ext Time (p_c), s		3.0		0.4		2.9		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	30.1	
HCM 6th LOS	C	

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



Movement	EBT	EBR	WBU	WBL	WBT	NBU	NBL	NBR
Lane Configurations								
Traffic Volume (veh/h)	1290	480	10	145	510	15	185	205
Future Volume (veh/h)	1290	480	10	145	510	15	185	205
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)		0.97		1.00			1.00	1.00
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870		1870	1870
Adj Flow Rate, veh/h	1344	395		151	531		193	74
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	2	2		2	2		2	2
Cap, veh/h	2132	925		190	2764		326	149
Arrive On Green	0.60	0.60		0.11	0.78		0.09	0.09
Sat Flow, veh/h	3647	1542		1781	3647		3456	1585
Grp Volume(v), veh/h	1344	395		151	531		193	74
Grp Sat Flow(s),veh/h/ln	1777	1542		1781	1777		1728	1585
Q Serve(g_s), s	17.1	4.3		5.8	2.7		3.8	3.1
Cycle Q Clear(g_c), s	17.1	4.3		5.8	2.7		3.8	3.1
Prop In Lane		1.00		1.00			1.00	1.00
Lane Grp Cap(c), veh/h	2132	925		190	2764		326	149
V/C Ratio(X)	0.63	0.43		0.79	0.19		0.59	0.50
Avail Cap(c_a), veh/h	3081	1337		886	5051		1817	834
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	9.1	1.5		30.7	2.0		30.6	30.3
Incr Delay (d2), s/veh	0.4	0.4		2.8	0.0		1.7	2.5
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	2.0		2.5	0.3		1.6	1.2
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	9.5	1.9		33.5	2.1		32.3	32.8
LnGrp LOS	A	A		C	A		C	C
Approach Vol, veh/h	1739				682		267	
Approach Delay, s/veh	7.8				9.0		32.4	
Approach LOS	A				A		C	

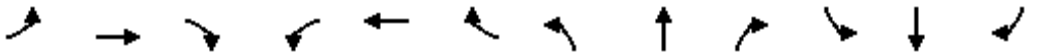
Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	12.5	47.2				59.7		10.6
Change Period (Y+Rc), s	5.0	* 5				5.0		4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0		37.0
Max Q Clear Time (g_c+I1), s	7.8	19.1				4.7		5.8
Green Ext Time (p_c), s	0.1	23.1				5.6		0.9

Intersection Summary	
HCM 6th Ctrl Delay	10.5
HCM 6th LOS	B

Notes

User approved ignoring U-Turning movement.

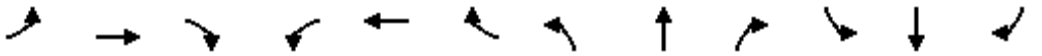
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	175	490	75	5	340	0	0	345	5	55	150	145
Future Volume (vph)	175	490	75	5	340	0	0	345	5	55	150	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7		3.7	2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			1.00		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1719	3133		1719	3209			1805		1719	3132	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1719	3133		1719	3209			1805		1719	3132	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	533	82	5	370	0	0	375	5	60	163	158
RTOR Reduction (vph)	0	7	0	0	0	0	0	1	0	0	94	0
Lane Group Flow (vph)	190	608	0	5	370	0	0	379	0	60	227	0
Confl. Peds. (#/hr)	25		15	15					15	15		20
Confl. Bikes (#/hr)			5						5			5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	2%	2%	5%	5%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	13.6	34.9		1.0	22.3			22.4		6.3	32.4	
Effective Green, g (s)	13.6	35.9		1.0	23.3			22.4		6.3	32.4	
Actuated g/C Ratio	0.17	0.45		0.01	0.29			0.28		0.08	0.41	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	294	1416		21	941			509		136	1278	
v/s Ratio Prot	c0.11	c0.19		0.00	0.12			c0.21		c0.03	0.07	
v/s Ratio Perm												
v/c Ratio	0.65	0.43		0.24	0.39			0.75		0.44	0.18	
Uniform Delay, d1	30.7	14.8		38.8	22.4			25.9		34.9	15.0	
Progression Factor	1.00	1.00		1.45	0.46			1.00		1.00	1.00	
Incremental Delay, d2	3.6	0.2		2.0	0.3			5.9		0.8	0.1	
Delay (s)	34.3	15.0		58.4	10.7			31.8		35.7	15.1	
Level of Service	C	B		E	B			C		D	B	
Approach Delay (s)		19.5			11.3			31.8			18.3	
Approach LOS		B			B			C			B	

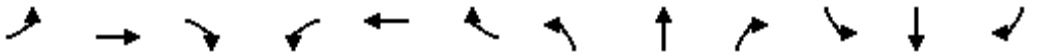
Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	79.4	Sum of lost time (s)	14.8
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	350	0	80	335	165	5	75	185	0	30	95
Future Volume (vph)	150	350	0	80	335	165	5	75	185	0	30	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.95			1.00	0.85		0.89	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1687	3374		1687	3169			1770	1472		1552	
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (perm)	1687	3374		1687	3169			1758	1472		1552	
Peak-hour factor, PHF	0.91	0.91	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.91	0.91
Adj. Flow (vph)	165	385	0	88	368	181	5	82	203	0	33	104
RTOR Reduction (vph)	0	0	0	0	46	0	0	0	120	0	60	0
Lane Group Flow (vph)	165	385	0	88	503	0	0	87	83	0	77	0
Confl. Peds. (#/hr)	10			10		10	5		10			5
Confl. Bikes (#/hr)									10			5
Heavy Vehicles (%)	7%	7%	2%	7%	7%	7%	7%	7%	7%	2%	7%	7%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	13.1	28.6		7.3	22.8			32.4	32.4		32.4	
Effective Green, g (s)	13.1	28.6		7.3	23.8			33.4	32.4		33.4	
Actuated g/C Ratio	0.16	0.36		0.09	0.30			0.42	0.41		0.42	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	278	1215		155	949			739	600		652	
v/s Ratio Prot	c0.10	c0.11		0.05	c0.16						0.05	
v/s Ratio Perm								0.05	c0.06			
v/c Ratio	0.59	0.32		0.57	0.53			0.12	0.14		0.12	
Uniform Delay, d1	30.7	18.3		34.5	23.1			14.0	14.7		14.0	
Progression Factor	1.20	0.50		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	2.1	0.1		2.8	0.5			0.1	0.1		0.1	
Delay (s)	38.9	9.3		37.4	23.7			14.1	14.8		14.1	
Level of Service	D	A		D	C			B	B		B	
Approach Delay (s)		18.2			25.6			14.6			14.1	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	79.4	Sum of lost time (s)	14.8
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	935	345	285	450	0	0	0	0	410	425	195
Future Volume (veh/h)	0	935	345	285	450	0	0	0	0	410	425	195
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1885	1885	1885	1885	0				1885	1885	1885
Adj Flow Rate, veh/h	0	984	0	300	474	0				288	648	84
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	1	1	1	1	0				1	1	1
Cap, veh/h	0	2001		817	2432	0				389	816	346
Arrive On Green	0.00	0.39	0.00	0.47	1.00	0.00				0.22	0.22	0.22
Sat Flow, veh/h	0	5316	1598	3483	3676	0				1795	3770	1598
Grp Volume(v), veh/h	0	984	0	300	474	0				288	648	84
Grp Sat Flow(s),veh/h/ln	0	1716	1598	1742	1791	0				1795	1885	1598
Q Serve(g_s), s	0.0	13.0	0.0	5.0	0.0	0.0				13.5	14.6	3.9
Cycle Q Clear(g_c), s	0.0	13.0	0.0	5.0	0.0	0.0				13.5	14.6	3.9
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2001		817	2432	0				389	816	346
V/C Ratio(X)	0.00	0.49		0.37	0.19	0.00				0.74	0.79	0.24
Avail Cap(c_a), veh/h	0	2001		817	2432	0				571	1198	508
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.71	0.71	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	20.8	0.0	19.6	0.0	0.0				32.9	33.4	29.2
Incr Delay (d2), s/veh	0.0	0.9	0.0	0.1	0.1	0.0				1.2	1.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.0	0.0	1.8	0.0	0.0				5.8	6.6	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	21.6	0.0	19.7	0.1	0.0				34.1	34.7	29.3
LnGrp LOS	A	C		B	A	A				C	C	C
Approach Vol, veh/h		984	A		774						1020	
Approach Delay, s/veh		21.6			7.7						34.1	
Approach LOS		C			A						C	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	26.1	40.0		23.9		66.1
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	13.5	* 35		28.6		52.0
Max Q Clear Time (g_c+I1), s	7.0	15.0		16.6		2.0
Green Ext Time (p_c), s	0.3	8.7		2.8		5.0

Intersection Summary		
HCM 6th Ctrl Delay		22.3
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	18.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	30	20	25	95	0	55	10	0	480	205	95	135
Future Vol, veh/h	30	20	25	95	0	55	10	0	480	205	95	135
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	33	22	27	103	0	60	11	0	522	223	103	147
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	11.6	13.5	22.5	10.2
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	40%	63%	100%	0%	0%
Vol Thru, %	100%	54%	27%	0%	0%	100%	100%
Vol Right, %	0%	46%	33%	37%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	250	445	75	150	95	68	68
LT Vol	0	0	30	95	95	0	0
Through Vol	250	240	20	0	0	68	68
RT Vol	0	205	25	55	0	0	0
Lane Flow Rate	272	484	82	163	103	73	73
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.468	0.788	0.166	0.326	0.202	0.133	0.096
Departure Headway (Hd)	6.195	5.868	7.326	7.206	7.025	6.516	4.715
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	579	614	488	497	509	547	754
Service Time	3.955	3.627	5.107	4.978	4.797	4.288	2.486
HCM Lane V/C Ratio	0.47	0.788	0.168	0.328	0.202	0.133	0.097
HCM Control Delay	14.3	27.1	11.6	13.5	11.6	10.3	8
HCM Lane LOS	B	D	B	B	B	B	A
HCM 95th-tile Q	2.5	7.6	0.6	1.4	0.7	0.5	0.3

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.92
Heavy Vehicles, %	4
Mvmt Flow	0
Number of Lanes	0

Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	0	510	370	10	155	550	0	0	0	0	10	250
Future Volume (vph)	0	510	370	10	155	550	0	0	0	0	10	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0						4.5
Lane Util. Factor		0.95			0.91	0.91						0.95
Frpb, ped/bikes		0.99			1.00	1.00						1.00
Flpb, ped/bikes		1.00			1.00	1.00						1.00
Frt		0.94			1.00	1.00						1.00
Flt Protected		1.00			0.95	1.00						0.95
Satd. Flow (prot)		3128			1535	3227						1603
Flt Permitted		1.00			0.95	1.00						0.95
Satd. Flow (perm)		3128			1535	3227						1603
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	531	385	10	161	573	0	0	0	0	10	260
RTOR Reduction (vph)	0	138	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	778	0	0	155	589	0	0	0	0	0	140
Confl. Peds. (#/hr)	5		5		5		5					
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type		NA		Split	Split	NA					Split	Split
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		23.0			21.7	21.7						11.6
Effective Green, g (s)		23.0			21.7	21.7						11.6
Actuated g/C Ratio		0.32			0.31	0.31						0.16
Clearance Time (s)		5.0			5.0	5.0						4.5
Vehicle Extension (s)		3.0			3.0	3.0						3.0
Lane Grp Cap (vph)		1016			470	989						262
v/s Ratio Prot		c0.25			0.10	c0.18						c0.09
v/s Ratio Perm												
v/c Ratio		0.77			0.33	0.60						0.53
Uniform Delay, d1		21.5			18.9	20.8						27.1
Progression Factor		1.00			1.00	1.00						1.00
Incremental Delay, d2		3.5			0.4	1.0						2.1
Delay (s)		25.0			19.4	21.8						29.2
Level of Service		C			B	C						C
Approach Delay (s)		25.0				21.3			0.0			
Approach LOS		C				C			A			

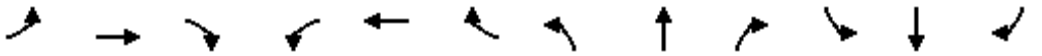
Intersection Summary			
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	70.8	Sum of lost time (s)	14.5
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	10	180
Future Volume (vph)	10	180
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.5	5.0
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	1.00
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	0.96	1.00
Satd. Flow (prot)	1612	1509
Flt Permitted	0.96	1.00
Satd. Flow (perm)	1612	1509
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	10	188
RTOR Reduction (vph)	0	35
Lane Group Flow (vph)	140	153
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Heavy Vehicles (%)	7%	7%
Turn Type	NA	custom
Protected Phases	4	5
Permitted Phases		4
Actuated Green, G (s)	11.6	34.6
Effective Green, g (s)	11.6	34.6
Actuated g/C Ratio	0.16	0.49
Clearance Time (s)	4.5	5.0
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	264	737
v/s Ratio Prot	0.09	0.07
v/s Ratio Perm		0.03
v/c Ratio	0.53	0.21
Uniform Delay, d1	27.1	10.3
Progression Factor	1.00	1.00
Incremental Delay, d2	2.0	0.1
Delay (s)	29.1	10.4
Level of Service	C	B
Approach Delay (s)	21.7	
Approach LOS	C	

Intersection Summary

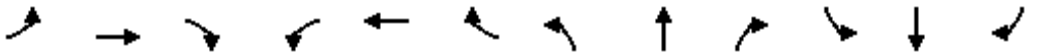
HCM Signalized Intersection Capacity Analysis
23: US 101 NB Off Ramp/US 101 NB On Ramp & San Bruno Ave/San Bruno Avenue

01/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	220	540	0	0	230	135	420	0	415	120	0	65
Future Volume (vph)	220	540	0	0	230	135	420	0	415	120	0	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00	0.98	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3242	1759			3343	1465		1671	1470	1671		1495
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3242	1759			3343	1465		1671	1470	1671		1495
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	256	628	0	0	267	157	488	0	483	140	0	76
RTOR Reduction (vph)	0	0	0	0	0	127	0	0	136	0	0	67
Lane Group Flow (vph)	256	628	0	0	267	30	0	488	347	140	0	9
Confl. Peds. (#/hr)	10		5	5		10			5	5		
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	12.4	33.7			16.8	16.8		31.7	31.7	10.0		10.0
Effective Green, g (s)	12.4	33.7			16.8	16.8		31.7	31.7	10.0		10.0
Actuated g/C Ratio	0.14	0.39			0.19	0.19		0.36	0.36	0.12		0.12
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	462	682			646	283		609	536	192		172
v/s Ratio Prot	0.08	c0.36			0.08					c0.08		0.01
v/s Ratio Perm						0.02		0.29	0.24			
v/c Ratio	0.55	0.92			0.41	0.11		0.80	0.65	0.73		0.05
Uniform Delay, d1	34.7	25.3			30.7	28.9		24.8	23.0	37.1		34.2
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	1.4	17.6			0.2	0.1		7.1	2.0	11.1		0.0
Delay (s)	36.1	42.9			30.9	28.9		31.8	25.0	48.2		34.3
Level of Service	D	D			C	C		C	C	D		C
Approach Delay (s)		41.0			30.2			28.4			43.3	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	86.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



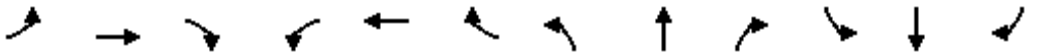
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	470	1055	70	25	735	120	150	110	40	175	85	175
Future Volume (veh/h)	470	1055	70	25	735	120	150	110	40	175	85	175
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.97	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1930
Adj Flow Rate, veh/h	490	1099	69	26	766	110	156	115	42	182	89	182
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	373	1609	101	79	995	143	92	357	130	257	93	795
Arrive On Green	0.07	0.16	0.16	0.04	0.32	0.32	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1767	3367	211	1767	3087	443	1095	1286	470	683	334	1618
Grp Volume(v), veh/h	490	575	593	26	437	439	156	0	157	271	0	182
Grp Sat Flow(s),veh/h/ln	1767	1763	1816	1767	1763	1768	1095	0	1756	1018	0	1618
Q Serve(g_s), s	19.0	27.7	27.7	1.3	20.1	20.1	1.0	0.0	6.4	17.7	0.0	5.8
Cycle Q Clear(g_c), s	19.0	27.7	27.7	1.3	20.1	20.1	25.0	0.0	6.4	24.0	0.0	5.8
Prop In Lane	1.00		0.12	1.00		0.25	1.00		0.27	0.67		1.00
Lane Grp Cap(c), veh/h	373	842	868	79	568	570	92	0	488	350	0	795
V/C Ratio(X)	1.31	0.68	0.68	0.33	0.77	0.77	1.70	0.00	0.32	0.78	0.00	0.23
Avail Cap(c_a), veh/h	373	842	868	98	568	570	92	0	488	350	0	795
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	0.76	0.64	0.64	0.64	1.00	0.00	1.00	0.83	0.00	0.83
Uniform Delay (d), s/veh	41.9	31.5	31.5	41.7	27.5	27.5	44.9	0.0	25.8	35.3	0.0	13.2
Incr Delay (d2), s/veh	155.0	3.4	3.3	0.6	6.4	6.4	357.6	0.0	0.1	8.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	25.0	13.7	14.1	0.6	9.1	9.1	11.2	0.0	2.7	6.6	0.0	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	196.9	34.9	34.8	42.3	33.9	33.9	402.6	0.0	25.9	43.3	0.0	13.3
LnGrp LOS	F	C	C	D	C	C	F	A	C	D	A	B
Approach Vol, veh/h		1658			902			313			453	
Approach Delay, s/veh		82.7			34.1			213.6			31.3	
Approach LOS		F			C			F			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	38.0		29.0	13.0	48.0		29.0				
Change Period (Y+Rc), s	4.0	9.0		4.0	9.0	* 5		4.0				
Max Green Setting (Gmax), s	19.0	29.0		25.0	5.0	* 43		25.0				
Max Q Clear Time (g_c+I1), s	21.0	22.1		26.0	3.3	29.7		27.0				
Green Ext Time (p_c), s	0.0	3.7		0.0	0.0	7.8		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		74.9	
HCM 6th LOS		E	

Notes

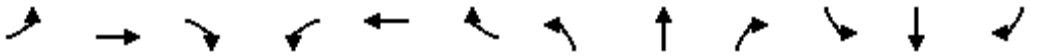
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	525	0	795	0	1335	325	0	2420	315
Future Volume (vph)	0	0	0	525	0	795	0	1335	325	0	2420	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.6		4.6		4.4	4.4		4.4	4.4
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.94		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3400		2760		5036	1474		5036	1515
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3400		2760		5036	1474		5036	1515
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	541	0	820	0	1376	335	0	2495	325
RTOR Reduction (vph)	0	0	0	0	0	28	0	0	144	0	0	90
Lane Group Flow (vph)	0	0	0	541	0	792	0	1376	191	0	2495	235
Confl. Peds. (#/hr)							20		15	15		20
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				24.1		42.7		68.3	68.3		86.9	86.9
Effective Green, g (s)				24.1		39.2		68.3	68.3		86.9	86.9
Actuated g/C Ratio				0.20		0.33		0.57	0.57		0.72	0.72
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				682		901		2866	838		3646	1097
v/s Ratio Prot				0.16		c0.29		0.27			c0.50	
v/s Ratio Perm									0.13			0.16
v/c Ratio				0.79		0.88		0.48	0.23		0.68	0.21
Uniform Delay, d1				45.6		38.2		15.3	12.8		9.0	5.4
Progression Factor				1.00		1.00		1.03	2.08		1.00	1.00
Incremental Delay, d2				5.9		9.5		0.4	0.5		1.1	0.4
Delay (s)				51.5		47.6		16.2	27.0		10.1	5.9
Level of Service				D		D		B	C		B	A
Approach Delay (s)		0.0			49.1			18.4			9.6	
Approach LOS		A			D			B			A	

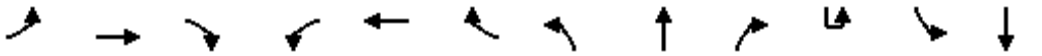
Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	325	0	400	0	0	0	0	1340	550	0	1820	1125
Future Volume (vph)	325	0	400	0	0	0	0	1340	550	0	1820	1125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.89	0.85					0.96			1.00	0.85
Flt Protected	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1665	1480	1490					4616			5036	1467
Flt Permitted	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1665	1480	1490					4616			5036	1467
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	346	0	426	0	0	0	0	1426	585	0	1936	1197
RTOR Reduction (vph)	0	31	31	0	0	0	0	0	0	0	0	242
Lane Group Flow (vph)	270	224	216	0	0	0	0	2011	0	0	1936	955
Confl. Peds. (#/hr)	10					10	15		15	15		15
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	17.6	17.6	17.6					93.4			93.4	93.4
Effective Green, g (s)	17.6	17.6	17.6					93.4			93.4	93.4
Actuated g/C Ratio	0.15	0.15	0.15					0.78			0.78	0.78
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	244	217	218					3592			3919	1141
v/s Ratio Prot	c0.16	0.15						0.44			0.38	
v/s Ratio Perm			0.15									c0.65
v/c Ratio	1.11	1.03	0.99					0.56			0.49	0.84
Uniform Delay, d1	51.2	51.2	51.1					5.2			4.8	8.5
Progression Factor	1.00	1.00	1.00					2.23			0.75	6.79
Incremental Delay, d2	89.2	70.1	58.4					0.5			0.3	5.7
Delay (s)	140.4	121.3	109.5					12.1			3.9	63.2
Level of Service	F	F	F					B			A	E
Approach Delay (s)		124.2			0.0			12.1			26.6	
Approach LOS		F			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	74.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	255	495	200	215	325	155	375	1285	215	125	250	1055
Future Volume (vph)	255	495	200	215	325	155	375	1285	215	125	250	1055
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.97	0.91	1.00		0.97	0.91
Frpb, ped/bikes	1.00	1.00	0.95	1.00	0.99		1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85		1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1752	3505	1482	3400	3290		3400	5036	1494		3400	5036
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1752	3505	1482	3400	3290		3400	5036	1494		3400	5036
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	268	521	211	226	342	163	395	1353	226	132	263	1111
RTOR Reduction (vph)	0	0	81	0	51	0	0	0	68	0	0	0
Lane Group Flow (vph)	268	521	130	226	454	0	395	1353	158	0	395	1111
Confl. Peds. (#/hr)	25		40	40		25	15		25		25	
Confl. Bikes (#/hr)			5			5						
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	3	8		7	4		1	6		5	5	2
Permitted Phases			8						6			
Actuated Green, G (s)	20.0	34.7	34.7	9.4	25.5		14.6	49.0	49.0		10.7	44.6
Effective Green, g (s)	20.0	34.7	34.7	9.4	25.5		14.6	49.0	49.0		10.7	44.6
Actuated g/C Ratio	0.17	0.29	0.29	0.08	0.21		0.12	0.41	0.41		0.09	0.37
Clearance Time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)	292	1013	428	266	699		413	2056	610		303	1871
v/s Ratio Prot	c0.15	0.15		0.07	c0.14		c0.12	c0.27			c0.12	0.22
v/s Ratio Perm			0.09						0.11			
v/c Ratio	0.92	0.51	0.30	0.85	0.65		0.96	0.66	0.26		1.30	0.59
Uniform Delay, d1	49.2	35.6	33.2	54.6	43.2		52.4	28.7	23.5		54.6	30.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		0.99	0.94
Incremental Delay, d2	31.3	0.2	0.1	20.8	1.6		32.7	1.7	1.0		154.9	1.1
Delay (s)	80.5	35.8	33.4	75.4	44.7		85.0	30.4	24.5		209.0	29.7
Level of Service	F	D	C	E	D		F	C	C		F	C
Approach Delay (s)		47.3			54.2			40.7				69.3
Approach LOS		D			D			D				E

Intersection Summary			
HCM 2000 Control Delay	52.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.7
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

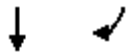
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	95	130	65	160	80	335	30	70	1130	375	55	555
Future Volume (veh/h)	95	130	65	160	80	335	30	70	1130	375	55	555
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.98		0.96	0.98		0.97		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856		1856	1856	1856		1856
Adj Flow Rate, veh/h	100	137	40	126	143	151		74	1189	154		584
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	3	3	3	3	3	3		3	3	3		3
Cap, veh/h	193	304	95	224	407	336		95	1721	529		616
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22		0.05	0.34	0.34		0.35
Sat Flow, veh/h	637	1387	431	1177	1856	1529		1767	5066	1559		1767
Grp Volume(v), veh/h	130	0	147	126	143	151		74	1189	154		584
Grp Sat Flow(s),veh/h/ln	868	0	1588	1177	1856	1529		1767	1689	1559		1767
Q Serve(g_s), s	11.5	0.0	9.6	12.4	7.8	10.3		5.0	24.3	8.7		38.6
Cycle Q Clear(g_c), s	19.4	0.0	9.6	22.0	7.8	10.3		5.0	24.3	8.7		38.6
Prop In Lane	0.77		0.27	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	244	0	348	224	407	336		95	1721	529		616
V/C Ratio(X)	0.53	0.00	0.42	0.56	0.35	0.45		0.78	0.69	0.29		0.95
Avail Cap(c_a), veh/h	328	0	463	309	541	446		177	1721	529		692
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	46.9	0.0	40.3	49.7	39.6	40.6		56.1	34.2	29.0		38.1
Incr Delay (d2), s/veh	1.8	0.0	0.8	2.2	0.5	0.9		13.1	2.3	1.4		21.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	3.8	0.0	3.9	3.8	3.6	4.0		2.6	10.3	3.5		20.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.7	0.0	41.1	51.9	40.1	41.5		69.2	36.5	30.4		59.3
LnGrp LOS	D	A	D	D	D	D		E	D	C		E
Approach Vol, veh/h		277			420				1417			
Approach Delay, s/veh		44.6			44.2				37.5			
Approach LOS		D			D				D			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.4	80.5		30.0	44.8	45.2		30.0				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	12.0	61.9		35.0	47.0	26.9		35.0				
Max Q Clear Time (g_c+I1), s	7.0	19.8		24.0	40.6	26.3		21.4				
Green Ext Time (p_c), s	0.1	15.0		1.4	1.2	0.5		1.5				

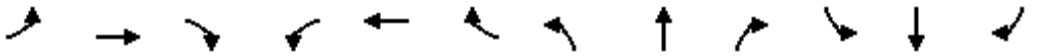
Intersection Summary		
HCM 6th Ctrl Delay		32.6
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1360	65
Future Volume (veh/h)	1360	65
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		1.00
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1856	1856
Adj Flow Rate, veh/h	1432	66
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	3	3
Cap, veh/h	3148	145
Arrive On Green	0.63	0.63
Sat Flow, veh/h	4962	229
Grp Volume(v), veh/h	975	523
Grp Sat Flow(s),veh/h/ln	1689	1813
Q Serve(g_s), s	17.8	17.8
Cycle Q Clear(g_c), s	17.8	17.8
Prop In Lane		0.13
Lane Grp Cap(c), veh/h	2143	1150
V/C Ratio(X)	0.45	0.45
Avail Cap(c_a), veh/h	2143	1150
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	11.3	11.3
Incr Delay (d2), s/veh	0.7	1.3
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	7.2
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	12.0	12.6
LnGrp LOS	B	B
Approach Vol, veh/h	2082	
Approach Delay, s/veh	25.4	
Approach LOS	C	
Timer - Assigned Phs		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	325	1015	0	0	615	370	130	235	560	0	0	0
Future Volume (veh/h)	325	1015	0	0	615	370	130	235	560	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	335	1046	0	0	634	0	134	398	410			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	1153	2134	0	0	750		514	540	457			
Arrive On Green	0.67	1.00	0.00	0.00	0.07	0.00	0.29	0.29	0.29			
Sat Flow, veh/h	3456	3647	0	0	3647	1585	1781	1870	1585			
Grp Volume(v), veh/h	335	1046	0	0	634	0	134	398	410			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1777	1585	1781	1870	1585			
Q Serve(g_s), s	3.6	0.0	0.0	0.0	15.9	0.0	5.2	17.3	22.3			
Cycle Q Clear(g_c), s	3.6	0.0	0.0	0.0	15.9	0.0	5.2	17.3	22.3			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1153	2134	0	0	750		514	540	457			
V/C Ratio(X)	0.29	0.49	0.00	0.00	0.85		0.26	0.74	0.90			
Avail Cap(c_a), veh/h	1153	2134	0	0	750		614	644	546			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.87	0.87	0.00	0.00	0.78	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	10.6	0.0	0.0	0.0	40.4	0.0	24.6	28.9	30.7			
Incr Delay (d2), s/veh	0.0	0.7	0.0	0.0	9.0	0.0	0.1	2.7	14.2			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.2	0.2	0.0	0.0	8.4	0.0	2.1	7.8	9.9			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.6	0.7	0.0	0.0	49.4	0.0	24.7	31.7	44.9			
LnGrp LOS	B	A	A	A	D		C	C	D			
Approach Vol, veh/h		1381			634	A		942				
Approach Delay, s/veh		3.1			49.4			36.4				
Approach LOS		A			D			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		59.0			35.0	24.0		31.0				
Change Period (Y+Rc), s		5.0			5.0	* 5		5.0				
Max Green Setting (Gmax), s		49.0			26.0	* 19		31.0				
Max Q Clear Time (g_c+I1), s		2.0			5.6	17.9		24.3				
Green Ext Time (p_c), s		13.5			0.6	0.6		1.6				

Intersection Summary	
HCM 6th Ctrl Delay	23.7
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

1: Train & Scott Street Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.1	0.1	0.0
Total Del/Veh (s)	2.9	9.0	5.0	5.0
Vehicles Entered	233	124	23	380
Vehicles Exited	233	124	23	380
Hourly Exit Rate	233	124	23	380
Input Volume	236	128	24	387
% of Volume	99	97	97	98
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott Street Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.5	0.4	0.3	0.2	0.3	0.2
Total Del/Veh (s)	6.2	11.2	4.3	4.2	5.1	3.1	10.7	12.7	11.4	12.5	9.7	10.0
Vehicles Entered	20	17	10	36	10	70	5	196	102	114	96	19
Vehicles Exited	20	17	10	37	10	70	5	195	103	113	97	19
Hourly Exit Rate	20	17	10	37	10	70	5	195	103	113	97	19
Input Volume	20	15	10	40	10	70	5	195	100	120	100	20
% of Volume	101	111	98	92	98	100	100	100	103	94	97	96
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott Street Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	10.1
Vehicles Entered	695
Vehicles Exited	696
Hourly Exit Rate	696
Input Volume	705
% of Volume	99
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0		0.0	0.3	0.4	0.3	0.2	0.2
Total Del/Veh (s)	7.3		5.2	8.1	8.4	7.2	5.0	7.4
Vehicles Entered	124	0	108	82	274	162	32	782
Vehicles Exited	124	0	108	82	273	162	32	781
Hourly Exit Rate	124	0	108	82	273	162	32	781
Input Volume	130	0	105	85	275	165	35	796
% of Volume	95	0	103	96	99	98	91	98
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	14.5
Vehicles Entered	1173
Vehicles Exited	1173
Hourly Exit Rate	1173
Input Volume	3398
% of Volume	35
Denied Entry Before	0
Denied Entry After	0

Intersection: 1: Train & Scott Street

Movement	EB	WB	SB
Directions Served	T	T	T
Maximum Queue (ft)	87	106	44
Average Queue (ft)	57	31	16
95th Queue (ft)	83	84	45
Link Distance (ft)	4	139	475
Upstream Blk Time (%)	14	0	
Queuing Penalty (veh)	34	0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Dollar Ave/Herman Ave & Scott Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	56	64	215	176
Average Queue (ft)	26	34	80	82
95th Queue (ft)	49	50	162	140
Link Distance (ft)	525	4	1115	1863
Upstream Blk Time (%)		8		
Queuing Penalty (veh)		9		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

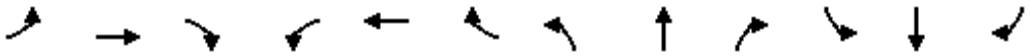
Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	136	166	121
Average Queue (ft)	65	84	59
95th Queue (ft)	111	133	97
Link Distance (ft)	184	938	791
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 43

2040 Plus Project (CPP) PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	90	390	370	5	130	460	0	0	345	110
Future Volume (vph)	0	0	90	390	370	5	130	460	0	0	345	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			0.99	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.96	
Flt Protected			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)			1565	1633	1739			3489			3279	
Flt Permitted			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (perm)			1565	1633	1739			3489			3279	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	99	429	407	5	143	505	0	0	379	121
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	69	0
Lane Group Flow (vph)	0	0	99	386	455	0	0	648	0	0	431	0
Confl. Peds. (#/hr)												15
Heavy Vehicles (%)	0%	0%	5%	5%	3%	0%	0%	3%	0%	0%	5%	5%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			12.5	12.4	12.4			12.5			11.9	
Effective Green, g (s)			13.1	12.4	12.4			13.1			12.5	
Actuated g/C Ratio			0.26	0.25	0.25			0.26			0.25	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			410	404	431			914			819	
v/s Ratio Prot			0.06					c0.19			c0.13	
v/s Ratio Perm				0.24	0.26							
v/c Ratio			0.24	0.96	1.06			0.71			0.53	
Uniform Delay, d1			14.5	18.5	18.8			16.7			16.2	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			0.4	34.9	58.8			2.7			0.6	
Delay (s)			15.0	53.4	77.6			19.4			16.8	
Level of Service			B	D	E			B			B	
Approach Delay (s)		15.0			66.5			19.4			16.8	
Approach LOS		B			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	37.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

09/28/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	415	230	25	325	460	10	970	510
Future Volume (veh/h)	415	230	25	325	460	10	970	510
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.99
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1657	1710		1657	1657		1657	1657
Adj Flow Rate, veh/h	536	0		346	489		1032	249
Peak Hour Factor	0.94	0.94		0.94	0.94		0.94	0.94
Percent Heavy Veh, %	4	0		4	4		4	4
Cap, veh/h	623	286		1214	2256		862	381
Arrive On Green	0.20	0.00		0.40	0.72		0.27	0.27
Sat Flow, veh/h	3156	1449		3061	3230		3230	1391
Grp Volume(v), veh/h	536	0		346	489		1032	249
Grp Sat Flow(s),veh/h/ln	1578	1449		1530	1574		1574	1391
Q Serve(g_s), s	16.4	0.0		7.7	5.2		27.4	15.8
Cycle Q Clear(g_c), s	16.4	0.0		7.7	5.2		27.4	15.8
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	623	286		1214	2256		862	381
V/C Ratio(X)	0.86	0.00		0.28	0.22		1.20	0.65
Avail Cap(c_a), veh/h	915	420		1214	2256		862	381
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.94	0.00		0.77	0.77		0.09	0.09
Uniform Delay (d), s/veh	38.8	0.0		20.5	4.8		36.3	32.1
Incr Delay (d2), s/veh	3.8	0.0		0.0	0.2		89.6	0.8
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	0.0		2.7	1.4		20.9	5.3
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	42.6	0.0		20.6	4.9		125.9	32.9
LnGrp LOS	D	A		C	A		F	C
Approach Vol, veh/h	536				835		1281	
Approach Delay, s/veh	42.6				11.4		107.8	
Approach LOS	D				B		F	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	44.3	32.0				76.3		23.7
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	31.0	* 27				52.4		29.0
Max Q Clear Time (g_c+I1), s	9.7	29.4				7.2		18.4
Green Ext Time (p_c), s	0.9	0.0				2.1		1.3

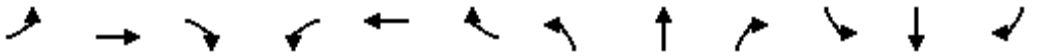
Intersection Summary	
HCM 6th Ctrl Delay	64.3
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

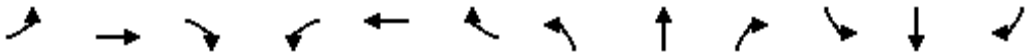


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	215	65	90	820	270	330	75	580	190	195	535	145
Future Volume (vph)	215	65	90	820	270	330	75	580	190	195	535	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.96		1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.95
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (prot)		2905		3060	1660	1381	1547	3094	1384	1408	2948	1309
Flt Permitted		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (perm)		2905		3060	1660	1381	1547	3094	1384	1408	2948	1309
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	222	67	93	845	278	340	77	598	196	201	552	149
RTOR Reduction (vph)	0	27	0	0	0	258	0	0	0	0	0	112
Lane Group Flow (vph)	0	355	0	845	278	82	77	598	196	133	620	37
Confl. Peds. (#/hr)			95									10
Confl. Bikes (#/hr)			5			10			5			
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	5%	5%	5%	5%	5%	5%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		21.6		29.1	29.1	29.1	21.1	21.1	89.5	29.5	29.5	29.5
Effective Green, g (s)		21.6		29.1	29.1	29.1	21.1	21.1	89.5	29.5	29.5	29.5
Actuated g/C Ratio		0.18		0.24	0.24	0.24	0.18	0.18	0.75	0.25	0.25	0.25
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		522		742	402	334	272	544	1032	346	724	321
v/s Ratio Prot		c0.12		c0.28	0.17		0.05	c0.19	0.14	0.09	c0.21	
v/s Ratio Perm						0.06						0.03
v/c Ratio		0.68		1.14	0.69	0.25	0.28	1.10	0.19	0.38	0.86	0.11
Uniform Delay, d1		46.0		45.5	41.4	36.6	42.9	49.5	4.5	37.7	43.2	35.1
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.8		78.3	5.1	0.4	0.4	68.5	0.1	3.2	12.4	0.7
Delay (s)		48.7		123.8	46.4	37.0	43.3	118.0	4.6	40.9	55.7	35.8
Level of Service		D		F	D	D	D	F	A	D	E	D
Approach Delay (s)		48.7			88.9			85.9			50.2	
Approach LOS		D			F			F			D	

Intersection Summary			
HCM 2000 Control Delay	74.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	97.1%	ICU Level of Service	F
Analysis Period (min)	15		

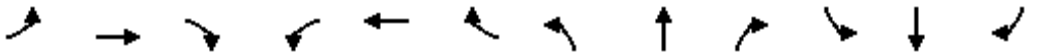
! Phase conflict between lane groups.

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	210	40	425	270	35	25	265	435	50	290	50
Future Volume (vph)	45	210	40	425	270	35	25	265	435	50	290	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		0.99		1.00	0.99			1.00	1.00		0.99	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	0.98			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2722		1413	1451			1481	2224		1436	
Flt Permitted		0.99		0.95	1.00			0.90	1.00		0.69	
Satd. Flow (perm)		2722		1413	1451			1337	2224		1002	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	48	226	43	457	290	38	27	285	468	54	312	54
RTOR Reduction (vph)	0	14	0	0	5	0	0	0	185	0	6	0
Lane Group Flow (vph)	0	303	0	457	323	0	0	312	283	0	414	0
Confl. Peds. (#/hr)			20			15			15			25
Confl. Bikes (#/hr)			5			5			5			10
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		23.5		32.7	32.7			23.8	60.0		23.8	
Effective Green, g (s)		23.0		32.2	32.2			22.8	54.5		22.8	
Actuated g/C Ratio		0.26		0.36	0.36			0.25	0.61		0.25	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		695		505	519			338	1346		253	
v/s Ratio Prot		c0.11		c0.32	0.22				0.13			
v/s Ratio Perm								0.23			c0.41	
v/c Ratio		0.44		0.90	0.62			0.92	0.21		1.64	
Uniform Delay, d1		28.1		27.4	23.9			32.7	8.0		33.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		2.0		19.2	1.7			29.5	0.0		303.7	
Delay (s)		30.0		46.7	25.5			62.3	8.1		337.3	
Level of Service		C		D	C			E	A		F	
Approach Delay (s)		30.0			37.8			29.7			337.3	
Approach LOS		C			D			C			F	

Intersection Summary			
HCM 2000 Control Delay	88.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	245	215	870	300	430	125	20	260	185	885	195
Future Volume (veh/h)	265	245	215	870	300	430	125	20	260	185	885	195
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1811	1811	1811	1811	1811	1678	1678	1678	1856	1856	1856
Adj Flow Rate, veh/h	300	229	0	916	316	0	132	21	0	195	932	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	6	6	6	15	15	15	3	3	3
Cap, veh/h	526	276		992	521		146	651		349	1119	
Arrive On Green	0.15	0.15	0.00	0.29	0.29	0.00	0.09	0.20	0.00	0.20	0.32	0.00
Sat Flow, veh/h	3450	1811	1535	3450	1811	1535	1598	3272	0	1767	3526	1572
Grp Volume(v), veh/h	300	229	0	916	316	0	132	21	0	195	932	0
Grp Sat Flow(s),veh/h/ln	1725	1811	1535	1725	1811	1535	1598	1594	0	1767	1763	1572
Q Serve(g_s), s	9.7	14.7	0.0	30.9	18.1	0.0	9.8	0.6	0.0	11.9	29.4	0.0
Cycle Q Clear(g_c), s	9.7	14.7	0.0	30.9	18.1	0.0	9.8	0.6	0.0	11.9	29.4	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	526	276		992	521		146	651		349	1119	
V/C Ratio(X)	0.57	0.83		0.92	0.61		0.90	0.03		0.56	0.83	
Avail Cap(c_a), veh/h	632	332		1018	534		146	651		349	1119	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.77	0.77	0.00	0.09	0.09	0.00	1.00	1.00	0.00	0.09	0.09	0.00
Uniform Delay (d), s/veh	47.2	49.3	0.0	41.5	36.9	0.0	54.0	38.3	0.0	43.4	38.0	0.0
Incr Delay (d2), s/veh	0.3	9.3	0.0	1.6	0.2	0.0	45.4	0.1	0.0	0.6	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	7.4	0.0	13.4	8.1	0.0	5.8	0.3	0.0	5.2	12.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.5	58.7	0.0	43.1	37.1	0.0	99.4	38.3	0.0	44.0	38.7	0.0
LnGrp LOS	D	E		D	D		F	D		D	D	
Approach Vol, veh/h		529	A		1232	A		153	A		1127	A
Approach Delay, s/veh		52.3			41.5			91.0			39.6	
Approach LOS		D			D			F			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.0	43.0		22.9	28.6	29.4		39.1				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	11.0	33.5		22.0	20.0	* 25		35.4				
Max Q Clear Time (g_c+I1), s	11.8	31.4		16.7	13.9	2.6		32.9				
Green Ext Time (p_c), s	0.0	1.3		0.9	0.2	0.0		1.6				

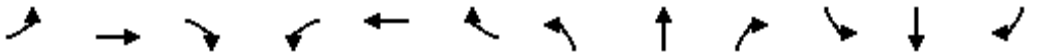
Intersection Summary		
HCM 6th Ctrl Delay	45.2	
HCM 6th LOS	D	

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	170	400	110	425	30	495	300	110	20	420	730
Future Volume (veh/h)	75	170	400	110	425	30	495	300	110	20	420	730
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		1.00	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1781	1781	1781	1811	1811	1811	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	80	181	149	117	452	28	527	319	0	21	447	591
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	8	8	8	6	6	6	9	9	9	4	4	4
Cap, veh/h	146	422	354	159	415	26	712	732		486	510	410
Arrive On Green	0.09	0.24	0.24	0.09	0.24	0.24	0.22	0.22	0.00	0.28	0.28	0.28
Sat Flow, veh/h	1697	1781	1471	1725	1683	104	3264	3445	0	1753	1841	1481
Grp Volume(v), veh/h	80	181	149	117	0	480	527	319	0	21	447	591
Grp Sat Flow(s),veh/h/ln	1697	1781	1471	1725	0	1787	1632	1678	0	1753	1841	1481
Q Serve(g_s), s	4.7	9.1	9.0	6.9	0.0	25.4	15.7	8.6	0.0	0.9	24.3	29.1
Cycle Q Clear(g_c), s	4.7	9.1	9.0	6.9	0.0	25.4	15.7	8.6	0.0	0.9	24.3	29.1
Prop In Lane	1.00		1.00	1.00		0.06	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	146	422	354	159	0	443	712	732		486	510	410
V/C Ratio(X)	0.55	0.43	0.42	0.74	0.00	1.08	0.74	0.44		0.04	0.88	1.44
Avail Cap(c_a), veh/h	162	431	356	164	0	432	726	747		486	510	410
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	0.76	1.00	0.00	1.00	0.88	0.88	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.0	35.3	33.7	46.4	0.0	39.5	38.3	35.5	0.0	27.8	36.2	37.9
Incr Delay (d2), s/veh	0.9	0.4	0.5	13.4	0.0	66.9	6.0	1.7	0.0	0.0	15.2	211.5
Initial Q Delay(d3),s/veh	0.0	11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	6.8	3.2	3.6	0.0	19.5	6.8	3.6	0.0	0.4	12.9	34.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.9	47.6	34.2	59.8	0.0	106.4	44.3	37.1	0.0	27.8	51.4	249.5
LnGrp LOS	D	D	C	E	A	F	D	D		C	D	F
Approach Vol, veh/h		410			597			846	A		1059	
Approach Delay, s/veh		42.6			97.3			41.6			161.5	
Approach LOS		D			F			D			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.7	29.4		28.0	13.0	30.0		34.0				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.0	4.6		4.9				
Max Green Setting (Gmax), s	10.0	25.4		22.4	10.0	25.4		29.1				
Max Q Clear Time (g_c+I1), s	8.9	11.1		17.7	6.7	27.4		31.1				
Green Ext Time (p_c), s	0.0	1.1		1.4	0.0	0.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		96.7	
HCM 6th LOS		F	

Notes

User approved volume balancing among the lanes for turning movement.

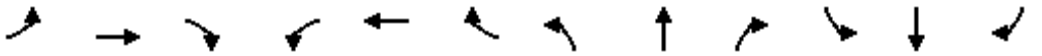
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	450	30	310	40	50	35	10	405	395	50	25	30
Future Volume (vph)	450	30	310	40	50	35	10	405	395	50	25	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00		1.00	0.95			1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	0.96		1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Frt	1.00	1.00	0.85		1.00	0.85		1.00	0.98			1.00
Flt Protected	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (prot)	1618	1631	2682		1753	1467		1703	3304			1703
Flt Permitted	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (perm)	1618	1631	2682		1753	1467		1703	3304			1703
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	469	31	323	42	52	36	10	422	411	52	26	31
RTOR Reduction (vph)	0	0	259	0	0	30	0	0	8	0	0	0
Lane Group Flow (vph)	239	261	64	0	94	6	0	432	455	0	0	57
Confl. Peds. (#/hr)	25					25				35		35
Confl. Bikes (#/hr)										5		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	Prot	NA		Prot	Prot
Protected Phases	4	4		3	3		5	5	2		1	1
Permitted Phases			4			3						
Actuated Green, G (s)	18.0	18.0	18.0		16.2	16.2		20.7	35.3			7.0
Effective Green, g (s)	18.0	18.0	18.0		16.2	16.2		20.7	35.3			7.0
Actuated g/C Ratio	0.20	0.20	0.20		0.18	0.18		0.23	0.39			0.08
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0			3.0
Lane Grp Cap (vph)	318	321	528		311	260		386	1277			130
v/s Ratio Prot	0.15	c0.16			c0.05			c0.25	0.14			0.03
v/s Ratio Perm			0.02			0.00						
v/c Ratio	0.75	0.81	0.12		0.30	0.02		1.12	0.36			0.44
Uniform Delay, d1	34.5	35.0	30.1		32.6	31.0		35.3	19.9			40.3
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Incremental Delay, d2	9.6	14.5	0.1		0.6	0.0		82.2	0.2			2.4
Delay (s)	44.2	49.5	30.2		33.2	31.1		117.5	20.1			42.6
Level of Service	D	D	C		C	C		F	C			D
Approach Delay (s)		40.4			32.6				67.1			
Approach LOS		D			C				E			

Intersection Summary			
HCM 2000 Control Delay	48.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	91.3	Sum of lost time (s)	15.8
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	695	255
Future Volume (vph)	695	255
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.1	4.1
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	0.97
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3406	1481
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3406	1481
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	724	266
RTOR Reduction (vph)	0	203
Lane Group Flow (vph)	724	63
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		5
Heavy Vehicles (%)	6%	6%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	21.6	21.6
Effective Green, g (s)	21.6	21.6
Actuated g/C Ratio	0.24	0.24
Clearance Time (s)	4.1	4.1
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	805	350
v/s Ratio Prot	c0.21	
v/s Ratio Perm		0.04
v/c Ratio	0.90	0.18
Uniform Delay, d1	33.8	27.8
Progression Factor	1.00	1.00
Incremental Delay, d2	12.8	0.2
Delay (s)	46.6	28.0
Level of Service	D	C
Approach Delay (s)	41.7	
Approach LOS	D	

Intersection Summary



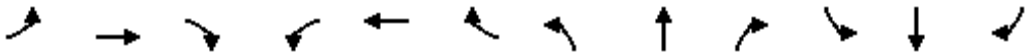
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	375	20	95	710	805	100	95	275	240	115	85
Future Volume (veh/h)	55	375	20	95	710	805	100	95	275	240	115	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	56	383	18	97	724	611	102	97	0	245	117	67
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	87	777	37	113	848	701	118	112		294	184	106
Arrive On Green	0.05	0.44	0.43	0.06	0.45	0.45	0.12	0.12	0.00	0.16	0.16	0.17
Sat Flow, veh/h	1795	1786	84	1795	1885	1559	942	896	1598	1795	1125	644
Grp Volume(v), veh/h	56	0	401	97	724	611	199	0	0	245	0	184
Grp Sat Flow(s),veh/h/ln	1795	0	1870	1795	1885	1559	1838	0	1598	1795	0	1769
Q Serve(g_s), s	2.3	0.0	11.6	4.0	25.8	26.6	8.0	0.0	0.0	9.9	0.0	7.3
Cycle Q Clear(g_c), s	2.3	0.0	11.6	4.0	25.8	26.6	8.0	0.0	0.0	9.9	0.0	7.3
Prop In Lane	1.00		0.04	1.00		1.00	0.51		1.00	1.00		0.36
Lane Grp Cap(c), veh/h	87	0	814	113	848	701	230	0		294	0	290
V/C Ratio(X)	0.64	0.00	0.49	0.86	0.85	0.87	0.87	0.00		0.83	0.00	0.63
Avail Cap(c_a), veh/h	132	0	832	187	897	742	252	0		538	0	530
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	35.1	0.0	15.3	34.8	18.4	18.7	32.2	0.0	0.0	30.4	0.0	29.2
Incr Delay (d2), s/veh	3.0	0.0	0.7	9.6	8.1	11.0	22.7	0.0	0.0	2.4	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	4.7	2.0	11.5	10.3	4.8	0.0	0.0	4.4	0.0	3.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.0	0.0	15.9	44.4	26.6	29.7	54.9	0.0	0.0	32.8	0.0	30.1
LnGrp LOS	D	A	B	D	C	C	D	A		C	A	C
Approach Vol, veh/h		457			1432			199	A		429	
Approach Delay, s/veh		18.6			29.1			54.9			31.6	
Approach LOS		B			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.6	37.8		16.3	8.7	36.7		13.4				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	6.0	35.2		23.0	8.3	32.9		10.8				
Max Q Clear Time (g_c+I1), s	4.3	28.6		11.9	6.0	13.6		10.0				
Green Ext Time (p_c), s	0.0	4.6		0.9	0.0	3.3		0.1				

Intersection Summary												
HCM 6th Ctrl Delay			29.7									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	780	105	510	1215	0	390	0	220	0	10	10
Future Volume (veh/h)	10	780	105	510	1215	0	390	0	220	0	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	10	788	54	515	1227	0	413	0	40	0	10	8
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	12	1021	447	677	1421	0	511	0	225	0	18	14
Arrive On Green	0.28	0.28	0.28	0.38	0.38	0.00	0.14	0.00	0.14	0.00	0.02	0.02
Sat Flow, veh/h	44	3630	1589	1795	3770	0	3591	0	1581	0	959	767
Grp Volume(v), veh/h	428	370	54	515	1227	0	413	0	40	0	0	18
Grp Sat Flow(s),veh/h/ln	1883	1791	1589	1795	1885	0	1795	0	1581	0	0	1727
Q Serve(g_s), s	18.7	16.6	2.2	22.2	26.6	0.0	9.9	0.0	2.0	0.0	0.0	0.9
Cycle Q Clear(g_c), s	18.7	16.6	2.2	22.2	26.6	0.0	9.9	0.0	2.0	0.0	0.0	0.9
Prop In Lane	0.02		1.00	1.00		0.00	1.00		1.00	0.00		0.44
Lane Grp Cap(c), veh/h	530	504	447	677	1421	0	511	0	225	0	0	32
V/C Ratio(X)	0.81	0.73	0.12	0.76	0.86	0.00	0.81	0.00	0.18	0.00	0.00	0.56
Avail Cap(c_a), veh/h	875	832	738	733	1539	0	954	0	420	0	0	381
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	29.6	28.8	23.6	24.1	25.5	0.0	36.8	0.0	33.4	0.0	0.0	42.9
Incr Delay (d2), s/veh	2.2	1.6	0.1	4.1	4.9	0.0	1.2	0.0	0.1	0.0	0.0	5.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.2	6.9	0.8	9.4	11.9	0.0	4.3	0.0	0.7	0.0	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.8	30.4	23.7	28.2	30.4	0.0	37.9	0.0	33.5	0.0	0.0	48.5
LnGrp LOS	C	C	C	C	C	A	D	A	C	A	A	D
Approach Vol, veh/h		852			1742			453			18	
Approach Delay, s/veh		30.7			29.7			37.5			48.5	
Approach LOS		C			C			D			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		37.3		16.6		28.9		5.6				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		28.6		11.9		20.7		2.9				
Green Ext Time (p_c), s		4.6		0.7		3.8		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	31.2	
HCM 6th LOS	C	

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

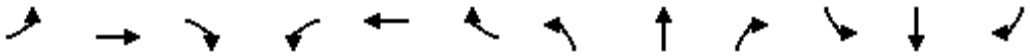
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	755	230	190	1150	545	185
Future Volume (veh/h)	755	230	190	1150	545	185
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.99	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	778	163	196	1186	562	49
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1
Cap, veh/h	1645	730	241	2391	745	342
Arrive On Green	0.46	0.46	0.13	0.67	0.21	0.21
Sat Flow, veh/h	3676	1589	1795	3676	3483	1598
Grp Volume(v), veh/h	778	163	196	1186	562	49
Grp Sat Flow(s),veh/h/ln	1791	1589	1795	1791	1742	1598
Q Serve(g_s), s	10.1	1.4	7.2	11.1	10.2	1.7
Cycle Q Clear(g_c), s	10.1	1.4	7.2	11.1	10.2	1.7
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1645	730	241	2391	745	342
V/C Ratio(X)	0.47	0.22	0.81	0.50	0.75	0.14
Avail Cap(c_a), veh/h	3289	1459	931	5359	1909	876
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.6	1.4	28.4	5.6	24.9	21.5
Incr Delay (d2), s/veh	0.3	0.2	2.5	0.2	1.6	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	1.2	3.0	2.6	4.1	0.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	12.9	1.6	30.9	5.8	26.5	21.7
LnGrp LOS	B	A	C	A	C	C
Approach Vol, veh/h	941			1382	611	
Approach Delay, s/veh	11.0			9.4	26.1	
Approach LOS	B			A	C	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	14.1	35.0				49.1	18.4
Change Period (Y+Rc), s	5.0	* 5				5.0	4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0	37.0
Max Q Clear Time (g_c+I1), s	9.2	12.1				13.1	12.2
Green Ext Time (p_c), s	0.1	10.2				18.2	2.2

Intersection Summary	
HCM 6th Ctrl Delay	13.4
HCM 6th LOS	B

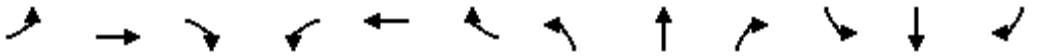
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



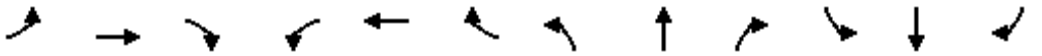
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	510	85	0	650	0	0	230	0	220	395	265
Future Volume (vph)	105	510	85	0	650	0	0	230	0	220	395	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7			2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95			0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00			1.00		1.00	1.00	
Frt	1.00	0.98			1.00			1.00		1.00	0.94	
Flt Protected	0.95	1.00			1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1770	3217			3303			1863		1770	3255	
Flt Permitted	0.95	1.00			1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1770	3217			3303			1863		1770	3255	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	111	537	89	0	684	0	0	242	0	232	416	279
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	0	0	87	0
Lane Group Flow (vph)	111	618	0	0	684	0	0	242	0	232	608	0
Confl. Peds. (#/hr)	50		20	20					25	25		40
Confl. Bikes (#/hr)			5									5
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	8.3	39.5			27.5			17.0		15.8	36.5	
Effective Green, g (s)	8.3	40.5			28.5			17.0		15.8	36.5	
Actuated g/C Ratio	0.10	0.49			0.34			0.20		0.19	0.44	
Clearance Time (s)	3.7	3.7			3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0			3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	176	1562			1128			379		335	1424	
v/s Ratio Prot	c0.06	c0.19			c0.21			c0.13		c0.13	0.19	
v/s Ratio Perm												
v/c Ratio	0.63	0.40			0.61			0.64		0.69	0.43	
Uniform Delay, d1	36.1	13.7			22.8			30.4		31.5	16.2	
Progression Factor	1.00	1.00			0.42			1.00		1.00	1.00	
Incremental Delay, d2	5.3	0.2			0.8			3.5		4.9	0.2	
Delay (s)	41.4	13.8			10.4			33.9		36.5	16.4	
Level of Service	D	B			B			C		D	B	
Approach Delay (s)		18.0			10.4			33.9			21.4	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	83.4	Sum of lost time (s)	14.8
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	545	0	195	575	90	10	0	200	0	40	210
Future Volume (vph)	140	545	0	195	575	90	10	0	200	0	40	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.98			1.00	0.85		0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.95	1.00		1.00	
Satd. Flow (prot)	1736	3471		1736	3389			1736	1516		1577	
Flt Permitted	0.95	1.00		0.95	1.00			0.52	1.00		1.00	
Satd. Flow (perm)	1736	3471		1736	3389			952	1516		1577	
Peak-hour factor, PHF	0.97	0.97	0.92	0.97	0.97	0.97	0.97	0.97	0.97	0.92	0.97	0.97
Adj. Flow (vph)	144	562	0	201	593	93	10	0	206	0	41	216
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	116	0	119	0
Lane Group Flow (vph)	144	562	0	201	676	0	0	10	90	0	138	0
Confl. Peds. (#/hr)				10					15			
Confl. Bikes (#/hr)						5						5
Heavy Vehicles (%)	4%	4%	2%	4%	4%	4%	4%	4%	4%	2%	4%	4%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	11.2	21.4		14.4	24.6			36.5	36.5		36.5	
Effective Green, g (s)	11.2	21.4		14.4	25.6			37.5	36.5		37.5	
Actuated g/C Ratio	0.13	0.26		0.17	0.31			0.45	0.44		0.45	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	233	890		299	1040			428	663		709	
v/s Ratio Prot	0.08	0.16		c0.12	c0.20						c0.09	
v/s Ratio Perm								0.01	0.06			
v/c Ratio	0.62	0.63		0.67	0.65			0.02	0.14		0.19	
Uniform Delay, d1	34.1	27.5		32.3	25.0			12.8	14.0		13.8	
Progression Factor	1.03	0.95		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	3.1	1.3		4.6	1.5			0.0	0.1		0.1	
Delay (s)	38.4	27.6		36.9	26.5			12.8	14.1		14.0	
Level of Service	D	C		D	C			B	B		B	
Approach Delay (s)		29.8			28.9			14.1			14.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	83.4	Sum of lost time (s)	14.8
Intersection Capacity Utilization	51.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	580	205	455	975	0	0	0	0	220	150	325
Future Volume (veh/h)	0	580	205	455	975	0	0	0	0	220	150	325
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	637	0	500	1071	0				161	323	60
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1037		1845	2840	0				225	473	200
Arrive On Green	0.00	0.20	0.00	1.00	1.00	0.00				0.12	0.12	0.12
Sat Flow, veh/h	0	5358	1610	3510	3705	0				1810	3800	1610
Grp Volume(v), veh/h	0	637	0	500	1071	0				161	323	60
Grp Sat Flow(s),veh/h/ln	0	1729	1610	1755	1805	0				1810	1900	1610
Q Serve(g_s), s	0.0	10.1	0.0	0.0	0.0	0.0				7.7	7.3	3.0
Cycle Q Clear(g_c), s	0.0	10.1	0.0	0.0	0.0	0.0				7.7	7.3	3.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1037		1845	2840	0				225	473	200
V/C Ratio(X)	0.00	0.61		0.27	0.38	0.00				0.71	0.68	0.30
Avail Cap(c_a), veh/h	0	1037		1845	2840	0				362	760	322
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.62	0.62	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	32.8	0.0	0.0	0.0	0.0				37.9	37.7	35.8
Incr Delay (d2), s/veh	0.0	2.7	0.0	0.0	0.2	0.0				1.6	0.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.3	0.0	0.0	0.1	0.0				3.4	3.4	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	35.5	0.0	0.0	0.2	0.0				39.4	38.4	36.1
LnGrp LOS	A	D		A	A	A				D	D	D
Approach Vol, veh/h		637	A		1571						544	
Approach Delay, s/veh		35.5			0.2						38.4	
Approach LOS		D			A						D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	52.8	22.0		15.2		74.8
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	42.5	* 17		17.6		63.0
Max Q Clear Time (g_c+I1), s	2.0	12.1		9.7		2.0
Green Ext Time (p_c), s	0.9	2.2		1.1		15.3

Intersection Summary		
HCM 6th Ctrl Delay		15.9
HCM 6th LOS		B

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	32.6
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	35	20	25	250	0	100	15	0	395	150	145	720
Future Vol, veh/h	35	20	25	250	0	100	15	0	395	150	145	720
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	20	26	255	0	102	15	0	403	153	148	735
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	15.2	47.8	36.4	25.7
HCM LOS	C	E	E	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	44%	71%	100%	0%	0%
Vol Thru, %	100%	57%	25%	0%	0%	100%	100%
Vol Right, %	0%	43%	31%	29%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	213	348	80	350	145	360	360
LT Vol	0	0	35	250	145	0	0
Through Vol	213	198	20	0	0	360	360
RT Vol	0	150	25	100	0	0	0
Lane Flow Rate	217	355	82	357	148	367	367
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.541	0.854	0.22	0.87	0.348	0.811	0.628
Departure Headway (Hd)	8.989	8.673	9.717	8.773	8.468	7.95	6.154
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	401	418	370	414	426	456	588
Service Time	6.741	6.426	7.472	6.492	6.193	5.674	3.877
HCM Lane V/C Ratio	0.541	0.849	0.222	0.862	0.347	0.805	0.624
HCM Control Delay	21.9	45.2	15.2	47.8	15.7	36.8	18.7
HCM Lane LOS	C	E	C	E	C	E	C
HCM 95th-tile Q	3.1	8.3	0.8	8.7	1.5	7.5	4.4

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.98
Heavy Vehicles, %	2
Mvmt Flow	0
Number of Lanes	0

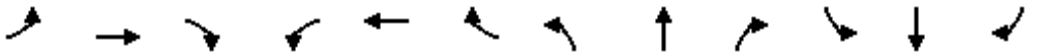
Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	520	505	40	455	825	0	0	0	0	185	0
Future Volume (vph)	0	520	505	40	455	825	0	0	0	0	185	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0					4.0	4.0
Lane Util. Factor		0.95			0.91	0.91					0.95	0.95
Frpb, ped/bikes		0.99			1.00	1.00					1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00					1.00	1.00
Frt		0.93			1.00	1.00					1.00	1.00
Flt Protected		1.00			0.95	0.99					0.95	0.95
Satd. Flow (prot)		3216			1595	3328					1665	1665
Flt Permitted		1.00			0.95	0.99					0.95	0.95
Satd. Flow (perm)		3216			1595	3328					1665	1665
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	547	532	42	479	868	0	0	0	0	195	0
RTOR Reduction (vph)	0	169	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	910	0	0	339	1050	0	0	0	0	97	98
Confl. Peds. (#/hr)	10		5		5		10					
Confl. Bikes (#/hr)							10					
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type		NA		Split	Split	NA					Split	NA
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		25.0			25.0	25.0					9.6	9.6
Effective Green, g (s)		26.0			26.0	26.0					10.1	10.1
Actuated g/C Ratio		0.35			0.35	0.35					0.14	0.14
Clearance Time (s)		5.0			5.0	5.0					4.5	4.5
Vehicle Extension (s)		3.0			3.0	3.0					3.0	3.0
Lane Grp Cap (vph)		1128			559	1167					226	226
v/s Ratio Prot		c0.28			0.21	c0.32					0.06	0.06
v/s Ratio Perm												
v/c Ratio		0.81			0.61	0.90					0.43	0.43
Uniform Delay, d1		21.8			19.8	22.8					29.4	29.4
Progression Factor		1.00			1.00	1.00					1.00	1.00
Incremental Delay, d2		4.3			1.9	9.4					1.3	1.3
Delay (s)		26.1			21.7	32.2					30.7	30.7
Level of Service		C			C	C					C	C
Approach Delay (s)		26.1				29.7			0.0			19.0
Approach LOS		C				C			A			B

Intersection Summary			
HCM 2000 Control Delay	26.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	74.1	Sum of lost time (s)	13.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

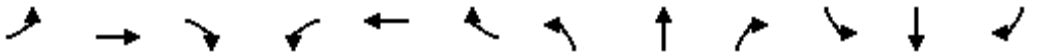
Movement	SBR
Lane Configurations	
Traffic Volume (vph)	335
Future Volume (vph)	335
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frpb, ped/bikes	1.00
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	353
RTOR Reduction (vph)	12
Lane Group Flow (vph)	341
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	3%
Turn Type	custom
Protected Phases	5
Permitted Phases	4
Actuated Green, G (s)	34.6
Effective Green, g (s)	36.6
Actuated g/C Ratio	0.49
Clearance Time (s)	5.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	774
v/s Ratio Prot	c0.15
v/s Ratio Perm	0.06
v/c Ratio	0.44
Uniform Delay, d1	12.1
Progression Factor	1.00
Incremental Delay, d2	0.4
Delay (s)	12.5
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	255	480	0	0	735	370	500	0	490	110	0	80
Future Volume (vph)	255	480	0	0	735	370	500	0	490	110	0	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.97		1.00	1.00	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3367	1827			3471	1507		1736	1553	1736		1553
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3367	1827			3471	1507		1736	1553	1736		1553
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	274	516	0	0	790	398	538	0	527	118	0	86
RTOR Reduction (vph)	0	0	0	0	0	294	0	0	190	0	0	78
Lane Group Flow (vph)	274	516	0	0	790	104	0	538	337	118	0	8
Confl. Peds. (#/hr)	10		5	5		10						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	13.2	42.0			24.3	24.3		31.5	31.5	9.6		9.6
Effective Green, g (s)	13.7	42.5			24.8	24.8		31.0	31.0	9.1		9.1
Actuated g/C Ratio	0.14	0.45			0.26	0.26		0.33	0.33	0.10		0.10
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	487	820			909	395		568	508	166		149
v/s Ratio Prot	0.08	c0.28			c0.23					c0.07		0.01
v/s Ratio Perm						0.07		0.31	0.22			
v/c Ratio	0.56	0.63			0.87	0.26		0.95	0.66	0.71		0.06
Uniform Delay, d1	37.7	20.0			33.3	27.7		31.0	27.3	41.5		38.8
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	1.5	1.1			8.6	0.1		24.8	2.5	11.3		0.1
Delay (s)	39.2	21.1			41.9	27.8		55.8	29.8	52.8		38.9
Level of Service	D	C			D	C		E	C	D		D
Approach Delay (s)		27.4			37.2			43.0			46.9	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	37.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	94.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	275	670	135	75	1195	190	105	130	50	175	130	475
Future Volume (veh/h)	275	670	135	75	1195	190	105	130	50	175	130	475
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945
Adj Flow Rate, veh/h	296	720	126	81	1285	204	113	140	54	188	140	511
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	622	2210	387	104	1321	208	72	369	142	219	121	1039
Arrive On Green	0.35	0.73	0.72	0.06	0.43	0.42	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1781	3022	529	1781	3073	484	781	1273	491	559	416	1597
Grp Volume(v), veh/h	296	423	423	81	739	750	113	0	194	328	0	511
Grp Sat Flow(s),veh/h/ln	1781	1777	1774	1781	1777	1780	781	0	1764	976	0	1597
Q Serve(g_s), s	13.0	8.4	8.5	4.5	40.6	41.5	0.0	0.0	8.8	20.2	0.0	0.0
Cycle Q Clear(g_c), s	13.0	8.4	8.5	4.5	40.6	41.5	29.0	0.0	8.8	29.0	0.0	0.0
Prop In Lane	1.00		0.30	1.00		0.27	1.00		0.28	0.57		1.00
Lane Grp Cap(c), veh/h	622	1299	1297	104	764	765	72	0	511	340	0	1039
V/C Ratio(X)	0.48	0.33	0.33	0.78	0.97	0.98	1.57	0.00	0.38	0.97	0.00	0.49
Avail Cap(c_a), veh/h	622	1299	1297	160	764	765	72	0	511	340	0	1039
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.84	0.84	0.40	0.40	0.40	1.00	0.00	1.00	0.89	0.00	0.89
Uniform Delay (d), s/veh	25.4	4.7	4.8	46.5	27.8	28.2	50.0	0.0	28.3	41.3	0.0	9.4
Incr Delay (d2), s/veh	0.2	0.6	0.6	2.2	14.1	16.4	312.7	0.0	0.2	36.8	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	2.5	2.5	2.0	19.1	20.0	8.1	0.0	3.7	11.7	0.0	5.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.6	5.3	5.4	48.6	41.9	44.6	362.7	0.0	28.5	78.1	0.0	9.5
LnGrp LOS	C	A	A	D	D	D	F	A	C	E	A	A
Approach Vol, veh/h		1142			1570			307			839	
Approach Delay, s/veh		10.6			43.6			151.5			36.3	
Approach LOS		B			D			F			D	

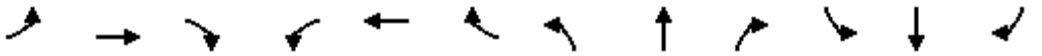
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	40.0	47.0		33.0	9.8	77.1		33.0				
Change Period (Y+Rc), s	5.0	* 5		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	16.0	* 42		29.0	9.0	49.0		29.0				
Max Q Clear Time (g_c+I1), s	15.0	43.5		31.0	6.5	10.5		31.0				
Green Ext Time (p_c), s	0.1	0.0		0.0	0.0	8.8		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		40.8	
HCM 6th LOS		D	

Notes

User approved pedestrian interval to be less than phase max green.

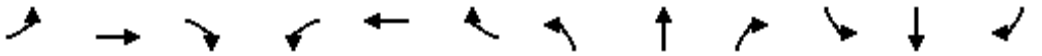
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	490	0	1185	0	2025	435	0	2010	665
Future Volume (vph)	0	0	0	490	0	1185	0	2025	435	0	2010	665
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0		5.0		4.0	4.0		4.0	4.0
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.93		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3467		2814		5136	1487		5136	1554
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3467		2814		5136	1487		5136	1554
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	510	0	1234	0	2109	453	0	2094	693
RTOR Reduction (vph)	0	0	0	0	0	6	0	0	234	0	0	274
Lane Group Flow (vph)	0	0	0	510	0	1228	0	2109	219	0	2094	419
Confl. Peds. (#/hr)							10		15	15		10
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				52.6		71.2		69.8	69.8		88.4	88.4
Effective Green, g (s)				52.2		66.9		70.2	70.2		88.8	88.8
Actuated g/C Ratio				0.35		0.45		0.47	0.47		0.59	0.59
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				1206		1255		2403	695		3040	919
v/s Ratio Prot				0.15		c0.44		c0.41			0.41	
v/s Ratio Perm									0.15			0.27
v/c Ratio				0.42		0.98		0.88	0.31		0.69	0.46
Uniform Delay, d1				37.4		40.9		36.0	24.9		21.1	17.1
Progression Factor				1.00		1.00		1.04	2.72		1.00	1.00
Incremental Delay, d2				0.1		20.1		3.1	0.7		1.3	1.6
Delay (s)				37.5		61.0		40.4	68.4		22.4	18.7
Level of Service				D		E		D	E		C	B
Approach Delay (s)		0.0			54.1			45.4			21.5	
Approach LOS		A			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	38.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		

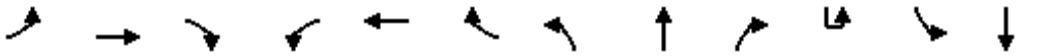
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	345	0	370	0	0	0	0	2115	630	0	1720	780
Future Volume (vph)	345	0	370	0	0	0	0	2115	630	0	1720	780
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1					3.9			3.9	3.9
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.90	0.85					0.97			1.00	0.85
Flt Protected	0.95	0.98	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1698	1515	1519					4757			5136	1505
Flt Permitted	0.95	0.98	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1698	1515	1519					4757			5136	1505
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	363	0	389	0	0	0	0	2226	663	0	1811	821
RTOR Reduction (vph)	0	26	26	0	0	0	0	0	0	0	0	199
Lane Group Flow (vph)	283	217	200	0	0	0	0	2889	0	0	1811	622
Confl. Peds. (#/hr)	5					5	10		20	20		10
Confl. Bikes (#/hr)												5
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	27.8	27.8	27.8					113.2			113.2	113.2
Effective Green, g (s)	28.3	28.3	28.3					113.7			113.7	113.7
Actuated g/C Ratio	0.19	0.19	0.19					0.76			0.76	0.76
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	320	285	286					3605			3893	1140
v/s Ratio Prot	c0.17	0.14						c0.61			0.35	
v/s Ratio Perm			0.13									0.41
v/c Ratio	0.88	0.76	0.70					0.80			0.47	0.55
Uniform Delay, d1	59.3	57.7	56.9					11.2			6.8	7.5
Progression Factor	1.00	1.00	1.00					2.16			0.22	4.24
Incremental Delay, d2	23.3	10.3	5.9					1.4			0.3	1.5
Delay (s)	82.6	68.0	62.8					25.5			1.8	33.3
Level of Service	F	E	E					C			A	C
Approach Delay (s)		71.9			0.0			25.5			11.6	
Approach LOS		E			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	345	435	335	315	465	290	345	1430	105	80	365	1305
Future Volume (vph)	345	435	335	315	465	290	345	1430	105	80	365	1305
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.6	4.6	3.0	3.2		3.0	3.6	3.6		3.0	4.1
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		0.97	0.91	1.00		0.97	0.91
Frpb, ped/bikes	1.00	1.00	0.96	1.00	0.98		1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85		1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	3574	1535	3467	3297		3467	5136	1523		3467	5136
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1787	3574	1535	3467	3297		3467	5136	1523		3467	5136
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	367	463	356	335	495	309	367	1521	112	85	388	1388
RTOR Reduction (vph)	0	0	102	0	66	0	0	0	61	0	0	0
Lane Group Flow (vph)	367	463	254	335	738	0	367	1521	51	0	473	1388
Confl. Peds. (#/hr)	35		20	20		35	5		20		20	
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	Prot	NA
Protected Phases	3	8		7	4		1	6		5	5	2
Permitted Phases			8						6			
Actuated Green, G (s)	31.5	47.5	47.5	17.2	34.6		16.7	49.4	49.4		19.7	51.9
Effective Green, g (s)	32.0	48.0	48.0	17.7	35.1		17.2	49.9	49.9		20.2	52.4
Actuated g/C Ratio	0.21	0.32	0.32	0.12	0.23		0.11	0.33	0.33		0.13	0.35
Clearance Time (s)	3.5	5.1	5.1	3.5	3.7		3.5	4.1	4.1		3.5	4.6
Vehicle Extension (s)	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2		0.2	0.2
Lane Grp Cap (vph)	381	1143	491	409	771		397	1708	506		466	1794
v/s Ratio Prot	c0.21	0.13		0.10	c0.22		0.11	c0.30			c0.14	0.27
v/s Ratio Perm			0.17						0.03			
v/c Ratio	0.96	0.41	0.52	0.82	0.96		0.92	0.89	0.10		1.02	0.77
Uniform Delay, d1	58.4	39.8	41.6	64.6	56.7		65.8	47.5	34.5		64.9	43.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.10	1.03
Incremental Delay, d2	36.1	0.1	0.4	11.5	22.1		26.6	7.4	0.4		43.1	3.0
Delay (s)	94.5	39.9	41.9	76.1	78.9		92.4	54.9	34.9		114.6	48.0
Level of Service	F	D	D	E	E		F	D	C		F	D
Approach Delay (s)		57.4			78.0			60.7				62.0
Approach LOS		E			E			E				E

Intersection Summary			
HCM 2000 Control Delay	63.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	245
Future Volume (vph)	245
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.1
Lane Util. Factor	1.00
Frpb, ped/bikes	0.98
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1566
Flt Permitted	1.00
Satd. Flow (perm)	1566
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	261
RTOR Reduction (vph)	60
Lane Group Flow (vph)	201
Confl. Peds. (#/hr)	5
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	1%
Turn Type	Perm
Protected Phases	
Permitted Phases	2
Actuated Green, G (s)	51.9
Effective Green, g (s)	52.4
Actuated g/C Ratio	0.35
Clearance Time (s)	4.6
Vehicle Extension (s)	0.2
Lane Grp Cap (vph)	547
v/s Ratio Prot	
v/s Ratio Perm	0.13
v/c Ratio	0.37
Uniform Delay, d1	36.4
Progression Factor	1.07
Incremental Delay, d2	1.7
Delay (s)	40.8
Level of Service	D
Approach Delay (s)	
Approach LOS	

Intersection Summary

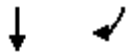
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	115	65	70	375	215	430	105	230	1900	330	95	275
Future Volume (veh/h)	115	65	70	375	215	430	105	230	1900	330	95	275
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.98		0.96		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885		1885	1885	1885		1885
Adj Flow Rate, veh/h	121	68	47	310	344	205		242	2000	235		289
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	1	1	1	1	1	1		1	1	1		1
Cap, veh/h	188	295	204	380	595	485		259	2248	693		301
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32		0.14	0.44	0.44		0.17
Sat Flow, veh/h	443	935	646	1266	1885	1536		1795	5147	1587		1795
Grp Volume(v), veh/h	121	0	115	310	344	205		242	2000	235		289
Grp Sat Flow(s),veh/h/ln	443	0	1581	1266	1885	1536		1795	1716	1587		1795
Q Serve(g_s), s	20.6	0.0	8.0	35.9	22.9	15.8		20.0	53.7	14.7		24.0
Cycle Q Clear(g_c), s	43.5	0.0	8.0	43.9	22.9	15.8		20.0	53.7	14.7		24.0
Prop In Lane	1.00		0.41	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	188	0	499	380	595	485		259	2248	693		301
V/C Ratio(X)	0.64	0.00	0.23	0.82	0.58	0.42		0.94	0.89	0.34		0.96
Avail Cap(c_a), veh/h	203	0	527	402	628	512		455	2248	693		323
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	61.2	0.0	37.8	54.1	43.0	40.5		63.5	38.9	27.9		61.9
Incr Delay (d2), s/veh	6.1	0.0	0.2	11.8	1.2	0.6		16.9	5.8	1.3		38.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	3.2	12.7	11.0	6.2		10.4	23.6	5.9		14.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.3	0.0	38.1	65.9	44.2	41.1		80.4	44.7	29.3		100.3
LnGrp LOS	E	A	D	E	D	D		F	D	C		F
Approach Vol, veh/h		236			859				2477			
Approach Delay, s/veh		53.1			51.3				46.7			
Approach LOS		D			D				D			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	25.6	73.0		51.3	29.1	69.5		51.3				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	39.0	49.6		50.3	28.0	60.6		50.3				
Max Q Clear Time (g_c+I1), s	22.0	35.0		45.9	26.0	55.7		45.5				
Green Ext Time (p_c), s	0.6	8.9		1.7	0.2	4.4		0.7				

Intersection Summary		
HCM 6th Ctrl Delay		46.8
HCM 6th LOS		D

Notes

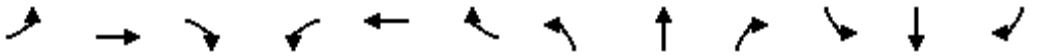
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1295	145
Future Volume (veh/h)	1295	145
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		0.99
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1885	1885
Adj Flow Rate, veh/h	1363	147
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	1	1
Cap, veh/h	2169	234
Arrive On Green	0.46	0.46
Sat Flow, veh/h	4713	508
Grp Volume(v), veh/h	992	518
Grp Sat Flow(s),veh/h/ln	1716	1790
Q Serve(g_s), s	32.9	33.0
Cycle Q Clear(g_c), s	32.9	33.0
Prop In Lane		0.28
Lane Grp Cap(c), veh/h	1579	824
V/C Ratio(X)	0.63	0.63
Avail Cap(c_a), veh/h	1579	824
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	30.7	30.8
Incr Delay (d2), s/veh	1.9	3.6
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.1	15.1
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	32.6	34.4
LnGrp LOS	C	C
Approach Vol, veh/h	1799	
Approach Delay, s/veh	44.0	
Approach LOS	D	
Timer - Assigned Phs		

HCM 6th Signalized Intersection Summary
31: 280 NB Off Ramp/280 NB On Ramp & San Bruno Avenue W

01/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	630	0	0	1085	720	350	600	455	0	0	0
Future Volume (veh/h)	155	630	0	0	1085	720	350	600	455	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1885	1885	1885			
Adj Flow Rate, veh/h	168	685	0	0	1179	0	380	652	495			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	1	1	1			
Cap, veh/h	194	1914	0	0	1556		676	710	600			
Arrive On Green	0.11	1.00	0.00	0.00	0.43	0.00	0.38	0.38	0.38			
Sat Flow, veh/h	3483	3676	0	0	3676	1598	1795	1885	1591			
Grp Volume(v), veh/h	168	685	0	0	1179	0	380	652	495			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1791	1598	1795	1885	1591			
Q Serve(g_s), s	4.3	0.0	0.0	0.0	25.0	0.0	15.1	29.7	25.3			
Cycle Q Clear(g_c), s	4.3	0.0	0.0	0.0	25.0	0.0	15.1	29.7	25.3			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	194	1914	0	0	1556		676	710	600			
V/C Ratio(X)	0.87	0.36	0.00	0.00	0.76		0.56	0.92	0.83			
Avail Cap(c_a), veh/h	194	1914	0	0	1556		698	733	619			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.79	0.79	0.00	0.00	0.32	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	39.7	0.0	0.0	0.0	21.5	0.0	22.2	26.7	25.4			
Incr Delay (d2), s/veh	25.6	0.4	0.0	0.0	1.1	0.0	0.5	15.8	8.1			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.4	0.1	0.0	0.0	10.0	0.0	6.1	15.5	10.3			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.3	0.4	0.0	0.0	22.6	0.0	22.7	42.5	33.5			
LnGrp LOS	E	A	A	A	C		C	D	C			
Approach Vol, veh/h		853			1179	A		1527				
Approach Delay, s/veh		13.2			22.6			34.7				
Approach LOS		B			C			C				

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		52.1			9.0	43.1		37.9				
Change Period (Y+Rc), s		5.0			4.0	5.0		5.0				
Max Green Setting (Gmax), s		46.0			5.0	37.0		34.0				
Max Q Clear Time (g_c+I1), s		2.0			6.3	27.0		31.7				
Green Ext Time (p_c), s		7.4			0.0	6.7		1.3				

Intersection Summary												
HCM 6th Ctrl Delay			25.5									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2: Train & Scott St Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.3	0.1	0.2
Total Del/Veh (s)	3.3	15.1	4.3	9.8
Vehicles Entered	176	237	22	435
Vehicles Exited	176	237	22	435
Hourly Exit Rate	176	237	22	435
Input Volume	172	234	24	429
% of Volume	103	101	93	101
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.4	0.4	0.3	0.3	0.4	0.3
Total Del/Veh (s)	5.7	10.2	4.7	4.8	2.3	3.4	10.9	14.0	12.1	13.5	10.5	8.3
Vehicles Entered	8	15	5	111	55	60	10	193	103	57	249	7
Vehicles Exited	8	15	5	111	54	60	11	193	102	57	249	6
Hourly Exit Rate	8	15	5	111	54	60	11	193	102	57	249	6
Input Volume	10	15	5	110	54	60	10	200	95	60	245	5
% of Volume	78	98	100	101	100	100	107	96	107	95	102	120
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	9.9
Vehicles Entered	873
Vehicles Exited	871
Hourly Exit Rate	871
Input Volume	871
% of Volume	100
Denied Entry Before	0
Denied Entry After	0

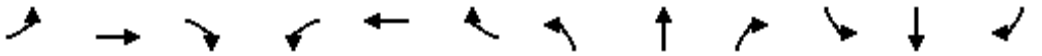
16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.3	0.3	0.4	0.4	0.3
Total Del/Veh (s)	6.1	4.3	6.4	6.4	9.3	7.1	7.1
Vehicles Entered	76	107	65	156	232	164	800
Vehicles Exited	76	107	65	155	232	164	799
Hourly Exit Rate	76	107	65	155	232	164	799
Input Volume	75	105	65	155	240	160	800
% of Volume	101	102	100	100	97	103	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.4
Total Del/Veh (s)	16.3
Vehicles Entered	1304
Vehicles Exited	1299
Hourly Exit Rate	1299
Input Volume	3756
% of Volume	35
Denied Entry Before	0
Denied Entry After	0

2040 Plus Project (CPP) No Int AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	115	650	175	5	55	170	0	0	415	45
Future Volume (vph)	0	0	115	650	175	5	55	170	0	0	415	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.6	4.0	4.0			4.6			4.6	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			0.99	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	1.00			1.00			0.99	
Flt Protected			1.00	0.95	0.97			0.99			1.00	
Satd. Flow (prot)			1580	1649	1684			3429			3401	
Flt Permitted			1.00	0.95	0.97			0.99			1.00	
Satd. Flow (perm)			1580	1649	1684			3429			3401	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	0	131	739	199	6	62	193	0	0	472	51
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	8	0
Lane Group Flow (vph)	0	0	131	466	478	0	0	256	0	0	515	0
Confl. Peds. (#/hr)							10					10
Confl. Bikes (#/hr)									5			5
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	2%	4%	4%	4%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			15.0	43.4	43.4			15.0			28.4	
Effective Green, g (s)			15.0	43.4	43.4			15.0			28.4	
Actuated g/C Ratio			0.15	0.43	0.43			0.15			0.28	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			237	715	730			514			965	
v/s Ratio Prot			c0.08					0.07			c0.15	
v/s Ratio Perm				0.28	0.28							
v/c Ratio			0.55	0.65	0.65			0.50			0.53	
Uniform Delay, d1			39.4	22.3	22.4			39.0			30.2	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			3.4	4.6	4.5			1.0			2.1	
Delay (s)			42.8	26.9	26.9			40.1			32.3	
Level of Service			D	C	C			D			C	
Approach Delay (s)		42.8			26.9			40.1			32.3	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	31.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

08/19/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	565	310	35	165	210	15	550	245
Future Volume (veh/h)	565	310	35	165	210	15	550	245
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.96
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1590	1710		1590	1590		1590	1590
Adj Flow Rate, veh/h	415	428		172	219		573	68
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	9	0		9	9		9	9
Cap, veh/h	491	469		962	1782		654	280
Arrive On Green	0.32	0.32		0.33	0.59		0.22	0.22
Sat Flow, veh/h	1514	1449		2938	3100		3100	1294
Grp Volume(v), veh/h	415	428		172	219		573	68
Grp Sat Flow(s),veh/h/ln	1514	1449		1469	1510		1510	1294
Q Serve(g_s), s	25.5	28.3		4.2	3.2		18.3	4.3
Cycle Q Clear(g_c), s	25.5	28.3		4.2	3.2		18.3	4.3
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	491	469		962	1782		654	280
V/C Ratio(X)	0.85	0.91		0.18	0.12		0.88	0.24
Avail Cap(c_a), veh/h	636	609		962	1782		767	329
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.86	0.86		0.67	0.67		0.51	0.51
Uniform Delay (d), s/veh	31.5	32.4		24.0	9.1		37.9	32.4
Incr Delay (d2), s/veh	5.8	11.9		0.0	0.1		8.6	1.0
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	10.0	11.3		1.4	1.0		7.4	1.4
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	37.2	44.3		24.0	9.2		46.5	33.4
LnGrp LOS	D	D		C	A		D	C
Approach Vol, veh/h	843				391		641	
Approach Delay, s/veh	40.8				15.7		45.1	
Approach LOS	D				B		D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	37.4	26.2				63.6		36.4
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	20.0	* 25				39.4		42.0
Max Q Clear Time (g_c+I1), s	6.2	20.3				5.2		30.3
Green Ext Time (p_c), s	0.3	1.3				0.9		2.1

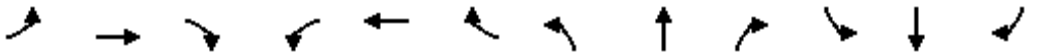
Intersection Summary	
HCM 6th Ctrl Delay	37.1
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	230	160	275	120	95	45	345	380	590	475	200
Future Volume (vph)	235	230	160	275	120	95	45	345	380	590	475	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.98		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (prot)		2933		2814	1527	1298	1464	2927	1309	1421	2949	1264
Flt Permitted		0.98		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (perm)		2933		2814	1527	1298	1464	2927	1309	1421	2949	1264
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	247	242	168	289	126	100	47	363	400	621	500	211
RTOR Reduction (vph)	0	33	0	0	0	88	0	0	0	0	0	146
Lane Group Flow (vph)	0	624	0	289	126	12	47	363	400	410	711	65
Confl. Peds. (#/hr)			70									25
Heavy Vehicles (%)	2%	2%	2%	12%	12%	12%	11%	11%	11%	4%	4%	4%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		24.7		13.1	13.1	13.1	16.2	16.2	71.4	32.3	32.3	32.3
Effective Green, g (s)		24.7		13.1	13.1	13.1	16.2	16.2	71.4	32.3	32.3	32.3
Actuated g/C Ratio		0.24		0.12	0.12	0.12	0.15	0.15	0.68	0.31	0.31	0.31
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		689		351	190	161	225	451	890	437	907	388
v/s Ratio Prot		c0.21		c0.10	0.08		0.03	c0.12	0.31	c0.29	0.24	
v/s Ratio Perm						0.01						0.05
v/c Ratio		0.91		0.82	0.66	0.08	0.21	0.80	0.45	0.94	0.78	0.17
Uniform Delay, d1		39.0		44.8	43.8	40.6	38.8	42.9	7.7	35.4	33.2	26.5
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		15.2		14.4	8.4	0.2	0.3	9.8	0.3	30.1	6.7	0.9
Delay (s)		54.2		59.2	52.3	40.8	39.1	52.7	8.0	65.4	39.9	27.5
Level of Service		D		E	D	D	D	D	A	E	D	C
Approach Delay (s)		54.2			53.9			29.8			45.8	
Approach LOS		D			D			C			D	

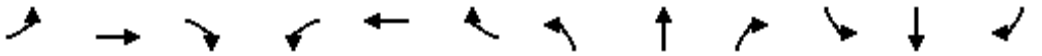
Intersection Summary			
HCM 2000 Control Delay	44.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	430	55	270	110	25	10	155	405	50	290	25
Future Volume (vph)	50	430	55	270	110	25	10	155	405	50	290	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		3.5	3.5			3.0	3.0		3.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		1.00		1.00	0.99			1.00	1.00		1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	0.97			1.00	0.85		0.99	
Flt Protected		1.00		0.95	1.00			1.00	1.00		0.99	
Satd. Flow (prot)		2756		1413	1432			1482	2224		1457	
Flt Permitted		1.00		0.95	1.00			0.98	1.00		0.94	
Satd. Flow (perm)		2756		1413	1432			1454	2224		1377	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	54	462	59	290	118	27	11	167	435	54	312	27
RTOR Reduction (vph)	0	12	0	0	11	0	0	0	102	0	4	0
Lane Group Flow (vph)	0	563	0	290	134	0	0	178	333	0	390	0
Confl. Peds. (#/hr)			15			15			15			25
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		23.6		17.5	17.5			21.9	42.9		21.9	
Effective Green, g (s)		23.6		17.5	17.5			21.9	39.4		21.9	
Actuated g/C Ratio		0.32		0.24	0.24			0.30	0.54		0.30	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		890		338	343			436	1200		413	
v/s Ratio Prot		c0.20		c0.21	0.09				0.15			
v/s Ratio Perm								0.12			c0.28	
v/c Ratio		0.63		0.86	0.39			0.41	0.28		0.94	
Uniform Delay, d1		21.0		26.6	23.3			20.4	9.1		24.9	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		3.4		18.3	0.3			0.2	0.0		29.8	
Delay (s)		24.4		44.8	23.5			20.6	9.1		54.7	
Level of Service		C		D	C			C	A		D	
Approach Delay (s)		24.4			37.7			12.5			54.7	
Approach LOS		C			D			B			D	

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	165	230	170	325	230	230	210	50	425	240	650	295
Future Volume (veh/h)	165	230	170	325	230	230	210	50	425	240	650	295
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1441	1441	1441	1618	1618	1618	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	139	291	0	342	242	0	221	53	0	253	684	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	31	31	31	19	19	19	7	7	7	6	6	6
Cap, veh/h	183	385		565	297		250	559		583	1255	
Arrive On Green	0.13	0.13	0.00	0.06	0.06	0.00	0.15	0.16	0.00	0.34	0.36	0.00
Sat Flow, veh/h	1372	2881	1221	3083	1618	1372	1711	3503	0	1725	3441	1535
Grp Volume(v), veh/h	139	291	0	342	242	0	221	53	0	253	684	0
Grp Sat Flow(s),veh/h/ln	1372	1441	1221	1541	1618	1372	1711	1706	0	1725	1721	1535
Q Serve(g_s), s	10.3	10.2	0.0	11.4	15.5	0.0	13.3	1.4	0.0	11.9	16.5	0.0
Cycle Q Clear(g_c), s	10.3	10.2	0.0	11.4	15.5	0.0	13.3	1.4	0.0	11.9	16.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	183	385		565	297		250	559		583	1255	
V/C Ratio(X)	0.76	0.76		0.61	0.82		0.89	0.09		0.43	0.54	
Avail Cap(c_a), veh/h	287	604		628	330		261	686		583	1255	
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	0.00	0.81	0.81	0.00	1.00	1.00	0.00	0.67	0.67	0.00
Uniform Delay (d), s/veh	43.8	43.8	0.0	45.6	47.6	0.0	44.0	37.3	0.0	26.9	26.4	0.0
Incr Delay (d2), s/veh	2.2	1.1	0.0	1.1	11.2	0.0	26.5	0.0	0.0	0.1	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	3.7	0.0	4.8	7.7	0.0	7.4	0.6	0.0	4.8	6.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.1	44.9	0.0	46.7	58.7	0.0	70.5	37.3	0.0	27.1	27.6	0.0
LnGrp LOS	D	D		D	E		E	D		C	C	
Approach Vol, veh/h		430	A		584	A		274	A		937	A
Approach Delay, s/veh		45.3			51.7			64.1			27.4	
Approach LOS		D			D			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.3	43.2		18.6	40.4	22.1		23.9				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	16.0	27.5		22.0	22.4	* 21		21.4				
Max Q Clear Time (g_c+I1), s	15.3	18.5		12.3	13.9	3.4		17.5				
Green Ext Time (p_c), s	0.0	3.3		1.2	0.4	0.1		1.2				

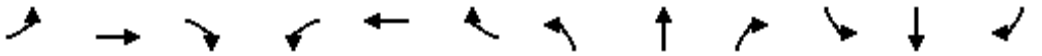
Intersection Summary			
HCM 6th Ctrl Delay		41.8	
HCM 6th LOS		D	

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	380	380	40	170	40	385	705	365	45	145	280
Future Volume (veh/h)	150	380	380	40	170	40	385	705	365	45	145	280
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.96	1.00		1.00	1.00		0.93
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1722	1722	1722	1574	1574	1574	1811	1811	1811	1663	1663	1663
Adj Flow Rate, veh/h	161	409	129	43	183	39	414	758	0	48	156	113
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	12	12	12	22	22	22	6	6	6	16	16	16
Cap, veh/h	234	441	366	102	219	47	1247	1283		207	217	171
Arrive On Green	0.05	0.08	0.08	0.07	0.18	0.18	0.37	0.37	0.00	0.13	0.13	0.13
Sat Flow, veh/h	1640	1722	1427	1499	1246	266	3346	3532	0	1584	1663	1309
Grp Volume(v), veh/h	161	409	129	43	0	222	414	758	0	48	156	113
Grp Sat Flow(s),veh/h/ln	1640	1722	1427	1499	0	1512	1673	1721	0	1584	1663	1309
Q Serve(g_s), s	10.2	24.8	9.0	2.9	0.0	14.9	9.3	18.6	0.0	2.9	9.5	8.6
Cycle Q Clear(g_c), s	10.2	24.8	9.0	2.9	0.0	14.9	9.3	18.6	0.0	2.9	9.5	8.6
Prop In Lane	1.00		1.00	1.00		0.18	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	234	441	366	102	0	266	1247	1283		207	217	171
V/C Ratio(X)	0.69	0.93	0.35	0.42	0.00	0.84	0.33	0.59		0.23	0.72	0.66
Avail Cap(c_a), veh/h	233	441	366	143	0	344	1250	1286		348	366	288
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.83	0.83	1.00	0.00	1.00	0.61	0.61	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.7	48.1	39.8	46.9	0.0	41.8	23.6	26.5	0.0	40.9	43.8	43.4
Incr Delay (d2), s/veh	5.8	22.4	0.4	1.0	0.0	10.5	0.4	1.2	0.0	0.2	1.7	1.6
Initial Q Delay(d3),s/veh	0.0	73.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	24.1	3.4	1.1	0.0	6.3	3.7	7.6	0.0	1.1	4.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.5	143.7	40.2	48.0	0.0	52.3	24.0	27.7	0.0	41.1	45.5	45.1
LnGrp LOS	D	F	D	D	A	D	C	C		D	D	D
Approach Vol, veh/h		699			265			1172	A		317	
Approach Delay, s/veh		103.8			51.6			26.4			44.7	
Approach LOS		F			D			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.1	31.4		43.8	19.5	23.0		18.6				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.6	* 4.6		4.9				
Max Green Setting (Gmax), s	10.0	26.9		26.9	13.0	* 24		23.1				
Max Q Clear Time (g_c+I1), s	4.9	26.8		20.6	12.2	16.9		11.5				
Green Ext Time (p_c), s	0.0	0.0		2.6	0.0	0.4		0.8				

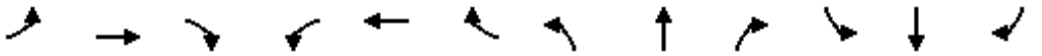
Intersection Summary			
HCM 6th Ctrl Delay		53.6	
HCM 6th LOS		D	

Notes

User approved volume balancing among the lanes for turning movement.

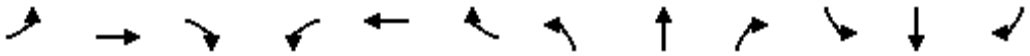
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	955	30	710	25	20	20	250	365	35	35	450	130
Future Volume (vph)	955	30	710	25	20	20	250	365	35	35	450	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1633	1642	2707		1696	1482	1656	3268		1626	3252	1455
Flt Permitted	0.95	0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1633	1642	2707		1696	1482	1656	3268		1626	3252	1455
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1005	32	747	26	21	21	263	384	37	37	474	137
RTOR Reduction (vph)	0	0	500	0	0	20	0	6	0	0	0	104
Lane Group Flow (vph)	513	524	247	0	47	1	263	415	0	37	474	33
Heavy Vehicles (%)	5%	5%	5%	9%	9%	9%	9%	9%	9%	11%	11%	11%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	20.7	20.7	20.7		4.7	4.7	17.1	30.6		4.4	17.9	17.9
Effective Green, g (s)	20.7	20.7	20.7		4.7	4.7	17.1	30.6		4.4	17.9	17.9
Actuated g/C Ratio	0.28	0.28	0.28		0.06	0.06	0.23	0.41		0.06	0.24	0.24
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6	3.0	4.1		3.0	4.1	4.1
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	449	451	745		106	92	376	1329		95	774	346
v/s Ratio Prot	0.31	c0.32			c0.03		c0.16	0.13		0.02	c0.15	
v/s Ratio Perm			0.09			0.00						0.02
v/c Ratio	1.14	1.16	0.33		0.44	0.01	0.70	0.31		0.39	0.61	0.09
Uniform Delay, d1	27.2	27.2	21.7		34.0	33.1	26.7	15.2		34.1	25.6	22.3
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	87.7	94.8	0.3		2.9	0.1	5.6	0.1		2.6	1.4	0.1
Delay (s)	114.9	122.1	22.0		36.9	33.1	32.3	15.3		36.7	27.0	22.5
Level of Service	F	F	C		D	C	C	B		D	C	C
Approach Delay (s)		78.1			35.8			21.8			26.6	
Approach LOS		E			D			C			C	

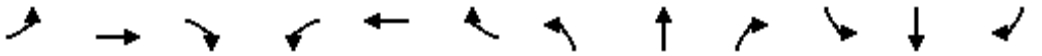
Intersection Summary			
HCM 2000 Control Delay	54.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	75.2	Sum of lost time (s)	14.8
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	20	20	65	15	110	20	480	165	90	140	10
Future Volume (vph)	15	20	20	65	15	110	20	480	165	90	140	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.95			0.92			0.97			0.99	
Flt Protected		0.99			0.98			1.00			0.98	
Satd. Flow (prot)		1573			1519			1618			1636	
Flt Permitted		0.92			0.89			0.99			0.58	
Satd. Flow (perm)		1462			1375			1598			968	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	22	22	71	16	120	22	522	179	98	152	11
RTOR Reduction (vph)	0	13	0	0	72	0	0	26	0	0	4	0
Lane Group Flow (vph)	0	47	0	0	135	0	0	697	0	0	257	0
Parking (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		584			550			639			387	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.10			c0.44			0.27	
v/c Ratio		0.08			0.25			1.09			0.67	
Uniform Delay, d1		8.4			9.0			13.5			11.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			1.1			62.6			8.7	
Delay (s)		8.6			10.0			76.1			19.8	
Level of Service		A			B			E			B	
Approach Delay (s)		8.6			10.0			76.1			19.8	
Approach LOS		A			B			E			B	

Intersection Summary			
HCM 2000 Control Delay	50.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



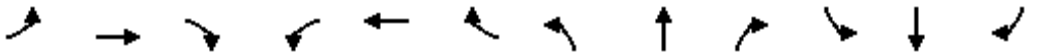
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	860	275	60	375	220	60	35	245	505	385	45
Future Volume (veh/h)	75	860	275	60	375	220	60	35	245	505	385	45
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	82	945	292	66	412	113	66	38	0	555	423	48
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	102	717	222	72	949	800	80	46		473	438	50
Arrive On Green	0.06	0.52	0.52	0.04	0.51	0.51	0.07	0.07	0.00	0.27	0.27	0.27
Sat Flow, veh/h	1781	1369	423	1781	1870	1577	1150	662	1585	1781	1648	187
Grp Volume(v), veh/h	82	0	1237	66	412	113	104	0	0	555	0	471
Grp Sat Flow(s),veh/h/ln	1781	0	1792	1781	1870	1577	1813	0	1585	1781	0	1835
Q Serve(g_s), s	6.8	0.0	78.0	5.5	20.7	5.7	8.4	0.0	0.0	39.5	0.0	37.7
Cycle Q Clear(g_c), s	6.8	0.0	78.0	5.5	20.7	5.7	8.4	0.0	0.0	39.5	0.0	37.7
Prop In Lane	1.00		0.24	1.00		1.00	0.63		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	102	0	939	72	949	800	126	0		473	0	487
V/C Ratio(X)	0.81	0.00	1.32	0.92	0.43	0.14	0.83	0.00		1.17	0.00	0.97
Avail Cap(c_a), veh/h	156	0	939	72	949	800	140	0		473	0	487
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	69.3	0.0	35.4	71.2	23.2	19.5	68.4	0.0	0.0	54.7	0.0	54.0
Incr Delay (d2), s/veh	8.7	0.0	150.3	77.4	0.4	0.1	26.9	0.0	0.0	98.6	0.0	32.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	0.0	72.4	4.0	9.1	2.1	4.8	0.0	0.0	30.8	0.0	21.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	78.0	0.0	185.7	148.6	23.6	19.6	95.3	0.0	0.0	153.3	0.0	86.1
LnGrp LOS	E	A	F	F	C	B	F	A		F	A	F
Approach Vol, veh/h		1319			591			104	A		1026	
Approach Delay, s/veh		179.0			36.8			95.3			122.4	
Approach LOS		F			D			F			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.0	80.0		43.0	9.5	82.5		13.8				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	13.0	71.0		39.5	6.0	78.0		11.5				
Max Q Clear Time (g_c+I1), s	8.8	22.7		41.5	7.5	80.0		10.4				
Green Ext Time (p_c), s	0.0	4.6		0.0	0.0	0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			129.4									
HCM 6th LOS			F									

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	1395	195	175	505	15	140	15	295	0	15	15
Future Volume (veh/h)	15	1395	195	175	505	15	140	15	295	0	15	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	16	1533	174	192	555	16	186	0	60	0	16	15
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	18	1757	758	369	749	22	285	0	127	0	33	31
Arrive On Green	0.49	0.49	0.49	0.21	0.21	0.21	0.08	0.00	0.08	0.00	0.04	0.04
Sat Flow, veh/h	36	3609	1558	1781	3616	104	3563	0	1585	0	888	833
Grp Volume(v), veh/h	831	718	174	192	287	284	186	0	60	0	0	31
Grp Sat Flow(s),veh/h/ln	1869	1777	1558	1781	1870	1850	1781	0	1585	0	0	1721
Q Serve(g_s), s	33.0	28.0	5.2	7.7	11.6	11.6	4.1	0.0	2.9	0.0	0.0	1.4
Cycle Q Clear(g_c), s	33.0	28.0	5.2	7.7	11.6	11.6	4.1	0.0	2.9	0.0	0.0	1.4
Prop In Lane	0.02		1.00	1.00		0.06	1.00		1.00	0.00		0.48
Lane Grp Cap(c), veh/h	909	865	758	369	387	383	285	0	127	0	0	64
V/C Ratio(X)	0.91	0.83	0.23	0.52	0.74	0.74	0.65	0.00	0.47	0.00	0.00	0.48
Avail Cap(c_a), veh/h	953	906	794	797	837	828	1063	0	473	0	0	428
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	19.1	17.8	11.9	28.3	29.9	29.9	35.9	0.0	35.4	0.0	0.0	38.0
Incr Delay (d2), s/veh	12.4	6.2	0.1	0.8	2.1	2.1	0.9	0.0	1.0	0.0	0.0	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.3	11.3	1.6	3.2	5.1	5.1	1.7	0.0	1.1	0.0	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.5	24.0	12.0	29.2	32.0	32.0	36.9	0.0	36.4	0.0	0.0	40.0
LnGrp LOS	C	C	B	C	C	C	D	A	D	A	A	D
Approach Vol, veh/h		1723			763			246			31	
Approach Delay, s/veh		26.4			31.3			36.7			40.0	
Approach LOS		C			C			D			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.8		9.9		43.2		6.5				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		13.6		6.1		35.0		3.4				
Green Ext Time (p_c), s		2.9		0.4		4.1		0.1				

Intersection Summary		
HCM 6th Ctrl Delay		28.8
HCM 6th LOS		C

Notes

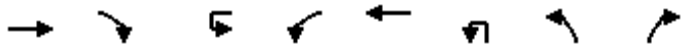
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

Intersection	
Intersection Delay, s/veh	20.2
Intersection LOS	C

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	145	125	130	375	165	45
Future Vol, veh/h	145	125	130	375	165	45
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	8	8	8	8	8	8
Mvmt Flow	156	134	140	403	177	48
Number of Lanes	1	0	0	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	14.2	27	11.7
HCM LOS	B	D	B

Lane	NBLn1	EBLn1	SBLn1
Vol Left, %	26%	54%	0%
Vol Thru, %	74%	0%	79%
Vol Right, %	0%	46%	21%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	505	270	210
LT Vol	130	145	0
Through Vol	375	0	165
RT Vol	0	125	45
Lane Flow Rate	543	290	226
Geometry Grp	1	1	1
Degree of Util (X)	0.807	0.475	0.353
Departure Headway (Hd)	5.351	5.886	5.627
Convergence, Y/N	Yes	Yes	Yes
Cap	673	610	637
Service Time	3.392	3.936	3.68
HCM Lane V/C Ratio	0.807	0.475	0.355
HCM Control Delay	27	14.2	11.7
HCM Lane LOS	D	B	B
HCM 95th-tile Q	8.3	2.6	1.6



Movement	EBT	EBR	WBU	WBL	WBT	NBU	NBL	NBR
Lane Configurations								
Traffic Volume (veh/h)	1215	490	15	145	495	20	185	205
Future Volume (veh/h)	1215	490	15	145	495	20	185	205
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)		0.97		1.00			1.00	1.00
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1870	1870		1870	1870		1870	1870
Adj Flow Rate, veh/h	1266	405		151	516		193	74
Peak Hour Factor	0.96	0.96		0.96	0.96		0.96	0.96
Percent Heavy Veh, %	2	2		2	2		2	2
Cap, veh/h	2089	906		191	2735		332	152
Arrive On Green	0.59	0.59		0.11	0.77		0.10	0.10
Sat Flow, veh/h	3647	1542		1781	3647		3456	1585
Grp Volume(v), veh/h	1266	405		151	516		193	74
Grp Sat Flow(s),veh/h/ln	1777	1542		1781	1777		1728	1585
Q Serve(g_s), s	15.3	4.3		5.5	2.6		3.6	3.0
Cycle Q Clear(g_c), s	15.3	4.3		5.5	2.6		3.6	3.0
Prop In Lane		1.00		1.00			1.00	1.00
Lane Grp Cap(c), veh/h	2089	906		191	2735		332	152
V/C Ratio(X)	0.61	0.45		0.79	0.19		0.58	0.49
Avail Cap(c_a), veh/h	3233	1403		930	5300		1907	875
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	1.00	1.00		1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	8.8	1.5		29.2	2.1		29.0	28.7
Incr Delay (d2), s/veh	0.4	0.5		2.8	0.0		1.6	2.4
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	2.0		2.3	0.3		1.5	1.2
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	9.3	2.0		31.9	2.1		30.6	31.1
LnGrp LOS	A	A		C	A		C	C
Approach Vol, veh/h	1671				667		267	
Approach Delay, s/veh	7.5				8.9		30.8	
Approach LOS	A				A		C	

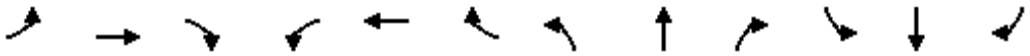
Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	12.2	44.4				56.6		10.4
Change Period (Y+Rc), s	5.0	* 5				5.0		4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0		37.0
Max Q Clear Time (g_c+I1), s	7.5	17.3				4.6		5.6
Green Ext Time (p_c), s	0.1	22.1				5.4		0.9

Intersection Summary	
HCM 6th Ctrl Delay	10.2
HCM 6th LOS	B

Notes

User approved ignoring U-Turning movement.

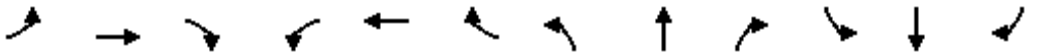
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	565	65	20	325	0	0	290	55	110	155	140
Future Volume (vph)	160	565	65	20	325	0	0	290	55	110	155	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7		3.7	2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			0.98		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1719	3149		1719	3209			1759		1719	3142	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1719	3149		1719	3209			1759		1719	3142	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	614	71	22	353	0	0	315	60	120	168	152
RTOR Reduction (vph)	0	6	0	0	0	0	0	6	0	0	82	0
Lane Group Flow (vph)	174	679	0	22	353	0	0	369	0	120	238	0
Confl. Peds. (#/hr)	25		15	15					15	15		20
Confl. Bikes (#/hr)			5						5			5
Heavy Vehicles (%)	5%	5%	5%	5%	5%	2%	2%	5%	5%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	13.0	31.6		2.4	21.0			23.6		10.9	38.2	
Effective Green, g (s)	13.0	32.6		2.4	22.0			23.6		10.9	38.2	
Actuated g/C Ratio	0.16	0.39		0.03	0.26			0.28		0.13	0.46	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	268	1232		49	847			498		224	1440	
v/s Ratio Prot	c0.10	c0.22		0.01	0.11			c0.21		c0.07	0.08	
v/s Ratio Perm												
v/c Ratio	0.65	0.55		0.45	0.42			0.74		0.54	0.17	
Uniform Delay, d1	33.0	19.7		39.8	25.3			27.1		33.8	13.2	
Progression Factor	1.00	1.00		1.41	0.55			1.00		1.00	1.00	
Incremental Delay, d2	4.0	0.5		2.3	0.3			5.8		1.2	0.1	
Delay (s)	37.0	20.2		58.3	14.4			32.9		35.1	13.3	
Level of Service	D	C		E	B			C		D	B	
Approach Delay (s)		23.6			16.9			32.9			19.2	
Approach LOS		C			B			C			B	

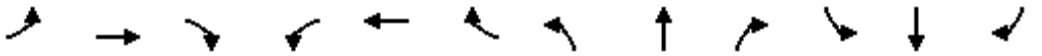
Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	83.3	Sum of lost time (s)	14.8
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	445	0	80	285	130	10	190	100	0	45	115
Future Volume (vph)	235	445	0	80	285	130	10	190	100	0	45	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.98		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.95			1.00	0.85		0.89	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		1.00	
Satd. Flow (prot)	1687	3374		1687	3178			1771	1472		1564	
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (perm)	1687	3374		1687	3178			1753	1472		1564	
Peak-hour factor, PHF	0.91	0.91	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.92	0.91	0.91
Adj. Flow (vph)	258	489	0	88	313	143	11	209	110	0	49	126
RTOR Reduction (vph)	0	0	0	0	43	0	0	0	60	0	67	0
Lane Group Flow (vph)	258	489	0	88	413	0	0	220	50	0	108	0
Confl. Peds. (#/hr)	10			10		10	5		10			5
Confl. Bikes (#/hr)									10			5
Heavy Vehicles (%)	7%	7%	2%	7%	7%	7%	7%	7%	7%	2%	7%	7%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	12.8	26.3		7.7	21.2			38.2	38.2		38.2	
Effective Green, g (s)	12.8	26.3		7.7	22.2			39.2	38.2		39.2	
Actuated g/C Ratio	0.15	0.32		0.09	0.27			0.47	0.46		0.47	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	259	1065		155	846			824	675		736	
v/s Ratio Prot	c0.15	c0.14		0.05	c0.13						0.07	
v/s Ratio Perm								c0.13	0.03			
v/c Ratio	1.00	0.46		0.57	0.49			0.27	0.07		0.15	
Uniform Delay, d1	35.2	22.8		36.2	25.8			13.4	12.6		12.5	
Progression Factor	1.24	0.58		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	51.0	0.3		2.8	0.4			0.2	0.0		0.1	
Delay (s)	94.7	13.6		39.0	26.2			13.5	12.7		12.6	
Level of Service	F	B		D	C			B	B		B	
Approach Delay (s)		41.6			28.3			13.2			12.6	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	29.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	83.3	Sum of lost time (s)	14.8
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	880	390	290	455	0	0	0	0	400	425	190
Future Volume (veh/h)	0	880	390	290	455	0	0	0	0	400	425	190
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1885	1885	1885	1885	0				1885	1885	1885
Adj Flow Rate, veh/h	0	926	0	305	479	0				281	644	79
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	1	1	1	1	0				1	1	1
Cap, veh/h	0	2001		822	2437	0				386	811	344
Arrive On Green	0.00	0.39	0.00	0.47	1.00	0.00				0.22	0.22	0.22
Sat Flow, veh/h	0	5316	1598	3483	3676	0				1795	3770	1598
Grp Volume(v), veh/h	0	926	0	305	479	0				281	644	79
Grp Sat Flow(s),veh/h/ln	0	1716	1598	1742	1791	0				1795	1885	1598
Q Serve(g_s), s	0.0	12.1	0.0	5.0	0.0	0.0				13.1	14.5	3.7
Cycle Q Clear(g_c), s	0.0	12.1	0.0	5.0	0.0	0.0				13.1	14.5	3.7
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2001		822	2437	0				386	811	344
V/C Ratio(X)	0.00	0.46		0.37	0.20	0.00				0.73	0.79	0.23
Avail Cap(c_a), veh/h	0	2001		822	2437	0				571	1198	508
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.63	0.63	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	20.5	0.0	19.5	0.0	0.0				32.9	33.4	29.2
Incr Delay (d2), s/veh	0.0	0.8	0.0	0.1	0.1	0.0				1.0	1.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.6	0.0	1.8	0.0	0.0				5.6	6.6	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	21.3	0.0	19.6	0.1	0.0				33.8	34.7	29.3
LnGrp LOS	A	C		B	A	A				C	C	C
Approach Vol, veh/h		926	A		784						1004	
Approach Delay, s/veh		21.3			7.7						34.0	
Approach LOS		C			A						C	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	26.2	40.0		23.8		66.2
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	13.5	* 35		28.6		52.0
Max Q Clear Time (g_c+I1), s	7.0	14.1		16.5		2.0
Green Ext Time (p_c), s	0.3	8.4		2.8		5.1

Intersection Summary		
HCM 6th Ctrl Delay		22.1
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	43
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	35	25	25	125	0	105	15	0	220	390	280	260
Future Vol, veh/h	35	25	25	125	0	105	15	0	220	390	280	260
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	38	27	27	136	0	114	16	0	239	424	304	283
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	14.2	20.8	76.6	18
HCM LOS	B	C	F	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	41%	54%	100%	0%	0%
Vol Thru, %	100%	22%	29%	0%	0%	100%	100%
Vol Right, %	0%	78%	29%	46%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	125	500	85	230	280	130	130
LT Vol	0	0	35	125	280	0	0
Through Vol	125	110	25	0	0	130	130
RT Vol	0	390	25	105	0	0	0
Lane Flow Rate	136	543	92	250	304	141	141
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.293	1.088	0.222	0.557	0.65	0.282	0.211
Departure Headway (Hd)	7.769	7.207	8.938	8.247	7.914	7.399	5.58
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	466	505	404	440	460	489	647
Service Time	5.469	4.907	6.638	5.947	5.614	5.099	3.28
HCM Lane V/C Ratio	0.292	1.075	0.228	0.568	0.661	0.288	0.218
HCM Control Delay	13.7	92.3	14.2	20.8	24.1	13	9.8
HCM Lane LOS	B	F	B	C	C	B	A
HCM 95th-tile Q	1.2	17.3	0.8	3.3	4.5	1.1	0.8

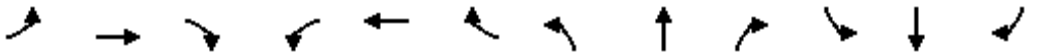
Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.92
Heavy Vehicles, %	4
Mvmt Flow	0
Number of Lanes	0

Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

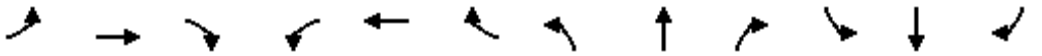
Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	0	500	370	15	160	580	0	0	0	0	15	260
Future Volume (vph)	0	500	370	15	160	580	0	0	0	0	15	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0						4.5
Lane Util. Factor		0.95			0.91	0.91						0.95
Frpb, ped/bikes		0.99			1.00	1.00						1.00
Flpb, ped/bikes		1.00			1.00	1.00						1.00
Frt		0.94			1.00	1.00						1.00
Flt Protected		1.00			0.95	1.00						0.95
Satd. Flow (prot)		3125			1535	3227						1603
Flt Permitted		1.00			0.95	1.00						0.95
Satd. Flow (perm)		3125			1535	3227						1603
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	521	385	16	167	604	0	0	0	0	16	271
RTOR Reduction (vph)	0	142	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	764	0	0	166	621	0	0	0	0	0	151
Confl. Peds. (#/hr)	5		5		5		5					
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type		NA		Split	Split	NA					Split	Split
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		22.8			22.0	22.0						12.2
Effective Green, g (s)		22.8			22.0	22.0						12.2
Actuated g/C Ratio		0.32			0.31	0.31						0.17
Clearance Time (s)		5.0			5.0	5.0						4.5
Vehicle Extension (s)		3.0			3.0	3.0						3.0
Lane Grp Cap (vph)		996			472	992						273
v/s Ratio Prot		c0.24			0.11	c0.19						c0.09
v/s Ratio Perm												
v/c Ratio		0.77			0.35	0.63						0.55
Uniform Delay, d1		22.0			19.2	21.2						27.2
Progression Factor		1.00			1.00	1.00						1.00
Incremental Delay, d2		3.6			0.5	1.2						2.4
Delay (s)		25.6			19.7	22.5						29.6
Level of Service		C			B	C						C
Approach Delay (s)		25.6				21.9			0.0			
Approach LOS		C				C			A			

Intersection Summary			
HCM 2000 Control Delay	23.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	71.5	Sum of lost time (s)	14.5
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	230	530	0	0	240	140	435	0	420	125	0	75
Future Volume (vph)	230	530	0	0	240	140	435	0	420	125	0	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00	0.98	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3242	1759			3343	1465		1671	1470	1671		1495
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3242	1759			3343	1465		1671	1470	1671		1495
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	267	616	0	0	279	163	506	0	488	145	0	87
RTOR Reduction (vph)	0	0	0	0	0	132	0	0	137	0	0	77
Lane Group Flow (vph)	267	616	0	0	279	31	0	506	351	145	0	10
Confl. Peds. (#/hr)	10		5	5		10			5	5		
Confl. Bikes (#/hr)			10									
Heavy Vehicles (%)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	12.7	33.6			16.4	16.4		31.7	31.7	10.2		10.2
Effective Green, g (s)	12.7	33.6			16.4	16.4		31.7	31.7	10.2		10.2
Actuated g/C Ratio	0.15	0.39			0.19	0.19		0.36	0.36	0.12		0.12
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	473	679			630	276		608	535	195		175
v/s Ratio Prot	0.08	c0.35			0.08					c0.09		0.01
v/s Ratio Perm						0.02		0.30	0.24			
v/c Ratio	0.56	0.91			0.44	0.11		0.83	0.66	0.74		0.06
Uniform Delay, d1	34.6	25.2			31.3	29.3		25.2	23.1	37.1		34.1
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	1.5	15.5			0.2	0.1		9.1	2.2	12.6		0.1
Delay (s)	36.1	40.7			31.4	29.3		34.3	25.3	49.7		34.2
Level of Service	D	D			C	C		C	C	D		C
Approach Delay (s)		39.3			30.7			29.9			43.9	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	34.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	87.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



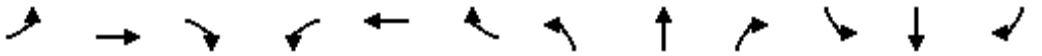
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	470	1085	75	30	740	125	155	110	45	180	90	180
Future Volume (veh/h)	470	1085	75	30	740	125	155	110	45	180	90	180
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.97	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1930
Adj Flow Rate, veh/h	490	1130	74	31	771	115	161	115	47	188	94	188
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	373	1604	105	79	989	147	80	345	141	252	93	795
Arrive On Green	0.14	0.32	0.32	0.04	0.32	0.32	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1767	3357	220	1767	3070	458	1088	1241	507	668	334	1618
Grp Volume(v), veh/h	490	593	611	31	443	443	161	0	162	282	0	188
Grp Sat Flow(s),veh/h/ln	1767	1763	1814	1767	1763	1765	1088	0	1748	1002	0	1618
Q Serve(g_s), s	19.0	26.6	26.6	1.5	20.5	20.5	0.0	0.0	6.6	18.4	0.0	6.0
Cycle Q Clear(g_c), s	19.0	26.6	26.6	1.5	20.5	20.5	25.0	0.0	6.6	25.0	0.0	6.0
Prop In Lane	1.00		0.12	1.00		0.26	1.00		0.29	0.67		1.00
Lane Grp Cap(c), veh/h	373	842	867	79	568	569	80	0	486	345	0	795
V/C Ratio(X)	1.31	0.70	0.70	0.39	0.78	0.78	2.01	0.00	0.33	0.82	0.00	0.24
Avail Cap(c_a), veh/h	373	842	867	98	568	569	80	0	486	345	0	795
HCM Platoon Ratio	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.75	0.75	0.75	0.63	0.63	0.63	1.00	0.00	1.00	0.82	0.00	0.82
Uniform Delay (d), s/veh	38.6	25.0	25.0	41.8	27.6	27.6	45.0	0.0	25.9	35.9	0.0	13.3
Incr Delay (d2), s/veh	154.9	3.7	3.6	0.8	6.6	6.6	496.7	0.0	0.1	11.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	24.4	12.1	12.5	0.7	9.2	9.2	12.8	0.0	2.8	7.2	0.0	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	193.5	28.7	28.6	42.6	34.2	34.2	541.7	0.0	26.0	47.1	0.0	13.3
LnGrp LOS	F	C	C	D	C	C	F	A	C	D	A	B
Approach Vol, veh/h		1694			917			323			470	
Approach Delay, s/veh		76.4			34.5			283.0			33.6	
Approach LOS		E			C			F			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	23.0	38.0		29.0	13.0	48.0		29.0				
Change Period (Y+Rc), s	4.0	9.0		4.0	9.0	* 5		4.0				
Max Green Setting (Gmax), s	19.0	29.0		25.0	5.0	* 43		25.0				
Max Q Clear Time (g_c+I1), s	21.0	22.5		27.0	3.5	28.6		27.0				
Green Ext Time (p_c), s	0.0	3.6		0.0	0.0	8.5		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			78.8									
HCM 6th LOS			E									

Notes

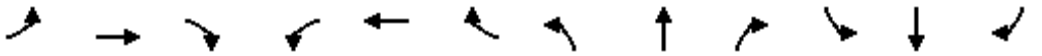
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	535	0	780	0	1125	345	0	2425	290
Future Volume (vph)	0	0	0	535	0	780	0	1125	345	0	2425	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.6		4.6		4.4	4.4		4.4	4.4
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.94		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3400		2760		5036	1474		5036	1516
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3400		2760		5036	1474		5036	1516
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	552	0	804	0	1160	356	0	2500	299
RTOR Reduction (vph)	0	0	0	0	0	53	0	0	150	0	0	80
Lane Group Flow (vph)	0	0	0	552	0	751	0	1160	206	0	2500	219
Confl. Peds. (#/hr)							20		15	15		20
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				23.1		41.7		69.3	69.3		87.9	87.9
Effective Green, g (s)				23.1		38.2		69.3	69.3		87.9	87.9
Actuated g/C Ratio				0.19		0.32		0.58	0.58		0.73	0.73
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				654		878		2908	851		3688	1110
v/s Ratio Prot				0.16		c0.27		0.23			c0.50	
v/s Ratio Perm									0.14			0.14
v/c Ratio				0.84		0.86		0.40	0.24		0.68	0.20
Uniform Delay, d1				46.7		38.3		13.9	12.4		8.5	5.0
Progression Factor				1.00		1.00		0.94	1.83		1.00	1.00
Incremental Delay, d2				9.4		7.9		0.3	0.6		1.0	0.4
Delay (s)				56.1		46.2		13.5	23.4		9.5	5.4
Level of Service				E		D		B	C		A	A
Approach Delay (s)		0.0			50.2			15.8			9.1	
Approach LOS		A			D			B			A	

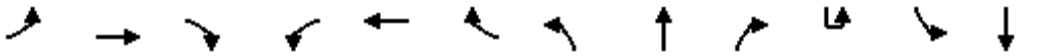
Intersection Summary			
HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	0	445	0	0	0	0	1330	575	0	1790	1170
Future Volume (vph)	140	0	445	0	0	0	0	1330	575	0	1790	1170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.86	0.85					0.95			1.00	0.85
Flt Protected	0.95	1.00	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1665	1438	1490					4606			5036	1467
Flt Permitted	0.95	1.00	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1665	1438	1490					4606			5036	1467
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	149	0	473	0	0	0	0	1415	612	0	1904	1245
RTOR Reduction (vph)	0	32	32	0	0	0	0	0	0	0	0	242
Lane Group Flow (vph)	134	215	209	0	0	0	0	2027	0	0	1904	1003
Confl. Peds. (#/hr)	10					10	15		15	15		15
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	17.6	17.6	17.6					93.4			93.4	93.4
Effective Green, g (s)	17.6	17.6	17.6					93.4			93.4	93.4
Actuated g/C Ratio	0.15	0.15	0.15					0.78			0.78	0.78
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	244	210	218					3585			3919	1141
v/s Ratio Prot	0.08	c0.15						0.44			0.38	
v/s Ratio Perm			0.14									c0.68
v/c Ratio	0.55	1.02	0.96					0.57			0.49	0.88
Uniform Delay, d1	47.5	51.2	50.8					5.3			4.7	9.3
Progression Factor	1.00	1.00	1.00					2.26			0.73	5.69
Incremental Delay, d2	1.4	67.9	48.0					0.5			0.3	7.7
Delay (s)	48.9	119.1	98.8					12.4			3.8	60.8
Level of Service	D	F	F					B			A	E
Approach Delay (s)		96.1			0.0			12.4			26.3	
Approach LOS		F			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	28.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	77.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (veh/h)	260	525	205	205	335	135	380	1290	195	85	290	1065
Future Volume (veh/h)	260	525	205	205	335	135	380	1290	195	85	290	1065
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0		0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		0.94	1.00		0.98		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Work Zone On Approach		No			No			No				No
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856		1856	1856
Adj Flow Rate, veh/h	274	553	131	216	353	88	400	1358	133		305	1121
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3		3	3
Cap, veh/h	299	1225	519	269	710	174	588	1520	460		477	1334
Arrive On Green	0.17	0.35	0.35	0.08	0.26	0.26	0.17	0.30	0.30		0.14	0.26
Sat Flow, veh/h	1767	3526	1496	3428	2766	677	3428	5066	1533		3428	5066
Grp Volume(v), veh/h	274	553	131	216	223	218	400	1358	133		305	1121
Grp Sat Flow(s),veh/h/ln	1767	1763	1496	1714	1763	1681	1714	1689	1533		1714	1689
Q Serve(g_s), s	18.3	14.6	4.7	7.4	12.9	13.3	13.1	30.8	6.4		10.1	25.1
Cycle Q Clear(g_c), s	18.3	14.6	4.7	7.4	12.9	13.3	13.1	30.8	6.4		10.1	25.1
Prop In Lane	1.00		1.00	1.00		0.40	1.00		1.00		1.00	
Lane Grp Cap(c), veh/h	299	1225	519	269	452	431	588	1520	460		477	1334
V/C Ratio(X)	0.92	0.45	0.25	0.80	0.49	0.51	0.68	0.89	0.29		0.64	0.84
Avail Cap(c_a), veh/h	331	1381	586	289	529	504	588	1520	460		477	1334
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Upstream Filter(I)	0.75	0.75	0.75	0.80	0.80	0.80	1.00	1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	49.0	30.3	11.0	54.4	37.9	38.1	46.6	40.2	20.5		48.8	41.8
Incr Delay (d2), s/veh	21.4	0.1	0.1	10.4	0.2	0.3	2.6	8.5	1.6		2.2	6.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	9.7	6.1	2.6	3.6	5.6	5.5	5.8	13.7	3.1		4.4	11.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.4	30.4	11.1	64.8	38.2	38.4	49.2	48.6	22.0		51.0	48.3
LnGrp LOS	E	C	B	E	D	D	D	D	C		D	D
Approach Vol, veh/h		958			657			1891				1694
Approach Delay, s/veh		39.2			47.0			46.9				45.4
Approach LOS		D			D			D				D

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	24.1	36.2	23.8	35.9	20.2	40.1	12.9	46.8
Change Period (Y+Rc), s	3.5	4.6	3.5	* 5.1	3.5	4.1	3.5	5.1
Max Green Setting (Gmax), s	14.6	31.6	22.5	* 36	10.7	36.0	10.1	47.0
Max Q Clear Time (g_c+I1), s	15.1	27.1	20.3	15.3	12.1	32.8	9.4	16.6
Green Ext Time (p_c), s	0.0	1.1	0.0	0.4	0.0	1.1	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	45.0
HCM 6th LOS	D

Notes

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	255
Future Volume (veh/h)	255
Initial Q (Qb), veh	0
Ped-Bike Adj(A_pbT)	0.97
Parking Bus, Adj	1.00
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	1856
Adj Flow Rate, veh/h	268
Peak Hour Factor	0.95
Percent Heavy Veh, %	3
Cap, veh/h	402
Arrive On Green	0.26
Sat Flow, veh/h	1528
Grp Volume(v), veh/h	268
Grp Sat Flow(s),veh/h/ln	1528
Q Serve(g_s), s	12.8
Cycle Q Clear(g_c), s	12.8
Prop In Lane	1.00
Lane Grp Cap(c), veh/h	402
V/C Ratio(X)	0.67
Avail Cap(c_a), veh/h	402
HCM Platoon Ratio	1.00
Upstream Filter(I)	1.00
Uniform Delay (d), s/veh	18.2
Incr Delay (d2), s/veh	8.5
Initial Q Delay(d3),s/veh	0.0
%ile BackOfQ(50%),veh/ln	5.3
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	26.6
LnGrp LOS	C
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	
Timer - Assigned Phs	

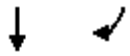
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	75	185	55	210	80	365	30	75	1105	400	45	630
Future Volume (veh/h)	75	185	55	210	80	365	30	75	1105	400	45	630
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.96	0.99		0.98		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856		1856	1856	1856		1856
Adj Flow Rate, veh/h	79	195	30	152	180	182		79	1163	180		663
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	3	3	3	3	3	3		3	3	3		3
Cap, veh/h	162	436	72	240	453	374		100	1401	430		684
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24		0.06	0.28	0.28		0.39
Sat Flow, veh/h	471	1786	297	1130	1856	1534		1767	5066	1555		1767
Grp Volume(v), veh/h	140	0	164	152	180	182		79	1163	180		663
Grp Sat Flow(s),veh/h/ln	932	0	1620	1130	1856	1534		1767	1689	1555		1767
Q Serve(g_s), s	10.1	0.0	10.2	15.7	9.7	12.2		5.3	25.9	11.4		44.2
Cycle Q Clear(g_c), s	19.8	0.0	10.2	25.9	9.7	12.2		5.3	25.9	11.4		44.2
Prop In Lane	0.56		0.18	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	275	0	395	240	453	374		100	1401	430		684
V/C Ratio(X)	0.51	0.00	0.41	0.63	0.40	0.49		0.79	0.83	0.42		0.97
Avail Cap(c_a), veh/h	334	0	473	293	541	447		177	1401	430		692
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	43.9	0.0	38.1	49.0	38.0	38.9		55.9	40.8	35.5		36.1
Incr Delay (d2), s/veh	1.5	0.0	0.7	3.1	0.6	1.0		12.6	5.8	3.0		26.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	4.0	0.0	4.2	4.6	4.5	4.8		2.7	11.4	4.7		23.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.3	0.0	38.8	52.2	38.5	39.9		68.4	46.6	38.5		62.7
LnGrp LOS	D	A	D	D	D	D		E	D	D		E
Approach Vol, veh/h		304			514				1422			
Approach Delay, s/veh		41.8			43.0				46.8			
Approach LOS		D			D				D			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.8	77.2		33.0	49.4	37.6		33.0				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	12.0	61.9		35.0	47.0	26.9		35.0				
Max Q Clear Time (g_c+I1), s	7.3	19.2		27.9	46.2	27.9		21.8				
Green Ext Time (p_c), s	0.1	13.3		1.4	0.3	0.0		1.6				

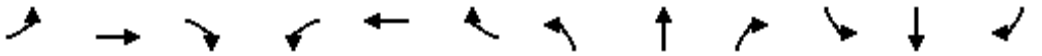
Intersection Summary		
HCM 6th Ctrl Delay		37.7
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



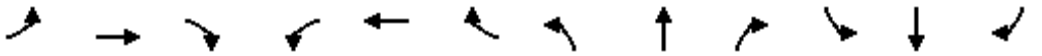
Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1250	65
Future Volume (veh/h)	1250	65
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		1.00
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1856	1856
Adj Flow Rate, veh/h	1316	66
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	3	3
Cap, veh/h	2996	150
Arrive On Green	0.61	0.61
Sat Flow, veh/h	4939	248
Grp Volume(v), veh/h	900	482
Grp Sat Flow(s),veh/h/ln	1689	1810
Q Serve(g_s), s	17.1	17.2
Cycle Q Clear(g_c), s	17.1	17.2
Prop In Lane		0.14
Lane Grp Cap(c), veh/h	2048	1098
V/C Ratio(X)	0.44	0.44
Avail Cap(c_a), veh/h	2048	1098
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	12.7	12.7
Incr Delay (d2), s/veh	0.7	1.3
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.5	7.1
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	13.3	13.9
LnGrp LOS	B	B
Approach Vol, veh/h	2045	
Approach Delay, s/veh	29.5	
Approach LOS	C	
Timer - Assigned Phs		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	0	5	5	0	20	5	185	5	55	60	30
Future Volume (vph)	20	0	5	5	0	20	5	185	5	55	60	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		1.00	1.00	0.91		1.00	1.00			1.00	1.00
Frt	1.00		0.85	1.00	0.85		1.00	1.00			1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)	1770		1583	1770	4322		1770	1856			1819	1583
Flt Permitted	0.95		1.00	0.95	1.00		0.68	1.00			0.78	1.00
Satd. Flow (perm)	1770		1583	1770	4322		1261	1856			1450	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	0	5	5	0	22	5	201	5	60	65	33
RTOR Reduction (vph)	0	0	3	0	21	0	0	1	0	0	0	24
Lane Group Flow (vph)	22	0	2	5	1	0	5	205	0	0	125	9
Turn Type	Prot		Perm	Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8			4		4
Actuated Green, G (s)	12.5		14.0	0.6	2.1		10.0	10.0			10.0	10.0
Effective Green, g (s)	12.5		14.0	0.6	2.1		10.0	10.0			10.0	10.0
Actuated g/C Ratio	0.33		0.37	0.02	0.06		0.27	0.27			0.27	0.27
Clearance Time (s)	4.5		4.5	4.5	4.5		4.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0		4.0	3.0	4.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	588		589	28	241		335	493			385	421
v/s Ratio Prot	c0.01			c0.00	0.00			c0.11				
v/s Ratio Perm			c0.00				0.00				0.09	0.01
v/c Ratio	0.04		0.00	0.18	0.01		0.01	0.42			0.32	0.02
Uniform Delay, d1	8.5		7.4	18.3	16.8		10.2	11.4			11.1	10.2
Progression Factor	1.00		1.00	1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	0.0		0.0	3.0	0.0		0.0	0.6			0.5	0.0
Delay (s)	8.5		7.4	21.3	16.8		10.2	12.0			11.6	10.2
Level of Service	A		A	C	B		B	B			B	B
Approach Delay (s)		8.3			17.6			11.9			11.3	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	37.6	Sum of lost time (s)	13.0
Intersection Capacity Utilization	34.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	325	950	0	0	625	370	130	235	655	0	0	0
Future Volume (veh/h)	325	950	0	0	625	370	130	235	655	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	335	979	0	0	644	0	134	444	458			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	1062	2039	0	0	750		561	589	499			
Arrive On Green	0.61	1.00	0.00	0.00	0.07	0.00	0.31	0.31	0.31			
Sat Flow, veh/h	3456	3647	0	0	3647	1585	1781	1870	1585			
Grp Volume(v), veh/h	335	979	0	0	644	0	134	444	458			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1777	1585	1781	1870	1585			
Q Serve(g_s), s	4.2	0.0	0.0	0.0	16.1	0.0	5.0	19.2	25.1			
Cycle Q Clear(g_c), s	4.2	0.0	0.0	0.0	16.1	0.0	5.0	19.2	25.1			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1062	2039	0	0	750		561	589	499			
V/C Ratio(X)	0.32	0.48	0.00	0.00	0.86		0.24	0.75	0.92			
Avail Cap(c_a), veh/h	1062	2039	0	0	750		614	644	546			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.88	0.88	0.00	0.00	0.77	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	12.8	0.0	0.0	0.0	40.5	0.0	22.8	27.7	29.7			
Incr Delay (d2), s/veh	0.1	0.7	0.0	0.0	9.7	0.0	0.1	3.9	18.7			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.4	0.2	0.0	0.0	8.6	0.0	2.0	8.8	11.6			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.9	0.7	0.0	0.0	50.3	0.0	22.9	31.6	48.4			
LnGrp LOS	B	A	A	A	D		C	C	D			
Approach Vol, veh/h		1314			644	A		1036				
Approach Delay, s/veh		3.8			50.3			37.9				
Approach LOS		A			D			D				
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		56.7			32.7	24.0		33.3				
Change Period (Y+Rc), s		5.0			5.0	* 5		5.0				
Max Green Setting (Gmax), s		49.0			26.0	* 19		31.0				
Max Q Clear Time (g_c+I1), s		2.0			6.2	18.1		27.1				
Green Ext Time (p_c), s		12.2			0.6	0.5		1.3				

Intersection Summary	
HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

1: Train & Scott Street Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.0	0.2	0.1	0.1
Total Del/Veh (s)	2.8	11.3	4.3	6.3
Vehicles Entered	264	194	22	480
Vehicles Exited	265	195	22	482
Hourly Exit Rate	265	195	22	482
Input Volume	275	201	24	500
% of Volume	96	97	93	96
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott Street Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.1	0.0	0.0	0.0	74.3	71.9	69.6	0.3	0.3	0.3
Total Del/Veh (s)	8.1	14.5	5.1	4.6	5.1	3.7	163.8	162.7	161.5	14.7	10.6	8.4
Vehicles Entered	14	20	20	62	16	108	18	470	158	90	140	10
Vehicles Exited	15	20	20	62	16	108	18	458	153	90	141	10
Hourly Exit Rate	15	20	20	62	16	108	18	458	153	90	141	10
Input Volume	15	20	20	65	16	110	20	480	165	90	140	10
% of Volume	98	101	101	95	98	98	91	95	93	100	101	98
Denied Entry Before	0	0	0	0	0	0	0	1	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	13	5	0	0	0

11: Dollar Ave/Herman Ave & Scott Street Performance by movement

Movement	All
Denied Del/Veh (s)	41.5
Total Del/Veh (s)	97.7
Vehicles Entered	1126
Vehicles Exited	1111
Hourly Exit Rate	1111
Input Volume	1151
% of Volume	97
Denied Entry Before	1
Denied Entry After	18

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.5	0.6	0.3	0.2	0.3
Total Del/Veh (s)	7.7	1.4	5.6	13.2	13.7	7.8	5.5	10.2
Vehicles Entered	147	16	118	126	379	166	56	1008
Vehicles Exited	147	16	117	125	380	166	57	1008
Hourly Exit Rate	147	16	117	125	380	166	57	1008
Input Volume	150	18	125	135	375	165	55	1023
% of Volume	98	91	94	92	101	101	103	99
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	27.6
Total Del/Veh (s)	73.7
Vehicles Entered	1719
Vehicles Exited	1705
Hourly Exit Rate	1705
Input Volume	4854
% of Volume	35
Denied Entry Before	1
Denied Entry After	18

Intersection: 1: Train & Scott Street

Movement	EB	WB	SB
Directions Served	T	T	T
Maximum Queue (ft)	89	146	42
Average Queue (ft)	59	54	16
95th Queue (ft)	76	119	44
Link Distance (ft)	4	139	475
Upstream Blk Time (%)	16	1	
Queuing Penalty (veh)	43	1	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: Dollar Ave/Herman Ave & Scott Street

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	64	66	1159	173
Average Queue (ft)	29	36	936	82
95th Queue (ft)	56	51	1407	144
Link Distance (ft)	525	4	1115	1863
Upstream Blk Time (%)		16	47	
Queuing Penalty (veh)		30	0	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

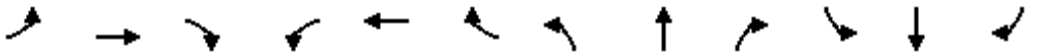
Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	132	335	127
Average Queue (ft)	67	131	63
95th Queue (ft)	109	245	104
Link Distance (ft)	184	938	791
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 75

2040 Plus Project (CPP) No Int PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	95	360	350	20	125	485	0	0	355	115
Future Volume (vph)	0	0	95	360	350	20	125	485	0	0	355	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0	4.0			4.0			4.0	
Lane Util. Factor			1.00	0.95	0.95			0.95			0.95	
Frpb, ped/bikes			1.00	1.00	1.00			1.00			0.99	
Flpb, ped/bikes			1.00	1.00	1.00			1.00			1.00	
Frt			0.86	1.00	0.99			1.00			0.96	
Flt Protected			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (prot)			1565	1633	1731			3490			3277	
Flt Permitted			1.00	0.95	1.00			0.99			1.00	
Satd. Flow (perm)			1565	1633	1731			3490			3277	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	0	104	396	385	22	137	533	0	0	390	126
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	69	0
Lane Group Flow (vph)	0	0	104	356	447	0	0	670	0	0	447	0
Confl. Peds. (#/hr)												15
Heavy Vehicles (%)	0%	0%	5%	5%	3%	0%	0%	3%	0%	0%	5%	5%
Turn Type			Over	Perm	NA		Split	NA			NA	
Protected Phases			1		6		1	1			4	
Permitted Phases				6								
Actuated Green, G (s)			12.5	12.1	12.1			12.5			12.2	
Effective Green, g (s)			13.1	12.1	12.1			13.1			12.8	
Actuated g/C Ratio			0.26	0.24	0.24			0.26			0.26	
Clearance Time (s)			4.6	4.0	4.0			4.6			4.6	
Vehicle Extension (s)			4.0	3.5	3.5			4.0			3.0	
Lane Grp Cap (vph)			410	395	418			914			838	
v/s Ratio Prot			0.07					c0.19			c0.14	
v/s Ratio Perm				0.22	0.26							
v/c Ratio			0.25	0.90	1.07			0.73			0.53	
Uniform Delay, d1			14.6	18.4	18.9			16.9			16.0	
Progression Factor			1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2			0.4	26.2	63.7			3.3			0.7	
Delay (s)			15.0	44.5	82.7			20.1			16.7	
Level of Service			B	D	F			C			B	
Approach Delay (s)		15.0			65.8			20.1			16.7	
Approach LOS		B			E			C			B	

Intersection Summary			
HCM 2000 Control Delay	36.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
2: Airport Blvd. & Baden Ave.

08/19/2020

Movement	EBL	EBR	NBU	NBL	NBT	SBU	SBT	SBR
Lane Configurations								
Traffic Volume (veh/h)	420	265	25	330	465	15	885	535
Future Volume (veh/h)	420	265	25	330	465	15	885	535
Initial Q (Qb), veh	0	0		0	0		0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00				0.99
Parking Bus, Adj	1.00	1.00		1.00	1.00		1.00	1.00
Work Zone On Approach	No				No		No	
Adj Sat Flow, veh/h/ln	1657	1710		1657	1657		1657	1657
Adj Flow Rate, veh/h	293	304		351	495		941	275
Peak Hour Factor	0.94	0.94		0.94	0.94		0.94	0.94
Percent Heavy Veh, %	4	0		4	4		4	4
Cap, veh/h	369	339		1103	2141		862	381
Arrive On Green	0.23	0.23		0.36	0.68		0.27	0.27
Sat Flow, veh/h	1578	1449		3061	3230		3230	1391
Grp Volume(v), veh/h	293	304		351	495		941	275
Grp Sat Flow(s),veh/h/ln	1578	1449		1530	1574		1574	1391
Q Serve(g_s), s	17.5	20.3		8.3	6.0		27.4	17.9
Cycle Q Clear(g_c), s	17.5	20.3		8.3	6.0		27.4	17.9
Prop In Lane	1.00	1.00		1.00				1.00
Lane Grp Cap(c), veh/h	369	339		1103	2141		862	381
V/C Ratio(X)	0.79	0.90		0.32	0.23		1.09	0.72
Avail Cap(c_a), veh/h	458	420		1103	2141		862	381
HCM Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00
Upstream Filter(I)	0.94	0.94		0.77	0.77		0.16	0.16
Uniform Delay (d), s/veh	36.0	37.1		23.1	6.1		36.3	32.8
Incr Delay (d2), s/veh	5.6	15.9		0.0	0.2		44.7	1.9
Initial Q Delay(d3),s/veh	0.0	0.0		0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	7.3	8.7		2.9	1.7		15.5	6.0
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	41.7	53.1		23.2	6.3		81.0	34.8
LnGrp LOS	D	D		C	A		F	C
Approach Vol, veh/h	597				846		1216	
Approach Delay, s/veh	47.5				13.3		70.5	
Approach LOS	D				B		E	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	40.6	32.0				72.6		27.4
Change Period (Y+Rc), s	4.6	* 4.6				4.6		4.0
Max Green Setting (Gmax), s	31.0	* 27				52.4		29.0
Max Q Clear Time (g_c+I1), s	10.3	29.4				8.0		22.3
Green Ext Time (p_c), s	0.9	0.0				2.1		1.0

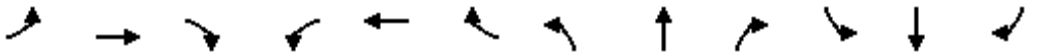
Intersection Summary	
HCM 6th Ctrl Delay	47.1
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

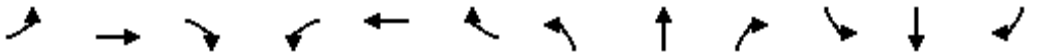
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	85	90	775	285	345	80	585	190	200	515	140
Future Volume (vph)	205	85	90	775	285	345	80	585	190	200	515	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Lane Util. Factor		0.95		0.97	1.00	1.00	1.00	0.95	1.00	0.91	0.91	1.00
Frpb, ped/bikes		0.97		1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.95
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (prot)		2917		3060	1660	1381	1547	3094	1384	1408	2947	1309
Flt Permitted		0.97		0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.99	1.00
Satd. Flow (perm)		2917		3060	1660	1381	1547	3094	1384	1408	2947	1309
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	211	88	93	799	294	356	82	603	196	206	531	144
RTOR Reduction (vph)	0	26	0	0	0	270	0	0	0	0	0	109
Lane Group Flow (vph)	0	366	0	799	294	86	82	603	196	136	601	35
Confl. Peds. (#/hr)			95									10
Confl. Bikes (#/hr)			5			10			5			
Heavy Vehicles (%)	1%	1%	1%	3%	3%	3%	5%	5%	5%	5%	5%	5%
Turn Type	Split	NA		Split	NA	Perm	Split	NA	custom	Split	NA	Perm
Protected Phases	4	4		7	7		6	6	2 6 7!	2!	2	
Permitted Phases						7						2
Actuated Green, G (s)		21.7		29.1	29.1	29.1	21.1	21.1	89.4	29.4	29.4	29.4
Effective Green, g (s)		21.7		29.1	29.1	29.1	21.1	21.1	89.4	29.4	29.4	29.4
Actuated g/C Ratio		0.18		0.24	0.24	0.24	0.18	0.18	0.75	0.24	0.24	0.24
Clearance Time (s)		4.0		4.9	4.9	4.9	4.9	4.9		4.9	4.9	4.9
Vehicle Extension (s)		2.0		3.0	3.0	3.0	2.5	2.5		2.0	2.0	2.0
Lane Grp Cap (vph)		527		742	402	334	272	544	1031	344	722	320
v/s Ratio Prot		c0.13		c0.26	0.18		0.05	c0.19	0.14	0.10	c0.20	
v/s Ratio Perm						0.06						0.03
v/c Ratio		0.69		1.08	0.73	0.26	0.30	1.11	0.19	0.40	0.83	0.11
Uniform Delay, d1		46.0		45.5	41.9	36.7	43.0	49.5	4.5	37.9	43.0	35.2
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		3.2		55.7	6.7	0.4	0.5	71.8	0.1	3.4	10.8	0.7
Delay (s)		49.2		101.1	48.6	37.1	43.5	121.2	4.6	41.2	53.8	35.8
Level of Service		D		F	D	D	D	F	A	D	D	D
Approach Delay (s)		49.2			74.7			88.1			48.9	
Approach LOS		D			E			F			D	

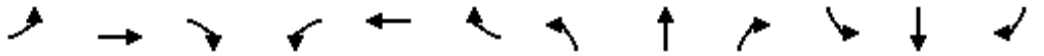
Intersection Summary			
HCM 2000 Control Delay	68.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	210	40	430	285	45	30	245	465	65	240	55
Future Volume (vph)	45	210	40	430	285	45	30	245	465	65	240	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	0.88		1.00	
Frpb, ped/bikes		0.99		1.00	0.99			1.00	1.00		0.99	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00		1.00	
Frt		0.98		1.00	0.98			1.00	0.85		0.98	
Flt Protected		0.99		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)		2722		1413	1445			1479	2224		1425	
Flt Permitted		0.99		0.95	1.00			0.89	1.00		0.65	
Satd. Flow (perm)		2722		1413	1445			1323	2224		928	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	48	226	43	462	306	48	32	263	500	70	258	59
RTOR Reduction (vph)	0	14	0	0	6	0	0	0	196	0	7	0
Lane Group Flow (vph)	0	303	0	462	348	0	0	295	304	0	380	0
Confl. Peds. (#/hr)			20			15			15			25
Confl. Bikes (#/hr)			5			5			5			10
Heavy Vehicles (%)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Turn Type	Split	NA		Split	NA		Perm	NA	pt+ov	Perm	NA	
Protected Phases	1	1		2	2			4	4 2		4	
Permitted Phases							4			4		
Actuated Green, G (s)		23.5		32.8	32.8			23.7	60.0		23.7	
Effective Green, g (s)		23.0		32.3	32.3			22.7	54.5		22.7	
Actuated g/C Ratio		0.26		0.36	0.36			0.25	0.61		0.25	
Clearance Time (s)		3.5		3.5	3.5			3.0			3.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0			2.0	
Lane Grp Cap (vph)		695		507	518			333	1346		234	
v/s Ratio Prot		c0.11		c0.33	0.24				0.14			
v/s Ratio Perm								0.22			c0.41	
v/c Ratio		0.44		0.91	0.67			0.89	0.23		1.63	
Uniform Delay, d1		28.1		27.5	24.4			32.4	8.1		33.6	
Progression Factor		1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		2.0		20.3	2.7			22.8	0.0		300.0	
Delay (s)		30.0		47.7	27.1			55.2	8.1		333.7	
Level of Service		C		D	C			E	A		F	
Approach Delay (s)		30.0			38.8			25.6			333.7	
Approach LOS		C			D			C			F	

Intersection Summary			
HCM 2000 Control Delay	82.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	225	355	870	255	435	140	20	255	195	885	135
Future Volume (veh/h)	265	225	355	870	255	435	140	20	255	195	885	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1811	1811	1811	1811	1811	1811	1678	1678	1678	1856	1856	1856
Adj Flow Rate, veh/h	287	226	0	916	268	0	147	21	0	205	932	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	6	6	6	15	15	15	3	3	3
Cap, veh/h	521	274		991	520		146	651		352	1125	
Arrive On Green	0.15	0.15	0.00	0.29	0.29	0.00	0.09	0.20	0.00	0.20	0.32	0.00
Sat Flow, veh/h	3450	1811	1535	3450	1811	1535	1598	3272	0	1767	3526	1572
Grp Volume(v), veh/h	287	226	0	916	268	0	147	21	0	205	932	0
Grp Sat Flow(s),veh/h/ln	1725	1811	1535	1725	1811	1535	1598	1594	0	1767	1763	1572
Q Serve(g_s), s	9.2	14.5	0.0	30.9	14.9	0.0	11.0	0.6	0.0	12.6	29.4	0.0
Cycle Q Clear(g_c), s	9.2	14.5	0.0	30.9	14.9	0.0	11.0	0.6	0.0	12.6	29.4	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	521	274		991	520		146	651		352	1125	
V/C Ratio(X)	0.55	0.83		0.92	0.52		1.00	0.03		0.58	0.83	
Avail Cap(c_a), veh/h	632	332		1018	534		146	651		352	1125	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.72	0.72	0.00	0.09	0.09	0.00	1.00	1.00	0.00	0.19	0.19	0.00
Uniform Delay (d), s/veh	47.2	49.4	0.0	41.5	35.8	0.0	54.5	38.3	0.0	43.5	37.8	0.0
Incr Delay (d2), s/veh	0.2	8.4	0.0	1.6	0.1	0.0	75.3	0.1	0.0	1.3	1.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	7.2	0.0	13.4	6.6	0.0	7.4	0.3	0.0	5.6	12.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.4	57.8	0.0	43.1	35.9	0.0	129.8	38.3	0.0	44.9	39.2	0.0
LnGrp LOS	D	E		D	D		F	D		D	D	
Approach Vol, veh/h		513	A		1184	A		168	A		1137	A
Approach Delay, s/veh		52.0			41.5			118.4			40.3	
Approach LOS		D			D			F			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.0	43.2		22.7	28.8	29.4		39.1				
Change Period (Y+Rc), s	4.0	4.9		4.6	4.9	* 4.9		4.6				
Max Green Setting (Gmax), s	11.0	33.5		22.0	20.0	* 25		35.4				
Max Q Clear Time (g_c+I1), s	13.0	31.4		16.5	14.6	2.6		32.9				
Green Ext Time (p_c), s	0.0	1.3		0.9	0.2	0.0		1.5				

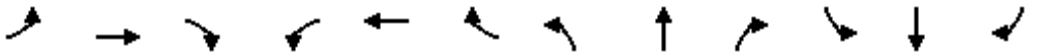
Intersection Summary		
HCM 6th Ctrl Delay		47.1
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	150	405	140	415	35	510	305	125	25	465	685
Future Volume (veh/h)	75	150	405	140	415	35	510	305	125	25	465	685
Initial Q (Qb), veh	0	13	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		1.00	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1781	1781	1781	1811	1811	1811	1767	1767	1767	1841	1841	1841
Adj Flow Rate, veh/h	80	160	154	149	441	33	543	324	0	27	495	543
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	8	8	8	6	6	6	9	9	9	4	4	4
Cap, veh/h	146	418	352	164	412	31	704	724		486	510	410
Arrive On Green	0.09	0.23	0.23	0.10	0.24	0.24	0.22	0.22	0.00	0.28	0.28	0.28
Sat Flow, veh/h	1697	1781	1471	1725	1658	124	3264	3445	0	1753	1841	1481
Grp Volume(v), veh/h	80	160	154	149	0	474	543	324	0	27	495	543
Grp Sat Flow(s),veh/h/ln	1697	1781	1471	1725	0	1783	1632	1678	0	1753	1841	1481
Q Serve(g_s), s	4.7	8.0	9.4	9.0	0.0	25.4	16.3	8.7	0.0	1.2	27.9	29.1
Cycle Q Clear(g_c), s	4.7	8.0	9.4	9.0	0.0	25.4	16.3	8.7	0.0	1.2	27.9	29.1
Prop In Lane	1.00		1.00	1.00		0.07	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	146	418	352	164	0	448	704	724		486	510	410
V/C Ratio(X)	0.55	0.38	0.44	0.91	0.00	1.06	0.77	0.45		0.06	0.97	1.32
Avail Cap(c_a), veh/h	162	431	356	164	0	431	726	747		486	510	410
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.77	0.77	0.77	1.00	0.00	1.00	0.87	0.87	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.0	35.1	33.9	47.0	0.0	39.3	38.7	35.7	0.0	27.9	37.5	37.9
Incr Delay (d2), s/veh	0.9	0.3	0.5	43.5	0.0	58.9	7.0	1.7	0.0	0.0	32.1	161.6
Initial Q Delay(d3),s/veh	0.0	11.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	6.2	3.4	5.8	0.0	18.7	7.1	3.7	0.0	0.5	16.9	28.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.9	46.7	34.4	90.5	0.0	98.2	45.7	37.5	0.0	27.9	69.6	199.6
LnGrp LOS	D	D	C	F	A	F	D	D		C	E	F
Approach Vol, veh/h		394			623			867	A		1065	
Approach Delay, s/veh		42.0			96.4			42.6			134.8	
Approach LOS		D			F			D			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.0	29.0		28.0	13.0	30.0		34.0				
Change Period (Y+Rc), s	4.0	4.6		4.6	4.0	4.6		4.9				
Max Green Setting (Gmax), s	10.0	25.4		22.4	10.0	25.4		29.1				
Max Q Clear Time (g_c+I1), s	11.0	11.4		18.3	6.7	27.4		31.1				
Green Ext Time (p_c), s	0.0	1.1		1.3	0.0	0.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		87.2	
HCM 6th LOS		F	

Notes

User approved volume balancing among the lanes for turning movement.

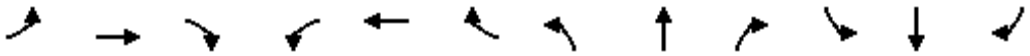
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (vph)	480	35	315	45	55	35	15	395	400	55	30	35
Future Volume (vph)	480	35	315	45	55	35	15	395	400	55	30	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Lane Util. Factor	0.95	0.95	0.88		1.00	1.00		1.00	0.95			1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	0.96		1.00	0.99			1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Frt	1.00	1.00	0.85		1.00	0.85		1.00	0.98			1.00
Flt Protected	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (prot)	1618	1632	2682		1753	1467		1703	3297			1703
Flt Permitted	0.95	0.96	1.00		0.98	1.00		0.95	1.00			0.95
Satd. Flow (perm)	1618	1632	2682		1753	1467		1703	3297			1703
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	500	36	328	47	57	36	16	411	417	57	31	36
RTOR Reduction (vph)	0	0	260	0	0	30	0	0	9	0	0	0
Lane Group Flow (vph)	255	281	68	0	104	6	0	427	465	0	0	67
Confl. Peds. (#/hr)	25					25				35		35
Confl. Bikes (#/hr)										5		
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	Prot	NA		Prot	Prot
Protected Phases	4	4		3	3		5	5	2		1	1
Permitted Phases			4			3						
Actuated Green, G (s)	19.1	19.1	19.1		16.4	16.4		20.6	34.7			7.4
Effective Green, g (s)	19.1	19.1	19.1		16.4	16.4		20.6	34.7			7.4
Actuated g/C Ratio	0.21	0.21	0.21		0.18	0.18		0.22	0.38			0.08
Clearance Time (s)	4.1	4.1	4.1		3.6	3.6		3.0	4.1			3.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		3.0	3.0			3.0
Lane Grp Cap (vph)	334	337	554		311	260		379	1238			136
v/s Ratio Prot	0.16	c0.17			c0.06			c0.25	0.14			0.04
v/s Ratio Perm			0.03			0.00						
v/c Ratio	0.76	0.83	0.12		0.33	0.02		1.13	0.38			0.49
Uniform Delay, d1	34.5	35.1	29.8		33.2	31.4		35.9	21.0			40.7
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00	1.00			1.00
Incremental Delay, d2	9.9	16.1	0.1		0.6	0.0		85.2	0.2			2.8
Delay (s)	44.5	51.2	29.9		33.9	31.4		121.1	21.2			43.5
Level of Service	D	D	C		C	C		F	C			D
Approach Delay (s)		41.1			33.2				68.5			
Approach LOS		D			C				E			

Intersection Summary			
HCM 2000 Control Delay	54.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	92.4	Sum of lost time (s)	15.8
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	760	265
Future Volume (vph)	760	265
Ideal Flow (vphpl)	1900	1900
Total Lost time (s)	4.1	4.1
Lane Util. Factor	0.95	1.00
Frpb, ped/bikes	1.00	0.97
Flpb, ped/bikes	1.00	1.00
Frt	1.00	0.85
Flt Protected	1.00	1.00
Satd. Flow (prot)	3406	1481
Flt Permitted	1.00	1.00
Satd. Flow (perm)	3406	1481
Peak-hour factor, PHF	0.96	0.96
Adj. Flow (vph)	792	276
RTOR Reduction (vph)	0	212
Lane Group Flow (vph)	792	64
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		5
Heavy Vehicles (%)	6%	6%
Turn Type	NA	Perm
Protected Phases	6	
Permitted Phases		6
Actuated Green, G (s)	21.5	21.5
Effective Green, g (s)	21.5	21.5
Actuated g/C Ratio	0.23	0.23
Clearance Time (s)	4.1	4.1
Vehicle Extension (s)	3.0	3.0
Lane Grp Cap (vph)	792	344
v/s Ratio Prot	c0.23	
v/s Ratio Perm		0.04
v/c Ratio	1.00	0.19
Uniform Delay, d1	35.5	28.4
Progression Factor	1.00	1.00
Incremental Delay, d2	32.0	0.3
Delay (s)	67.4	28.7
Level of Service	E	C
Approach Delay (s)	56.6	
Approach LOS	E	

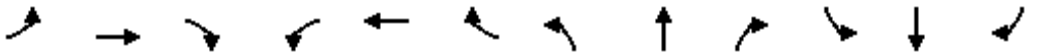
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	25	10	170	10	75	25	205	125	130	370	0
Future Volume (vph)	5	25	10	170	10	75	25	205	125	130	370	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			0.99			0.99			1.00	
Flpb, ped/bikes		1.00			0.97			1.00			1.00	
Frt		0.97			0.96			0.95			1.00	
Flt Protected		0.99			0.97			1.00			0.99	
Satd. Flow (prot)		1581			1496			1577			1655	
Flt Permitted		0.97			0.78			0.95			0.81	
Satd. Flow (perm)		1537			1201			1503			1358	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	5	27	11	181	11	80	27	218	133	138	394	0
RTOR Reduction (vph)	0	6	0	0	34	0	0	44	0	0	0	0
Lane Group Flow (vph)	0	37	0	0	238	0	0	334	0	0	532	0
Confl. Peds. (#/hr)	15		35	35		15	10					10
Confl. Bikes (#/hr)						5			5			5
Parking (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.5			18.5			18.5			18.5	
Actuated g/C Ratio		0.41			0.41			0.41			0.41	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		631			493			617			558	
v/s Ratio Prot												
v/s Ratio Perm		0.02			c0.20			0.22			c0.39	
v/c Ratio		0.06			0.48			0.54			0.95	
Uniform Delay, d1		8.0			9.7			10.0			12.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			3.4			3.4			28.2	
Delay (s)		8.2			13.1			13.4			41.0	
Level of Service		A			B			B			D	
Approach Delay (s)		8.2			13.1			13.4			41.0	
Approach LOS		A			B			B			D	

Intersection Summary			
HCM 2000 Control Delay	25.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



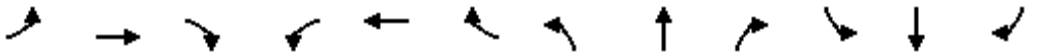
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	375	25	90	705	795	100	100	280	240	115	90
Future Volume (veh/h)	55	375	25	90	705	795	100	100	280	240	115	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	56	383	24	92	719	601	102	102	0	245	117	72
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	87	761	48	111	842	696	117	117		295	179	110
Arrive On Green	0.05	0.43	0.43	0.06	0.45	0.45	0.13	0.13	0.00	0.16	0.16	0.17
Sat Flow, veh/h	1795	1755	110	1795	1885	1559	920	920	1598	1795	1092	672
Grp Volume(v), veh/h	56	0	407	92	719	601	204	0	0	245	0	189
Grp Sat Flow(s),veh/h/ln	1795	0	1865	1795	1885	1559	1839	0	1598	1795	0	1764
Q Serve(g_s), s	2.3	0.0	11.9	3.8	25.6	26.0	8.2	0.0	0.0	9.9	0.0	7.5
Cycle Q Clear(g_c), s	2.3	0.0	11.9	3.8	25.6	26.0	8.2	0.0	0.0	9.9	0.0	7.5
Prop In Lane	1.00		0.06	1.00		1.00	0.50		1.00	1.00		0.38
Lane Grp Cap(c), veh/h	87	0	808	111	842	696	235	0		295	0	290
V/C Ratio(X)	0.64	0.00	0.50	0.83	0.85	0.86	0.87	0.00		0.83	0.00	0.65
Avail Cap(c_a), veh/h	132	0	831	187	898	742	253	0		539	0	530
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	35.0	0.0	15.4	34.8	18.6	18.7	32.1	0.0	0.0	30.3	0.0	29.2
Incr Delay (d2), s/veh	3.0	0.0	0.7	6.0	8.1	10.3	23.6	0.0	0.0	2.3	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	4.8	1.8	11.4	10.0	5.0	0.0	0.0	4.4	0.0	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.0	0.0	16.1	40.8	26.6	29.0	55.7	0.0	0.0	32.7	0.0	30.2
LnGrp LOS	D	A	B	D	C	C	E	A		C	A	C
Approach Vol, veh/h		463			1412			204	A		434	
Approach Delay, s/veh		18.7			28.6			55.7			31.6	
Approach LOS		B			C			E			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.6	37.5		16.3	8.6	36.5		13.6				
Change Period (Y+Rc), s	3.5	4.5		3.5	3.5	4.5		3.5				
Max Green Setting (Gmax), s	6.0	35.2		23.0	8.3	32.9		10.8				
Max Q Clear Time (g_c+I1), s	4.3	28.0		11.9	5.8	13.9		10.2				
Green Ext Time (p_c), s	0.0	4.9		0.9	0.0	3.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		29.5	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	780	110	455	1175	0	405	0	225	0	15	15
Future Volume (veh/h)	15	780	110	455	1175	0	405	0	225	0	15	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	15	788	59	460	1187	0	429	0	44	0	15	13
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	18	1017	448	657	1380	0	525	0	231	0	26	22
Arrive On Green	0.28	0.28	0.28	0.37	0.37	0.00	0.15	0.00	0.15	0.00	0.03	0.03
Sat Flow, veh/h	66	3607	1589	1795	3770	0	3591	0	1581	0	921	798
Grp Volume(v), veh/h	430	373	59	460	1187	0	429	0	44	0	0	28
Grp Sat Flow(s),veh/h/ln	1882	1791	1589	1795	1885	0	1795	0	1581	0	0	1720
Q Serve(g_s), s	19.2	17.0	2.5	19.6	26.2	0.0	10.4	0.0	2.2	0.0	0.0	1.4
Cycle Q Clear(g_c), s	19.2	17.0	2.5	19.6	26.2	0.0	10.4	0.0	2.2	0.0	0.0	1.4
Prop In Lane	0.03		1.00	1.00		0.00	1.00		1.00	0.00		0.46
Lane Grp Cap(c), veh/h	530	505	448	657	1380	0	525	0	231	0	0	48
V/C Ratio(X)	0.81	0.74	0.13	0.70	0.86	0.00	0.82	0.00	0.19	0.00	0.00	0.58
Avail Cap(c_a), veh/h	860	818	726	721	1513	0	938	0	413	0	0	373
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	30.1	29.3	24.1	24.3	26.4	0.0	37.2	0.0	33.7	0.0	0.0	43.1
Incr Delay (d2), s/veh	2.3	1.6	0.1	2.5	4.8	0.0	1.2	0.0	0.1	0.0	0.0	4.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.5	7.1	0.9	8.2	11.7	0.0	4.5	0.0	0.8	0.0	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.4	30.9	24.2	26.8	31.1	0.0	38.4	0.0	33.9	0.0	0.0	47.2
LnGrp LOS	C	C	C	C	C	A	D	A	C	A	A	D
Approach Vol, veh/h		862			1647			473			28	
Approach Delay, s/veh		31.2			29.9			38.0			47.2	
Approach LOS		C			C			D			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		36.9		17.2		29.3		6.5				
Change Period (Y+Rc), s		4.1		3.5		4.1		3.5				
Max Green Setting (Gmax), s		36.0		24.0		41.0		20.0				
Max Q Clear Time (g_c+I1), s		28.2		12.4		21.2		3.4				
Green Ext Time (p_c), s		4.6		0.7		3.9		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			31.7									
HCM 6th LOS			C									

Notes
User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.

Intersection	
Intersection Delay, s/veh	15.3
Intersection LOS	C

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	95	110	110	175	305	155
Future Vol, veh/h	95	110	110	175	305	155
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	6	6	6	6	6	6
Mvmt Flow	103	120	120	190	332	168
Number of Lanes	1	0	0	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	12	13.2	18
HCM LOS	B	B	C

Lane	NBLn1	EBLn1	SBLn1
Vol Left, %	39%	46%	0%
Vol Thru, %	61%	0%	66%
Vol Right, %	0%	54%	34%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	285	205	460
LT Vol	110	95	0
Through Vol	175	0	305
RT Vol	0	110	155
Lane Flow Rate	310	223	500
Geometry Grp	1	1	1
Degree of Util (X)	0.467	0.357	0.685
Departure Headway (Hd)	5.425	5.761	4.932
Convergence, Y/N	Yes	Yes	Yes
Cap	663	624	735
Service Time	3.46	3.802	2.963
HCM Lane V/C Ratio	0.468	0.357	0.68
HCM Control Delay	13.2	12	18
HCM Lane LOS	B	B	C
HCM 95th-tile Q	2.5	1.6	5.5

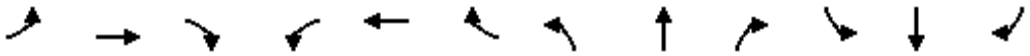
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	755	235	180	1045	560	190
Future Volume (veh/h)	755	235	180	1045	560	190
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.99	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885
Adj Flow Rate, veh/h	778	168	186	1077	577	54
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	1
Cap, veh/h	1647	731	230	2372	763	350
Arrive On Green	0.46	0.46	0.13	0.66	0.22	0.22
Sat Flow, veh/h	3676	1589	1795	3676	3483	1598
Grp Volume(v), veh/h	778	168	186	1077	577	54
Grp Sat Flow(s),veh/h/ln	1791	1589	1795	1791	1742	1598
Q Serve(g_s), s	10.1	1.4	6.8	9.8	10.5	1.8
Cycle Q Clear(g_c), s	10.1	1.4	6.8	9.8	10.5	1.8
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1647	731	230	2372	763	350
V/C Ratio(X)	0.47	0.23	0.81	0.45	0.76	0.15
Avail Cap(c_a), veh/h	3294	1461	932	5366	1912	877
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.6	1.3	28.6	5.5	24.6	21.3
Incr Delay (d2), s/veh	0.3	0.2	2.5	0.2	1.6	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	1.2	2.9	2.4	4.1	0.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	12.9	1.5	31.1	5.7	26.2	21.5
LnGrp LOS	B	A	C	A	C	C
Approach Vol, veh/h	946			1263	631	
Approach Delay, s/veh	10.9			9.4	25.8	
Approach LOS	B			A	C	

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	13.7	35.0				48.7	18.8
Change Period (Y+Rc), s	5.0	* 5				5.0	4.0
Max Green Setting (Gmax), s	35.0	* 61				100.0	37.0
Max Q Clear Time (g_c+I1), s	8.8	12.1				11.8	12.5
Green Ext Time (p_c), s	0.1	10.3				15.3	2.3

Intersection Summary	
HCM 6th Ctrl Delay	13.5
HCM 6th LOS	B

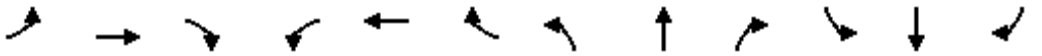
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



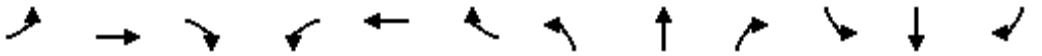
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	525	95	90	760	0	0	260	35	195	300	180
Future Volume (vph)	85	525	95	90	760	0	0	260	35	195	300	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	10	10	12	10	12	10	12	12	12	12	12
Total Lost time (s)	3.7	2.7		3.7	2.7			3.7		3.7	3.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.98		1.00	1.00			0.98		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1770	3209		1770	3303			1823		1770	3268	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (perm)	1770	3209		1770	3303			1823		1770	3268	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	89	553	100	95	800	0	0	274	37	205	316	189
RTOR Reduction (vph)	0	10	0	0	0	0	0	5	0	0	68	0
Lane Group Flow (vph)	89	643	0	95	800	0	0	306	0	205	437	0
Confl. Peds. (#/hr)	50		20	20					25	25		40
Confl. Bikes (#/hr)			5									5
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	13	10		9	14		11	16		15	12	
Permitted Phases												
Actuated Green, G (s)	7.8	34.4		7.7	34.3			20.8		14.7	39.2	
Effective Green, g (s)	7.8	35.4		7.7	35.3			20.8		14.7	39.2	
Actuated g/C Ratio	0.08	0.38		0.08	0.38			0.23		0.16	0.42	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7		3.7	3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0		2.0	3.0	
Lane Grp Cap (vph)	149	1229		147	1261			410		281	1386	
v/s Ratio Prot	0.05	0.20		c0.05	c0.24			c0.17		c0.12	0.13	
v/s Ratio Perm												
v/c Ratio	0.60	0.52		0.65	0.63			0.75		0.73	0.32	
Uniform Delay, d1	40.8	22.0		41.0	23.3			33.4		37.0	17.7	
Progression Factor	1.00	1.00		1.42	0.54			1.00		1.00	1.00	
Incremental Delay, d2	4.2	0.4		5.5	0.8			7.3		7.8	0.1	
Delay (s)	45.0	22.4		63.6	13.4			40.6		44.8	17.8	
Level of Service	D	C		E	B			D		D	B	
Approach Delay (s)		25.1			18.7			40.6			25.6	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	92.4	Sum of lost time (s)	14.8
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	535	0	155	760	50	15	35	205	0	210	245
Future Volume (vph)	180	535	0	155	760	50	15	35	205	0	210	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.7	3.7		3.7	2.7			2.7	3.7		2.7	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.97		0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.99			1.00	0.85		0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		1.00	
Satd. Flow (prot)	1736	3471		1736	3433			1800	1514		1666	
Flt Permitted	0.95	1.00		0.95	1.00			0.88	1.00		1.00	
Satd. Flow (perm)	1736	3471		1736	3433			1604	1514		1666	
Peak-hour factor, PHF	0.97	0.97	0.92	0.97	0.97	0.97	0.97	0.97	0.97	0.92	0.97	0.97
Adj. Flow (vph)	186	552	0	160	784	52	15	36	211	0	216	253
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	121	0	47	0
Lane Group Flow (vph)	186	552	0	160	833	0	0	51	90	0	422	0
Confl. Peds. (#/hr)				10					15			
Confl. Bikes (#/hr)						5						5
Heavy Vehicles (%)	4%	4%	2%	4%	4%	4%	4%	4%	4%	2%	4%	4%
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8		8			
Actuated Green, G (s)	12.2	29.2		12.9	29.9			39.2	39.2		39.2	
Effective Green, g (s)	12.2	29.2		12.9	30.9			40.2	39.2		40.2	
Actuated g/C Ratio	0.13	0.32		0.14	0.33			0.44	0.42		0.44	
Clearance Time (s)	3.7	3.7		3.7	3.7			3.7	3.7		3.7	
Vehicle Extension (s)	2.0	3.0		2.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	229	1096		242	1148			697	642		724	
v/s Ratio Prot	c0.11	0.16		0.09	c0.24						c0.25	
v/s Ratio Perm								0.03	0.06			
v/c Ratio	0.81	0.50		0.66	0.73			0.07	0.14		0.58	
Uniform Delay, d1	39.0	25.7		37.7	27.0			15.2	16.3		19.7	
Progression Factor	1.45	0.71		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	16.2	0.3		5.2	2.3			0.0	0.1		1.2	
Delay (s)	72.7	18.6		42.8	29.3			15.3	16.4		20.9	
Level of Service	E	B		D	C			B	B		C	
Approach Delay (s)		32.2			31.5			16.2			20.9	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	92.4	Sum of lost time (s)	14.8
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	585	205	485	980	0	0	0	0	225	160	315
Future Volume (veh/h)	0	585	205	485	980	0	0	0	0	225	160	315
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				1900	1900	1900
Adj Flow Rate, veh/h	0	643	0	533	1077	0				280	129	79
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1037		1895	2891	0				399	210	178
Arrive On Green	0.00	0.20	0.00	1.00	1.00	0.00				0.11	0.11	0.11
Sat Flow, veh/h	0	5358	1610	3510	3705	0				3619	1900	1610
Grp Volume(v), veh/h	0	643	0	533	1077	0				280	129	79
Grp Sat Flow(s),veh/h/ln	0	1729	1610	1755	1805	0				1810	1900	1610
Q Serve(g_s), s	0.0	10.2	0.0	0.0	0.0	0.0				6.7	5.8	4.1
Cycle Q Clear(g_c), s	0.0	10.2	0.0	0.0	0.0	0.0				6.7	5.8	4.1
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1037		1895	2891	0				399	210	178
V/C Ratio(X)	0.00	0.62		0.28	0.37	0.00				0.70	0.62	0.44
Avail Cap(c_a), veh/h	0	1037		1895	2891	0				724	380	322
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.59	0.59	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	32.9	0.0	0.0	0.0	0.0				38.6	38.2	37.5
Incr Delay (d2), s/veh	0.0	2.8	0.0	0.0	0.2	0.0				0.8	1.1	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.3	0.0	0.0	0.1	0.0				2.9	2.7	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	35.7	0.0	0.0	0.2	0.0				39.5	39.3	38.1
LnGrp LOS	A	D		A	A	A				D	D	D
Approach Vol, veh/h		643	A		1610						488	
Approach Delay, s/veh		35.7			0.2						39.2	
Approach LOS		D			A						D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	54.1	22.0		13.9		76.1
Change Period (Y+Rc), s	5.0	* 5		4.4		5.0
Max Green Setting (Gmax), s	42.5	* 17		17.6		63.0
Max Q Clear Time (g_c+I1), s	2.0	12.2		8.7		2.0
Green Ext Time (p_c), s	1.0	2.1		0.8		15.4

Intersection Summary		
HCM 6th Ctrl Delay		15.4
HCM 6th LOS		B

Notes

User approved volume balancing among the lanes for turning movement.

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	73
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Vol, veh/h	40	25	25	215	0	330	20	0	485	145	200	575
Future Vol, veh/h	40	25	25	215	0	330	20	0	485	145	200	575
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	41	26	26	219	0	337	20	0	495	148	204	587
Number of Lanes	0	1	0	0	1	0	0	0	2	0	1	2

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	1	1
HCM Control Delay	16.8	178.5	52.6	22.5
HCM LOS	C	F	F	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	44%	39%	100%	0%	0%
Vol Thru, %	100%	63%	28%	0%	0%	100%	100%
Vol Right, %	0%	37%	28%	61%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	263	388	90	545	200	288	288
LT Vol	0	0	40	215	200	0	0
Through Vol	263	243	25	0	0	288	288
RT Vol	0	145	25	330	0	0	0
Lane Flow Rate	268	395	92	556	204	293	293
Geometry Grp	8	8	7	7	7	7	7
Degree of Util (X)	0.667	0.955	0.249	1.305	0.492	0.667	0.525
Departure Headway (Hd)	9.98	9.702	10.65	8.446	9.585	9.06	7.24
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	364	376	340	428	380	402	502
Service Time	7.68	7.402	8.35	6.236	7.285	6.76	4.94
HCM Lane V/C Ratio	0.736	1.051	0.271	1.299	0.537	0.729	0.584
HCM Control Delay	30.5	67.6	16.8	178.5	21.2	28.1	17.7
HCM Lane LOS	D	F	C	F	C	D	C
HCM 95th-tile Q	4.6	10.5	1	24.5	2.6	4.7	3

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBR
Lane Configurations	
Traffic Vol, veh/h	0
Future Vol, veh/h	0
Peak Hour Factor	0.98
Heavy Vehicles, %	2
Mvmt Flow	0
Number of Lanes	0

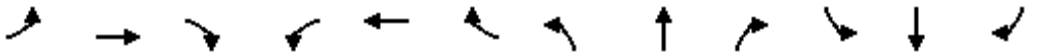
Approach	
Opposing Approach	
Opposing Lanes	
Conflicting Approach Left	
Conflicting Lanes Left	
Conflicting Approach Right	
Conflicting Lanes Right	
HCM Control Delay	
HCM LOS	

Movement	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	0	550	485	45	460	830	0	0	0	0	190	0
Future Volume (vph)	0	550	485	45	460	830	0	0	0	0	190	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0					4.0	4.0
Lane Util. Factor		0.95			0.91	0.91					0.95	0.95
Frpb, ped/bikes		0.99			1.00	1.00					1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00					1.00	1.00
Frt		0.93			1.00	1.00					1.00	1.00
Flt Protected		1.00			0.95	0.99					0.95	0.95
Satd. Flow (prot)		3230			1595	3328					1665	1665
Flt Permitted		1.00			0.95	0.99					0.95	0.95
Satd. Flow (perm)		3230			1595	3328					1665	1665
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	579	511	47	484	874	0	0	0	0	200	0
RTOR Reduction (vph)	0	154	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	936	0	0	347	1058	0	0	0	0	100	100
Confl. Peds. (#/hr)	10		5		5		10					
Confl. Bikes (#/hr)							10					
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type		NA		Split	Split	NA					Split	NA
Protected Phases		5		6	6	6					4	4
Permitted Phases												
Actuated Green, G (s)		25.0			25.0	25.0					9.8	9.8
Effective Green, g (s)		26.0			26.0	26.0					10.3	10.3
Actuated g/C Ratio		0.35			0.35	0.35					0.14	0.14
Clearance Time (s)		5.0			5.0	5.0					4.5	4.5
Vehicle Extension (s)		3.0			3.0	3.0					3.0	3.0
Lane Grp Cap (vph)		1130			558	1164					230	230
v/s Ratio Prot		c0.29			0.22	c0.32					0.06	0.06
v/s Ratio Perm												
v/c Ratio		0.83			0.62	0.91					0.43	0.43
Uniform Delay, d1		22.1			20.1	23.0					29.3	29.3
Progression Factor		1.00			1.00	1.00					1.00	1.00
Incremental Delay, d2		5.1			2.2	10.4					1.3	1.3
Delay (s)		27.2			22.2	33.4					30.6	30.6
Level of Service		C			C	C					C	C
Approach Delay (s)		27.2				30.6			0.0			19.0
Approach LOS		C				C			A			B

Intersection Summary			
HCM 2000 Control Delay	27.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	74.3	Sum of lost time (s)	13.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

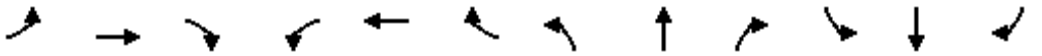
Movement	SBR
Lane Configurations	
Traffic Volume (vph)	340
Future Volume (vph)	340
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frpb, ped/bikes	1.00
Flpb, ped/bikes	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1568
Flt Permitted	1.00
Satd. Flow (perm)	1568
Peak-hour factor, PHF	0.95
Adj. Flow (vph)	358
RTOR Reduction (vph)	12
Lane Group Flow (vph)	346
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Heavy Vehicles (%)	3%
Turn Type	custom
Protected Phases	5
Permitted Phases	4
Actuated Green, G (s)	34.8
Effective Green, g (s)	36.8
Actuated g/C Ratio	0.50
Clearance Time (s)	5.0
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	776
v/s Ratio Prot	c0.16
v/s Ratio Perm	0.06
v/c Ratio	0.45
Uniform Delay, d1	12.1
Progression Factor	1.00
Incremental Delay, d2	0.4
Delay (s)	12.6
Level of Service	B
Approach Delay (s)	
Approach LOS	

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	265	505	0	0	745	375	495	0	495	115	0	85
Future Volume (vph)	265	505	0	0	745	375	495	0	495	115	0	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0	4.0	4.0		4.0
Lane Util. Factor	0.97	1.00			0.95	1.00		1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.97		1.00	1.00	1.00		1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Frt	1.00	1.00			1.00	0.85		1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (prot)	3367	1827			3471	1507		1736	1553	1736		1553
Flt Permitted	0.95	1.00			1.00	1.00		0.95	1.00	0.95		1.00
Satd. Flow (perm)	3367	1827			3471	1507		1736	1553	1736		1553
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	285	543	0	0	801	403	532	0	532	124	0	91
RTOR Reduction (vph)	0	0	0	0	0	297	0	0	178	0	0	82
Lane Group Flow (vph)	285	543	0	0	801	106	0	532	354	124	0	9
Confl. Peds. (#/hr)	10		5	5		10						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Prot	NA			NA	Perm	Perm	NA	Perm	Prot		Prot
Protected Phases	5	2			6			8		7		7
Permitted Phases						6	8		8			
Actuated Green, G (s)	13.6	42.7			24.6	24.6		31.5	31.5	9.8		9.8
Effective Green, g (s)	14.1	43.2			25.1	25.1		31.0	31.0	9.3		9.3
Actuated g/C Ratio	0.15	0.45			0.26	0.26		0.32	0.32	0.10		0.10
Clearance Time (s)	4.5	4.5			4.5	4.5		3.5	3.5	3.5		3.5
Vehicle Extension (s)	3.0	0.2			0.2	0.2		0.2	0.2	0.2		0.2
Lane Grp Cap (vph)	497	826			912	396		563	504	169		151
v/s Ratio Prot	0.08	c0.30			c0.23					c0.07		0.01
v/s Ratio Perm						0.07		0.31	0.23			
v/c Ratio	0.57	0.66			0.88	0.27		0.94	0.70	0.73		0.06
Uniform Delay, d1	37.9	20.4			33.7	27.9		31.4	28.2	41.9		39.1
Progression Factor	1.00	1.00			1.00	1.00		1.00	1.00	1.00		1.00
Incremental Delay, d2	1.6	1.4			9.3	0.1		24.6	3.6	13.2		0.1
Delay (s)	39.5	21.8			43.1	28.0		56.0	31.8	55.1		39.2
Level of Service	D	C			D	C		E	C	E		D
Approach Delay (s)		27.9			38.0			43.9			48.4	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	38.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	95.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	280	675	140	80	1225	195	110	135	55	180	135	475
Future Volume (veh/h)	280	675	140	80	1225	195	110	135	55	180	135	475
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1945
Adj Flow Rate, veh/h	301	726	132	86	1317	210	118	145	59	194	145	511
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	645	2224	404	110	1321	209	72	363	148	213	117	1060
Arrive On Green	0.36	0.74	0.73	0.06	0.43	0.42	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1781	3002	546	1781	3071	485	777	1251	509	541	404	1597
Grp Volume(v), veh/h	301	430	428	86	757	770	118	0	204	339	0	511
Grp Sat Flow(s),veh/h/ln	1781	1777	1771	1781	1777	1780	777	0	1760	945	0	1597
Q Serve(g_s), s	13.0	8.3	8.4	4.8	42.3	43.0	0.0	0.0	9.3	19.7	0.0	0.0
Cycle Q Clear(g_c), s	13.0	8.3	8.4	4.8	42.3	43.0	29.0	0.0	9.3	29.0	0.0	0.0
Prop In Lane	1.00		0.31	1.00		0.27	1.00		0.29	0.57		1.00
Lane Grp Cap(c), veh/h	645	1316	1312	110	764	765	72	0	510	331	0	1060
V/C Ratio(X)	0.47	0.33	0.33	0.78	0.99	1.01	1.64	0.00	0.40	1.03	0.00	0.48
Avail Cap(c_a), veh/h	645	1316	1312	160	764	765	72	0	510	331	0	1060
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.84	0.84	0.37	0.37	0.37	1.00	0.00	1.00	0.90	0.00	0.90
Uniform Delay (d), s/veh	24.5	4.4	4.5	46.3	28.3	28.6	50.0	0.0	28.5	41.8	0.0	8.8
Incr Delay (d2), s/veh	0.2	0.6	0.6	3.2	17.7	21.4	341.5	0.0	0.2	53.7	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	2.4	2.4	2.2	20.5	21.7	8.6	0.0	4.0	13.2	0.0	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.6	5.0	5.1	49.4	46.0	50.0	391.5	0.0	28.7	95.5	0.0	8.9
LnGrp LOS	C	A	A	D	D	F	F	A	C	F	A	A
Approach Vol, veh/h		1159			1613			322			850	
Approach Delay, s/veh		10.1			48.1			161.6			43.4	
Approach LOS		B			D			F			D	

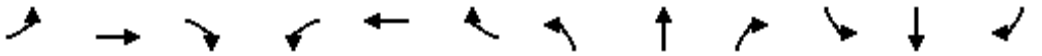
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	41.2	47.0		33.0	10.2	78.1		33.0				
Change Period (Y+Rc), s	5.0	* 5		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	16.0	* 42		29.0	9.0	49.0		29.0				
Max Q Clear Time (g_c+I1), s	15.0	45.0		31.0	6.8	10.4		31.0				
Green Ext Time (p_c), s	0.1	0.0		0.0	0.0	9.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		45.2	
HCM 6th LOS		D	

Notes

User approved pedestrian interval to be less than phase max green.

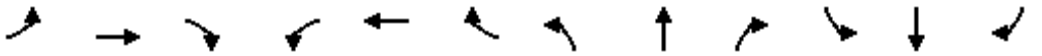
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	530	0	1240	0	1945	475	0	1960	470
Future Volume (vph)	0	0	0	530	0	1240	0	1945	475	0	1960	470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0		5.0		4.0	4.0		4.0	4.0
Lane Util. Factor				0.97		0.88		0.91	1.00		0.91	1.00
Frpb, ped/bikes				1.00		1.00		1.00	0.93		1.00	0.97
Flpb, ped/bikes				1.00		1.00		1.00	1.00		1.00	1.00
Frt				1.00		0.85		1.00	0.85		1.00	0.85
Flt Protected				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (prot)				3467		2814		5136	1487		5136	1554
Flt Permitted				0.95		1.00		1.00	1.00		1.00	1.00
Satd. Flow (perm)				3467		2814		5136	1487		5136	1554
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	552	0	1292	0	2026	495	0	2042	490
RTOR Reduction (vph)	0	0	0	0	0	5	0	0	267	0	0	202
Lane Group Flow (vph)	0	0	0	552	0	1287	0	2026	228	0	2042	288
Confl. Peds. (#/hr)							10		15	15		10
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot		custom		NA	Perm		NA	Perm
Protected Phases				4		4 5		6			2	
Permitted Phases									6			2
Actuated Green, G (s)				53.6		72.2		68.8	68.8		87.4	87.4
Effective Green, g (s)				53.2		67.9		69.2	69.2		87.8	87.8
Actuated g/C Ratio				0.35		0.45		0.46	0.46		0.59	0.59
Clearance Time (s)				4.6				4.4	4.4		4.4	4.4
Vehicle Extension (s)				0.2				0.2	0.2		0.2	0.2
Lane Grp Cap (vph)				1229		1273		2369	686		3006	909
v/s Ratio Prot				0.16		c0.46		c0.39			0.40	
v/s Ratio Perm									0.15			0.19
v/c Ratio				0.45		1.01		0.86	0.33		0.68	0.32
Uniform Delay, d1				37.2		41.0		35.9	25.7		21.4	15.8
Progression Factor				1.00		1.00		1.01	3.10		1.00	1.00
Incremental Delay, d2				0.1		27.9		2.7	0.8		1.3	0.9
Delay (s)				37.2		68.9		39.2	80.6		22.7	16.7
Level of Service				D		E		D	F		C	B
Approach Delay (s)		0.0			59.4			47.3			21.5	
Approach LOS		A			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	41.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.9
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		

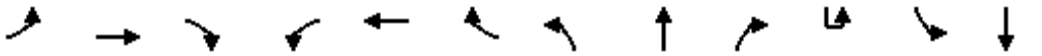
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	325	0	405	0	0	0	0	2100	610	0	1675	815
Future Volume (vph)	325	0	405	0	0	0	0	2100	610	0	1675	815
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.1	4.1					3.9			3.9	3.9
Lane Util. Factor	0.95	0.91	0.95					0.91			0.91	1.00
Frpb, ped/bikes	1.00	1.00	1.00					0.99			1.00	0.94
Flpb, ped/bikes	1.00	1.00	1.00					1.00			1.00	1.00
Frt	1.00	0.89	0.85					0.97			1.00	0.85
Flt Protected	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (prot)	1698	1509	1519					4761			5136	1505
Flt Permitted	0.95	0.99	1.00					1.00			1.00	1.00
Satd. Flow (perm)	1698	1509	1519					4761			5136	1505
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	342	0	426	0	0	0	0	2211	642	0	1763	858
RTOR Reduction (vph)	0	29	29	0	0	0	0	0	0	0	0	200
Lane Group Flow (vph)	267	225	218	0	0	0	0	2853	0	0	1763	658
Confl. Peds. (#/hr)	5					5	10		20	20		10
Confl. Bikes (#/hr)												5
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Parking (#/hr)								0	0			
Turn Type	Split	NA	Perm					NA			NA	Perm
Protected Phases	8	8						6			2	
Permitted Phases			8									2
Actuated Green, G (s)	26.5	26.5	26.5					114.5			114.5	114.5
Effective Green, g (s)	27.0	27.0	27.0					115.0			115.0	115.0
Actuated g/C Ratio	0.18	0.18	0.18					0.77			0.77	0.77
Clearance Time (s)	4.6	4.6	4.6					4.4			4.4	4.4
Vehicle Extension (s)	0.2	0.2	0.2					0.2			0.2	0.2
Lane Grp Cap (vph)	305	271	273					3650			3937	1153
v/s Ratio Prot	c0.16	0.15						c0.60			0.34	
v/s Ratio Perm			0.14									0.44
v/c Ratio	0.88	0.83	0.80					0.78			0.45	0.57
Uniform Delay, d1	59.9	59.3	58.9					10.2			6.2	7.3
Progression Factor	1.00	1.00	1.00					2.31			0.24	5.26
Incremental Delay, d2	22.6	18.3	14.1					1.1			0.3	1.6
Delay (s)	82.5	77.6	73.0					24.6			1.8	39.8
Level of Service	F	E	E					C			A	D
Approach Delay (s)		77.8			0.0			24.6			14.2	
Approach LOS		E			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	26.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT
Lane Configurations												
Traffic Volume (veh/h)	350	440	335	320	495	280	355	1440	105	100	355	1300
Future Volume (veh/h)	350	440	335	320	495	280	355	1440	105	100	355	1300
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0		0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.96	1.00		0.98		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Work Zone On Approach		No			No			No				No
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1885	1885	1885		1885	1885
Adj Flow Rate, veh/h	372	468	247	340	527	228	378	1532	47		378	1383
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94		0.94	0.94
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1		1	1
Cap, veh/h	395	1247	531	393	579	249	871	1630	496		941	1716
Arrive On Green	0.22	0.35	0.35	0.11	0.24	0.24	0.25	0.32	0.32		0.27	0.33
Sat Flow, veh/h	1795	3582	1526	3483	2400	1033	3483	5147	1567		3483	5147
Grp Volume(v), veh/h	372	468	247	340	393	362	378	1532	47		378	1383
Grp Sat Flow(s),veh/h/ln	1795	1791	1526	1742	1791	1643	1742	1716	1567		1742	1716
Q Serve(g_s), s	30.6	14.7	14.1	14.4	32.0	32.2	13.7	43.4	3.1		13.3	36.7
Cycle Q Clear(g_c), s	30.6	14.7	14.1	14.4	32.0	32.2	13.7	43.4	3.1		13.3	36.7
Prop In Lane	1.00		1.00	1.00		0.63	1.00		1.00		1.00	
Lane Grp Cap(c), veh/h	395	1247	531	393	432	396	871	1630	496		941	1716
V/C Ratio(X)	0.94	0.38	0.46	0.86	0.91	0.92	0.43	0.94	0.09		0.40	0.81
Avail Cap(c_a), veh/h	395	1247	531	532	436	400	871	1630	496		941	1716
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Upstream Filter(I)	0.84	0.84	0.84	0.09	0.09	0.09	1.00	1.00	1.00		1.00	1.00
Uniform Delay (d), s/veh	57.6	36.7	21.2	65.4	55.3	55.6	47.3	49.9	33.9		44.8	45.6
Incr Delay (d2), s/veh	27.2	0.1	0.2	0.9	2.9	3.4	0.1	12.0	0.4		0.1	4.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
%ile BackOfQ(50%),veh/ln	16.8	6.5	5.1	6.4	14.7	13.7	6.0	20.2	1.3		5.8	16.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	84.7	36.7	21.4	66.3	58.2	58.9	47.4	61.9	34.3		44.9	49.7
LnGrp LOS	F	D	C	E	E	E	D	E	C		D	D
Approach Vol, veh/h		1087			1095			1957				2032
Approach Delay, s/veh		49.7			61.0			58.4				46.2
Approach LOS		D			E			E				D

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	40.6	54.1	36.0	40.8	43.6	51.1	19.9	56.8
Change Period (Y+Rc), s	3.5	4.6	3.5	* 5.1	3.5	4.1	3.5	5.1
Max Green Setting (Gmax), s	16.7	49.5	32.5	* 36	19.7	47.0	22.4	44.7
Max Q Clear Time (g_c+I1), s	15.7	38.7	32.6	34.2	15.3	45.4	16.4	16.7
Green Ext Time (p_c), s	0.0	1.9	0.0	0.3	0.0	0.7	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	53.3
HCM 6th LOS	D

Notes

User approved ignoring U-Turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	SBR
Lane Configurations	
Traffic Volume (veh/h)	255
Future Volume (veh/h)	255
Initial Q (Qb), veh	0
Ped-Bike Adj(A_pbT)	0.98
Parking Bus, Adj	1.00
Work Zone On Approach	
Adj Sat Flow, veh/h/ln	1885
Adj Flow Rate, veh/h	271
Peak Hour Factor	0.94
Percent Heavy Veh, %	1
Cap, veh/h	523
Arrive On Green	0.33
Sat Flow, veh/h	1569
Grp Volume(v), veh/h	271
Grp Sat Flow(s),veh/h/ln	1569
Q Serve(g_s), s	16.8
Cycle Q Clear(g_c), s	16.8
Prop In Lane	1.00
Lane Grp Cap(c), veh/h	523
V/C Ratio(X)	0.52
Avail Cap(c_a), veh/h	523
HCM Platoon Ratio	1.00
Upstream Filter(I)	1.00
Uniform Delay (d), s/veh	26.0
Incr Delay (d2), s/veh	3.6
Initial Q Delay(d3),s/veh	0.0
%ile BackOfQ(50%),veh/ln	6.8
Unsig. Movement Delay, s/veh	
LnGrp Delay(d),s/veh	29.6
LnGrp LOS	C
Approach Vol, veh/h	
Approach Delay, s/veh	
Approach LOS	
Timer - Assigned Phs	

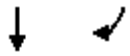
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Traffic Volume (veh/h)	105	105	70	415	270	455	115	220	1820	400	85	310
Future Volume (veh/h)	105	105	70	415	270	455	115	220	1820	400	85	310
Initial Q (Qb), veh	0	0	0	0	0	0		0	0	0		0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.96		1.00		0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Work Zone On Approach		No			No				No			
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885		1885	1885	1885		1885
Adj Flow Rate, veh/h	111	111	47	360	391	231		232	1916	309		326
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		0.95	0.95	0.95		0.95
Percent Heavy Veh, %	1	1	1	1	1	1		1	1	1		1
Cap, veh/h	176	378	160	367	628	513		249	2093	645		323
Arrive On Green	0.33	0.33	0.34	0.33	0.33	0.33		0.14	0.41	0.41		0.18
Sat Flow, veh/h	383	1135	481	1222	1885	1538		1795	5147	1586		1795
Grp Volume(v), veh/h	111	0	158	360	391	231		232	1916	309		326
Grp Sat Flow(s),veh/h/ln	383	0	1616	1222	1885	1538		1795	1716	1586		1795
Q Serve(g_s), s	20.2	0.0	10.8	39.2	26.2	17.7		19.2	52.8	21.5		27.0
Cycle Q Clear(g_c), s	46.4	0.0	10.8	50.0	26.2	17.7		19.2	52.8	21.5		27.0
Prop In Lane	1.00		0.30	1.00		1.00		1.00		1.00		1.00
Lane Grp Cap(c), veh/h	176	0	539	367	628	513		249	2093	645		323
V/C Ratio(X)	0.63	0.00	0.29	0.98	0.62	0.45		0.93	0.92	0.48		1.01
Avail Cap(c_a), veh/h	176	0	539	367	628	513		455	2093	645		323
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00
Uniform Delay (d), s/veh	61.6	0.0	36.9	57.6	42.1	39.2		63.9	42.1	32.8		61.5
Incr Delay (d2), s/veh	7.2	0.0	0.3	41.7	1.9	0.6		15.4	7.7	2.5		52.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0
%ile BackOfQ(50%),veh/ln	4.5	0.0	4.4	18.2	12.6	6.9		9.9	23.7	8.8		17.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.7	0.0	37.2	99.4	44.0	39.8		79.4	49.8	35.3		113.8
LnGrp LOS	E	A	D	F	D	D		E	D	D		F
Approach Vol, veh/h		269			982				2457			
Approach Delay, s/veh		50.2			63.3				50.8			
Approach LOS		D			E				D			

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	24.8	71.2		54.0	31.0	65.0		54.0				
Change Period (Y+Rc), s	3.0	4.4		3.7	3.0	4.4		3.7				
Max Green Setting (Gmax), s	39.0	49.6		50.3	28.0	60.6		50.3				
Max Q Clear Time (g_c+I1), s	21.2	35.7		52.0	29.0	54.8		48.4				
Green Ext Time (p_c), s	0.6	8.6		0.0	0.0	5.1		0.3				

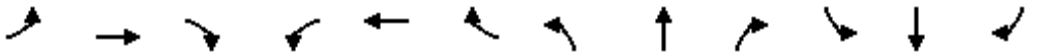
Intersection Summary		
HCM 6th Ctrl Delay	52.3	
HCM 6th LOS	D	

Notes

User approved volume balancing among the lanes for turning movement.
User approved ignoring U-Turning movement.



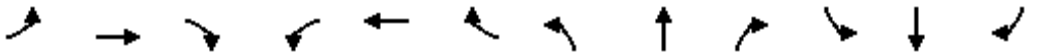
Movement	SBT	SBR
Lane Configurations		
Traffic Volume (veh/h)	1295	145
Future Volume (veh/h)	1295	145
Initial Q (Qb), veh	0	0
Ped-Bike Adj(A_pbT)		0.99
Parking Bus, Adj	1.00	1.00
Work Zone On Approach	No	
Adj Sat Flow, veh/h/ln	1885	1885
Adj Flow Rate, veh/h	1363	147
Peak Hour Factor	0.95	0.95
Percent Heavy Veh, %	1	1
Cap, veh/h	2112	228
Arrive On Green	0.45	0.45
Sat Flow, veh/h	4712	508
Grp Volume(v), veh/h	992	518
Grp Sat Flow(s),veh/h/ln	1716	1790
Q Serve(g_s), s	33.7	33.7
Cycle Q Clear(g_c), s	33.7	33.7
Prop In Lane		0.28
Lane Grp Cap(c), veh/h	1538	802
V/C Ratio(X)	0.65	0.65
Avail Cap(c_a), veh/h	1538	802
HCM Platoon Ratio	1.00	1.00
Upstream Filter(I)	1.00	1.00
Uniform Delay (d), s/veh	32.1	32.2
Incr Delay (d2), s/veh	2.1	4.0
Initial Q Delay(d3),s/veh	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.5	15.5
Unsig. Movement Delay, s/veh		
LnGrp Delay(d),s/veh	34.2	36.2
LnGrp LOS	C	D
Approach Vol, veh/h	1836	
Approach Delay, s/veh	48.9	
Approach LOS	D	
Timer - Assigned Phs		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	0	5	5	0	30	5	30	5	10	180	10
Future Volume (vph)	10	0	5	5	0	30	5	30	5	10	180	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00		1.00	1.00	0.91		1.00	1.00			1.00	1.00
Frt	1.00		0.85	1.00	0.85		1.00	0.98			1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1770		1583	1770	4322		1770	1826			1858	1583
Flt Permitted	0.95		1.00	0.95	1.00		0.63	1.00			0.99	1.00
Satd. Flow (perm)	1770		1583	1770	4322		1170	1826			1841	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	0	5	5	0	33	5	33	5	11	196	11
RTOR Reduction (vph)	0	0	3	0	29	0	0	3	0	0	0	8
Lane Group Flow (vph)	11	0	2	5	4	0	5	35	0	0	207	3
Turn Type	Prot		Perm	Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8			4		4
Actuated Green, G (s)	11.1		15.5	0.7	5.1		12.7	12.7			12.7	12.7
Effective Green, g (s)	11.6		16.0	1.2	5.6		12.7	12.7			12.7	12.7
Actuated g/C Ratio	0.28		0.38	0.03	0.13		0.30	0.30			0.30	0.30
Clearance Time (s)	4.5		4.5	4.5	4.5		4.0	4.0			4.0	4.0
Vehicle Extension (s)	3.0		4.0	3.0	4.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	490		604	50	577		354	553			558	479
v/s Ratio Prot	c0.01			c0.00	c0.00			0.02				
v/s Ratio Perm			0.00				0.00				c0.11	0.00
v/c Ratio	0.02		0.00	0.10	0.01		0.01	0.06			0.37	0.01
Uniform Delay, d1	11.0		8.0	19.8	15.7		10.2	10.4			11.5	10.2
Progression Factor	1.00		1.00	1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	0.0		0.0	0.9	0.0		0.0	0.0			0.4	0.0
Delay (s)	11.0		8.0	20.7	15.7		10.2	10.4			11.9	10.2
Level of Service	B		A	C	B		B	B			B	B
Approach Delay (s)		10.1			16.4			10.4			11.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	41.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	30.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	160	635	0	0	1120	720	350	615	455	0	0	0
Future Volume (veh/h)	160	635	0	0	1120	720	350	615	455	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1885	1885	1885			
Adj Flow Rate, veh/h	174	690	0	0	1217	0	380	668	495			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	1	1	1			
Cap, veh/h	194	1896	0	0	1537		686	720	608			
Arrive On Green	0.11	1.00	0.00	0.00	0.43	0.00	0.38	0.38	0.38			
Sat Flow, veh/h	3483	3676	0	0	3676	1598	1795	1885	1591			
Grp Volume(v), veh/h	174	690	0	0	1217	0	380	668	495			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1791	1598	1795	1885	1591			
Q Serve(g_s), s	4.4	0.0	0.0	0.0	26.4	0.0	14.9	30.5	25.1			
Cycle Q Clear(g_c), s	4.4	0.0	0.0	0.0	26.4	0.0	14.9	30.5	25.1			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	194	1896	0	0	1537		686	720	608			
V/C Ratio(X)	0.90	0.36	0.00	0.00	0.79		0.55	0.93	0.81			
Avail Cap(c_a), veh/h	194	1896	0	0	1537		698	733	619			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.78	0.78	0.00	0.00	0.42	0.00	1.00	1.00	1.00			
Uniform Delay (d), s/veh	39.8	0.0	0.0	0.0	22.2	0.0	21.8	26.6	25.0			
Incr Delay (d2), s/veh	31.2	0.4	0.0	0.0	1.8	0.0	0.5	17.5	7.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.6	0.1	0.0	0.0	10.7	0.0	6.1	16.3	10.1			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.0	0.4	0.0	0.0	24.0	0.0	22.3	44.1	32.5			
LnGrp LOS	E	A	A	A	C		C	D	C			
Approach Vol, veh/h		864			1217	A		1543				
Approach Delay, s/veh		14.6			24.0			35.0				
Approach LOS		B			C			D				

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		51.6			9.0	42.6		38.4				
Change Period (Y+Rc), s		5.0			4.0	5.0		5.0				
Max Green Setting (Gmax), s		46.0			5.0	37.0		34.0				
Max Q Clear Time (g_c+I1), s		2.0			6.4	28.4		32.5				
Green Ext Time (p_c), s		7.5			0.0	6.0		0.8				

Intersection Summary												
HCM 6th Ctrl Delay			26.5									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

2: Train & Scott St Performance by movement

Movement	EBT	WBT	SBT	All
Denied Del/Veh (s)	0.1	2.6	0.1	1.3
Total Del/Veh (s)	3.3	35.0	4.2	19.2
Vehicles Entered	251	274	25	550
Vehicles Exited	250	273	25	548
Hourly Exit Rate	250	273	25	548
Input Volume	247	264	24	535
% of Volume	101	103	105	102
Denied Entry Before	0	0	0	0
Denied Entry After	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.0	0.0	0.0	0.3	0.4	0.4	0.5	0.5	0.6
Total Del/Veh (s)	9.1	13.1	6.2	5.6	5.5	3.7	24.3	24.9	23.7	63.2	61.2	41.1
Vehicles Entered	3	27	11	174	12	77	25	201	123	99	367	6
Vehicles Exited	3	26	11	174	12	77	25	202	124	98	368	6
Hourly Exit Rate	3	26	11	174	12	77	25	202	124	98	368	6
Input Volume	5	25	10	170	12	75	25	205	125	95	370	5
% of Volume	60	105	107	103	98	103	101	98	99	103	99	120
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

11: Dollar Ave/Herman Ave & Scott St Performance by movement

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	35.2
Vehicles Entered	1125
Vehicles Exited	1126
Hourly Exit Rate	1126
Input Volume	1122
% of Volume	100
Denied Entry Before	0
Denied Entry After	0

16: San Mateo Ave & Scott St Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	0.3	0.5	0.4	0.3
Total Del/Veh (s)	7.5	1.4	5.9	9.9	9.0	18.1	13.4	11.9
Vehicles Entered	110	10	138	115	170	300	150	993
Vehicles Exited	109	10	137	116	171	300	150	993
Hourly Exit Rate	109	10	137	116	171	300	150	993
Input Volume	110	9	135	110	175	305	145	990
% of Volume	99	108	101	105	98	98	103	100
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	0.8
Total Del/Veh (s)	40.6
Vehicles Entered	1644
Vehicles Exited	1643
Hourly Exit Rate	1643
Input Volume	4771
% of Volume	34
Denied Entry Before	0
Denied Entry After	0

Intersection: 2: Train & Scott St

Movement	EB	WB	B92	SB
Directions Served	T	T	T	T
Maximum Queue (ft)	87	229	150	33
Average Queue (ft)	40	122	23	4
95th Queue (ft)	83	236	112	22
Link Distance (ft)	8	138	186	482
Upstream Blk Time (%)	18	24	1	
Queuing Penalty (veh)	43	62	4	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: Dollar Ave/Herman Ave & Scott St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	57	66	316	787
Average Queue (ft)	26	36	129	351
95th Queue (ft)	52	51	260	776
Link Distance (ft)	516	8	947	1729
Upstream Blk Time (%)		28		
Queuing Penalty (veh)		71		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 16: San Mateo Ave & Scott St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	139	187	349
Average Queue (ft)	67	74	129
95th Queue (ft)	113	145	325
Link Distance (ft)	186	939	1415
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 180

Appendix B:

Revised Appendix 4.17-1, *Final Water Supply Assessment*

Water Supply Assessment for the Southline Specific Plan

South San Francisco District
California Water Service

FINAL

December 2021
EKI C00070.00

EKI ENVIRONMENT & WATER, INC.

www.ekiconsult.com
2001 Junipero Serra Blvd, Suite 300 • Daly City, CA 94014

Water Supply Assessment

Southline Specific Plan
South San Francisco District, California Water Service

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1 INTRODUCTION

Included herein is a Senate Bill 610-compliant water supply assessment (WSA) in support of the proposed Southline Specific Plan ("Project"; **Figure 1**). The proposed Project site is comprised of approximately 26.5 acres located northeast of the intersection of South Maple Avenue and Tanforan Avenue in the City of South San Francisco, California (City of South San Francisco, 2020). The proposed Project includes demolition of the existing buildings and development of a commercial campus comprised of office and/or research and development (R&D) uses of up to approximately 2.8 million square feet (SF), plus associated irrigated landscaping (BKF Engineers, 2020). The proposed Project is located within the California Water Service (Cal Water) South San Francisco District (SSF District) service area and Cal Water will be the water service provider for the proposed Project.

The information provided in this WSA is consistent with California Water Code (CWC or Water Code) §10910-10912 requirements and the California Department of Water Resources' (DWR's) *Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001: To Assist Water Suppliers, Cities, and Counties in Integrating Water and Land Use Planning*, dated 8 October 2003. The text of specific sub-sections of the Water Code is included in indented and italicized font at the beginning of specific sections of this WSA. The information presented in those respective sections, and the associated tables and figures, respond directly to applicable Water Code requirements.

The purpose of a WSA is to evaluate whether a water provider has sufficient water supply to meet the current and planned water demands within its service area, including the demands associated with the proposed Project, during normal and dry hydrologic years over a 20-year time horizon.[1] Given that the SSF District shares its contractual allocation for its primary supply source (i.e., the City and County of San Francisco's Regional Water System [RWS]) with Cal Water's Bear Gulch and Mid-Peninsula Districts (referred to as the "three Peninsula Districts", **Figure 2**), the collective projected supplies and demands for all three Peninsula Districts are considered in this WSA. More specifically, this WSA includes:

- A summary of the WSA requirements articulated in Water Code §10910-10912 and a description of how they apply to the proposed Project;
- A description and analysis of the current and projected future water demands of the proposed Project through the year 2045;
- A description and analysis of the historical and current water demands for the SSF District, and projected future water demands for the three Peninsula Districts' service areas through the year 2045;
- A description and analysis of the current and projected future water supplies for the three Peninsula Districts' service areas through the year 2045; and

[1] The Water Code specifies that a WSA must look at supplies and demand on a 20-year horizon (i.e., to 2040), but given the available data, this WSA looks beyond that to 2045.

- A comparison of the water supplies and demands for the three Peninsula Districts' service areas, including the projected water demands associated with the proposed Project.

The information contained in this WSA is based primarily on Cal Water's SSF, Bear Gulch, and Mid-Peninsula Districts 2020 Urban Water Management Plans (UWMPs), except where updated with relevant water demand and supply reliability and other information provided by Cal Water, DWR, the San Francisco Public Utilities Commission (SFPUC), and the Bay Area Water Supply and Conservation Agency (BAWSCA). The findings of this WSA are contingent upon the successful development of supplemental water supplies and/or the implementation of conservation/demand management measures to offset any net new demands from qualifying projects in specified Cal Water's districts under Cal Water's Water Neutral Development Policy. This policy is discussed further in Section 4.1.

This WSA concludes that, through the (1) development of supplemental water supplies and/or (2) implementation of conservation or demand management measures equal to the Project's estimated net new demands consistent with the Cal Water's Water Neutral Development Policy, the proposed Project will not affect water supply reliability within the South San Francisco District. Based on currently available information and conservative estimates of projected demand, Cal Water expects to be able to meet all future demands within its existing South San Francisco District service area (as well as the Mid-Peninsula and Bear Gulch Districts), inclusive of the proposed Project in normal hydrologic years. The shortfalls that are currently projected during dry years will be addressed through planned implementation of the South San Francisco District Water Shortage Contingency Plan (WSCP). In addition, as described herein and in Cal Water's 2020 UWMP, BAWSCA, Cal Water, and SFPUC are pursuing the development of additional water supplies to improve the RWS and South San Francisco District supply reliability.

Legend

Proposed Project

N

0 500 1,000

Feet

Project Location

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world aerial map, obtained 21 September 2020.
2. Parcels used for the project site were obtained from Cal Water via email on 28 July 2020.

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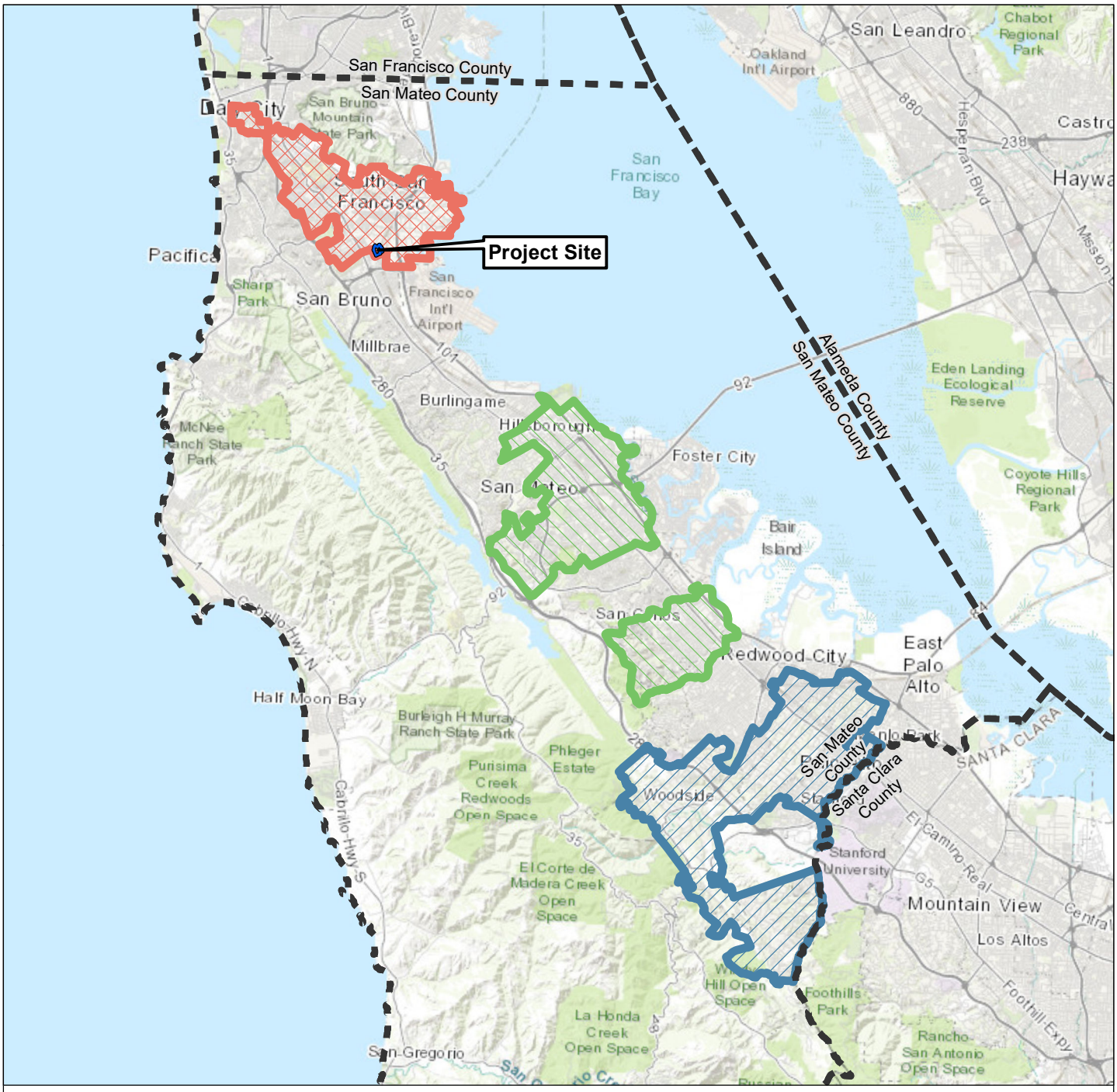
Southline Specific Plan
South San Francisco, CA
July 2021
EKI C00070.00

Figure 1

Path: X:\C00070.00\Maps\Fig1_SPLocation.mxd



Legend

- Proposed Project
- County Boundary
- Bear Gulch District
- Mid-Peninsula District
- South San Francisco District

N

0 4 8

(Scale in Miles)

Abbreviations

Cal Water = California Water Service

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world aerial map, obtained 21 September 2020.
2. Boundary data for Cal Water districts' service areas received from Cal Water on 16 October 2017.

Cal Water's Three Peninsula Districts

Southline Specific Plan
South San Francisco, CA
July 2021
EKI C00070.00

Figure 2

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Path: X:\C00070.00\Maps\Fig2_3Districts.mxd

2 GENERAL REQUIREMENTS FOR THE PREPARATION OF A WATER SUPPLY ASSESSMENT

The purpose of this section is to outline the types of projects that require the preparation of a WSA, who is responsible for preparation, and the necessary components of a WSA.

2.1 Applicability of Senate Bill 610 to the Project

Water Code Section 10910

(a) Any city or county that determines that a project, as defined in Section 10912, is subject to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) under Section 21080 of the Public Resources Code shall comply with this part.

Water Code Section 10912

For the purposes of this part, the following terms have the following meanings:

(a) "Project" means any of the following:
- *(1) A proposed residential development of more than 500 dwelling units.*
- *(2) A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.*
- *(3) A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.*
- *(4) A proposed hotel or motel, or both, having more than 500 rooms.*
- *(5) A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.*
- *(6) A mixed-use project that includes one or more of the projects specified in this subdivision.*
- *(7) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.*

The approximately 26.5-acre proposed Project Site is located northeast of the intersection of South Maple Avenue and Tanforan Avenue in the City of South San Francisco (**Figure 1**), which is located within San Mateo County (City of South San Francisco, 2020). The proposed Project will allow for development of new office and research and development buildings totaling up to approximately 2.8 million SF of space, plus associated irrigated landscaping (BKF Engineers, 2020). The proposed Project meets the definition of a "project" requiring a WSA pursuant to SB 610 (Water Code §10910(a) and 10912(a)(3)).

2.2 Responsibility for Preparation of the Water Supply Assessment

Water Code Section 10910

(b) The city or county, at the time that it determines whether an environmental impact report, a negative declaration, or a mitigated negative declaration is required for any project subject to the California Environmental Quality Act pursuant to Section 21080.1 of the Public Resources Code, shall identify any water system that is, or may become as a result of supplying water to the project identified pursuant to this subdivision, a public water system, as defined in Section 10912, that may supply water for the project. If the city or county is not able to identify any public water system

that may supply water for the project, the city or county shall prepare the water assessment required by this part after consulting with any entity serving domestic water supplies whose service area includes the project site, the local agency formation commission, and any public water system adjacent to the project site.

The proposed Project is located within the Cal Water SSF District service area and the water for the proposed Project will be supplied by Cal Water. Therefore, in accordance with Water Code §10910(b), Cal Water is the entity responsible for preparation and adoption of a WSA for the proposed Project.

2.3 Components of a Water Supply Assessment

Water Code Section 10910

(c) (4) If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses.

As listed above in Water Code §10910(c)(4), the primary purpose of a WSA is to evaluate whether sufficient water supply is available to meet all future demands within the water supplier's service area, including those associated with the proposed Project, during normal and dry hydrologic years for a 20-year planning horizon.[2] Given that the SSF District shares its contractual allocation for its primary supply source (i.e., the City and County of San Francisco's RWS) with Cal Water's three Peninsula Districts (**Figure 2**), the collective projected supplies and demands for all three Peninsula Districts are considered in this WSA. More specifically, this WSA includes:

- A summary of the WSA requirements articulated in Water Code §10910-10912 and a description of how they apply to the proposed Project;
- A description and analysis of the current and projected future water demands of the proposed Project through the year 2045;
- A description and analysis of the historical and current water demands for the SSF District, and projected future water demands for the three Peninsula Districts' service areas through the year 2045;
- A description and analysis of the current and projected future water supplies for the three Peninsula Districts' service areas through the year 2045; and
- A comparison of the water supplies and demands for the three Peninsula Districts' service areas, including the projected water demands associated with the proposed Project.

[2] The Water Code specifies that a WSA must look at supplies and demand on a 20-year horizon (i.e., to 2040), but given the available data, this WSA looks beyond that to 2045.

3 PROJECT DESCRIPTION

The proposed Project would allow for development of a number of office and research and development buildings totaling up to approximately 2.8 million SF of space, plus associated irrigated landscaping on an approximately 26.5-acre site (BKF Engineers, 2020; City of South San Francisco, 2020). For the purposes of this WSA, it is conservatively assumed that full Project buildout is achieved by 2025.

The Environmental Impact Report prepared for the proposed Project (Southline Specific Plan) describes two reasonably foreseeable buildout scenarios: (1) an Office Buildout Scenario, and (2) a Life Sciences Buildout Scenario. The Office Scenario would include office uses and an amenities building for a total of 2,800,000 SF (Floor Area Ratio [FAR] of approximately 2.4). The Life Sciences Scenario would include R&D uses, including laboratory and office spaces, and an amenities building for a total of 2,025,050 SF (FAR of approximately 1.75). Under both the Office Buildout Scenario and the Life Sciences Buildout Scenario, the amenity building would include publicly accessible ground-floor retail, dining, and/or related amenity uses, whereas the upper floors would include amenity uses only available to the Project campus tenants such as a fitness center and meeting spaces. To provide for a conservative analysis, this WSA analyzes the water demand associated with the Life Sciences Scenario, as water demands for that scenario are expected to be greater than that of the Office Scenario.[3]

As shown on **Figure 1**, the proposed Project site is currently developed for industrial uses, which would be demolished to allow for development of the proposed Project. Historical water use at the site ranged between 9 to 13-acre feet per year (AFY) between 2018 and 2020, and averaged 11 AFY (Cal Water, 2020b). The proposed Project is located within the Cal Water SSF District service area and potable water service will be provided by Cal Water (**Figure 2**).

[3] While the Office Scenario would allow for development of more overall square footage as compared to the Life Science Scenario, the R&D uses that would be developed under the Life Science Scenario generate a higher gallons per day / square foot of water demand compared to office water demand.

4 PROJECT WATER DEMAND

The City of South San Francisco has adopted green building standards and water efficient landscaping ordinances consistent with previous versions of the CalGreen building standards and the California Model Water Efficient Landscape Ordinance (MWELO). As part of state requirements, all new developments must comply with these efficiency standards. As such, the proposed Project development is expected to include a number of water-efficient features, including, but not limited to:

- Use of low-flow lavatory faucets, kitchen faucets, toilets, and urinals in accordance with CalGreen Code; and
- Inclusion of low-water use landscaping and high-efficiency irrigation systems to minimize outdoor water use in accordance with MWELO.

As described below, average annual water demand for the proposed Project was provided by LPGS Tanforan, LLC ("Project Proponent"; BKF Engineers, 2020; see **Appendix A**) and evaluated relative to current water use by similar uses in the Cal Water SSF District. Similar uses within the Cal Water SSF District are based on the Cal Water WSA Water Factor Tool, which was developed based on 2016-2018 water use data for the SSF District (Cal Water, 2019b). **Table 1** includes a summary of the water demand projections associated with the proposed land uses at Project completion. For the purposes of this WSA, it is conservatively assumed that full Project buildout is achieved by 2025.

4.1 Cal Water Water Neutral Development Policy

In July 2021, Cal Water began development of a Water Neutral Development Policy (or Policy) for its three Peninsula Districts, which share the same SFPUC supply allocation. The purpose of the Policy is to ensure that there is enough water at all times to meet the basic needs of the community and increase drought resiliency, among other things. As noted above, the findings of this WSA are contingent upon the successful development of supplemental water supplies and/or the implementation of conservation/demand management measures to offset any net new demands from qualifying projects in specified Cal Water's districts under the Policy.

As currently drafted, the Policy will require any new residential, commercial, or industrial development within the SSF District that is expected to exceed a specified amount of new demand to offset its net increase in water demand. The net increase in water demand associated with any new development is calculated as the expected total water use due to the proposed development and/or expansion, minus the amount of existing water use, onsite credits (if available), and/or alternative sources of water supply. Alternative sources may include, but are not limited to: (1) reused graywater, (2) reused blackwater, (3) reused mixed gray/blackwater, (4) captured rainwater / stormwater, and (5) air conditioning condensate.

The offset amount is determined using a detailed projection of total annual water demand resulting from the proposed development, excluding temporary demands such as those required for landscape establishment. The applicant may choose to comply with the defined offset amount by: (1) paying to the SSF District the required offset amount calculated according to the offset costs included in the Policy, and/or (2) conducting other activities as defined in the Policy. The

offset amount for the Southline Specific Plan is identified in Section 4.5. Cal Water will verify compliance with this Water Neutral Development Policy (i.e., ensure that all payments for offsets and/or conservation offset measures are completed) prior to establishing a water service connection.

4.2 Commercial Water Use

As discussed in Section 3, the proposed Project has two possible buildout scenarios. The Project Proponent provided estimated indoor water use for the Life Science Buildout Scenario, which would be expected to have greater water demand than the Office Buildout Scenario. The Life Science Buildout Scenario includes 1,936,850 SF of R&D uses, including laboratory and office spaces, and an 88,200-SF amenities building, for a total development of 2,025,050 SF.

Table 1 provides a summary of the land uses, unit demand factors, and respective water demand associated with each land use. The unit demand factor provided by the Project Proponent for the R&D portions of the proposed Project is 0.21 gallons per day/square feet (GPD/SF) (BKF Engineers, 2020). The unit demand factors for the amenities building vary from 0.10 GPD/SF to 0.80 GPD/SF depending on specific amenity use type (e.g., restaurant, cafeteria, fitness or auditorium uses). Based on information provided by the Project Proponent, all unit demand factors were sourced from published Redwood City water demand assumption, as recommended by the City of South San Francisco.[4] These water demand factors are substantially higher than that of current non-residential uses within the SSF District, which, based on 2016-2018 data, are 0.063 GPD/SF. Based on demand estimates provided by the Project Proponent, it is estimated that the total indoor water use for the proposed Project will be approximately 459,779 GPD, or 515 AFY (BKF Engineers, 2020).

4.3 Outdoor Water Use

The Project Proponent provided estimated irrigated landscape water use based on a unit demand factor of 0.07 GPD/SF (BKF Engineers, 2020; see **Appendix A**). The proposed Project would include approximately 260,400 SF of irrigated landscape area, and be in compliance with the City of South San Francisco's water efficient landscaping ordinance.[5] Based on this methodology, it is estimated that the total irrigated landscape water use for the proposed Project will be 18,228 GPD or 20 AFY (BKF Engineers, 2020).

[4] Annual water demand (AFY) based on 365 days of use per year.

[5] The City of South San Francisco Notice Preparation of an EIR indicates that the Project is expected to include approximately 369,000 SF of open space, which is less than was estimated in BKF Engineers (2020) (City of South San Francisco, 2020).

Table 1

Summary of Estimated Incremental Annual Project Water Demand

Southline Specific Plan, South San Francisco, California

Water Use (a)	Area (SF)	Demand Factor (GPD/SF)	Total Water Demand (AFY)				
			2025	2030	2035	2040	2045
R&D	1,936,850	0.21	456	456	456	456	456
Amenity Building							
Restaurant/Dining	16,400	0.47	8.7	8.7	8.7	8.7	8.7
Cafeteria	9,000	0.80	8.1	8.1	8.1	8.1	8.1
Fitness Center	49,000	0.75	41	41	41	41	41
Auditorium/Other	13,800	0.10	1.5	1.5	1.5	1.5	1.5
Irrigation	260,400	0.070	20	20	20	20	20
Distribution System Losses (b)	--	--	33	33	33	33	33
Existing Site Demand (c)	--	--	-13	-13	-13	-13	-13
Net Annual Water Demand (d)			**555**	**555**	**555**	**555**	**555**

Abbreviations:

"AFY" = acre-feet per year
"DWR" = California Department of Water Resources
"GPD" = gallons per day
"SF" = square feet

Notes:

(a) Estimated demands for the proposed project per Reference 1.

(b) Estimated distribution system water loss is calculated using the 2019 DWR Water Audit Report percent water loss (i.e., 5.8% of project demands), per Reference 2 and includes both real and apparent losses.

(c) Existing site demands per Reference 3. Existing demands are subtracted from total projected water demands to show the incremental increase in demands associated with the Project (i.e., the net increase in water demand). Existing demands are estimated as the average of the last three years of water use at the project site based on available metered data (2017-2019).

(d) Total may not sum due to rounding.

References:

1. BKF Engineers, 2020. Southline Project - Water Demand, dated 25 November 2020, prepared by BKF Engineers.
2. DWR, 2021. WUEdata - Water Audit Report Data website, accessed 2 July 2021, (https://wuedata.water.ca.gov/awwa_plans).
3. Data provided by Cal Water via email, 28 July 2020.

4.4 Distribution System Losses

Water distribution systems experience a degree of water loss over the course of transmission from the source to the customer. Although distribution system losses from the newly-constructed portion of the system's infrastructure associated with the proposed Project would initially be expected to be minimal, it is conservatively assumed that distribution system losses associated with delivering water for the proposed Project will ultimately be consistent with the proportion of non-revenue water loss per the most recent validated water loss audit submitted to DWR for the SSF District (i.e., 5.8%; DWR, 2021). It should be noted that while these real losses represent a demand on the system, water lost through the distribution system returns to the groundwater basin and thus is not a true demand on the groundwater supply. However, for purposes of this WSA, all water loss is conservatively considered a demand. **Table 1** shows the distribution system losses for the proposed Project, estimated at a total of 33 AFY.

4.5 Total Project Water Demand

Historical water use for the current land use at the proposed Project site over the last three years (i.e., 2018 – 2020) ranged between 9 AFY and 13 AFY, and averaged 11 AFY (Cal Water, 2020b). Thus, based on the above methodologies and assumptions, and adjusting for the existing water use at the site, the incremental increase in water demand associated with the proposed Project at full buildout and occupancy is estimated to be 557 AFY, as shown in **Table 1**. However, as discussed in Section 4.1, in accordance with the SSF District's Water Neutral Development Policy, the offset amount for the Southline Specific Plan is equal to the incremental increase in water demand associated with the proposed Project. Thus, the proposed Project will be required to offset a total of 557 AFY and is therefore not expected to result in a net increase in water demands to Cal Water's SSF District.

5 CAL WATER SSF DISTRICT WATER DEMAND

Water Code Section 10910

(c) (1) The city or county, at the time it makes the determination required under Section 21080.1 of the Public Resources Code, shall request each public water system identified pursuant to subdivision (b) to determine whether the projected water demand associated with a proposed project was included as part of the most recently adopted urban water management plan adopted pursuant to Part 2.6 (commencing with Section 10610).

(c) (2) If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g).

(c) (3) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.

In support of the development of its 2020 UWMPs, Cal Water updated its estimates of projected future water demand for the three Peninsula Districts (Cal Water, 2021a). Consistent with the UWMP Act (Water Code §10610-10656), Cal Water's projected future water demand is estimated in five-year increments, between the years 2025 and 2045.

The projections include all existing demands within the SSF District, as well as for other large projects for which Cal Water has prepared WSAs in the last five years (i.e., 201 Haskins Way, South SFPUC Site, South San Francisco Downtown Station, Oyster Point Development, and the 2017 Genentech Master Plan Update). In addition, 527 AFY associated with the proposed Project was included in the 2020 UWMP demand projections for the SSF District.

Through implementation of the Water Neutral Development Policy, the proposed Project will result in a decrease in demands for the SSF District relative to those projected in the 2020 UWMP.[6] All other new developments that are expected to exceed a specified amount of demand within the three Peninsula Districts will also be required to comply with the Water Neutral Development Policy and thus will result in no incremental increase in demand on the system.

[6] Demand estimates for the District's service area through 2045 were developed using Cal Water's demand forecast model, which estimates future demands based on current water use for the District, anticipated growth based on projections by the Association of Bay Area Governments (ABAG), projected water conservation efforts, and anticipated passive conservation savings.

5.1 Current and Historical Water Demand Within the Cal Water SSF District Service Area

Historical water demand within the Cal Water SSF District service area from 2000 through 2020 is summarized in **Table 2**. The largest proportion of water demand within the SSF District service area is from the commercial sector, which represented 45% of the demand in the 2016-2020 period. The remainder of the demand was split between single-family residential (SFR) (37% of overall demand), industrial (9% of overall demand), multi-family residential (MFR) (5% of the overall demand), and institutional/government (4% of the overall demand; Cal Water, 2020c).

Water use from 2000 to 2008 within the SSF District remained fairly consistent, at an average of 9,356 AFY. A slight decrease in water use occurred from 2008 to 2012, which generally corresponds with the 2007 to 2009 drought and the economic downturn. Then, a significant drop in water demand occurred in 2014 and 2015, corresponding with the recent historic drought and mandatory state-wide water use restrictions and water conservation targets. Based on the data summarized in **Table 2**, the total water use averaged 6,838 AFY from 2016 through 2020.

5.2 SSF District Water Demand Projections

Projected water demands for the SSF District are documented in the SSF District 2020 UWMP (2020 UWMP) and presented in **Table 3** in 5-year increments. Taking into account historical water use, expected population increase and other growth, climatic variability, and other assumptions, water demand within the SSF District is projected to increase to 8,423 AFY by 2045, a change of 23% compared to the 2016-2020 average.

5.3 Total Projected SSF District Water Demand (Inclusive of the Proposed Project)

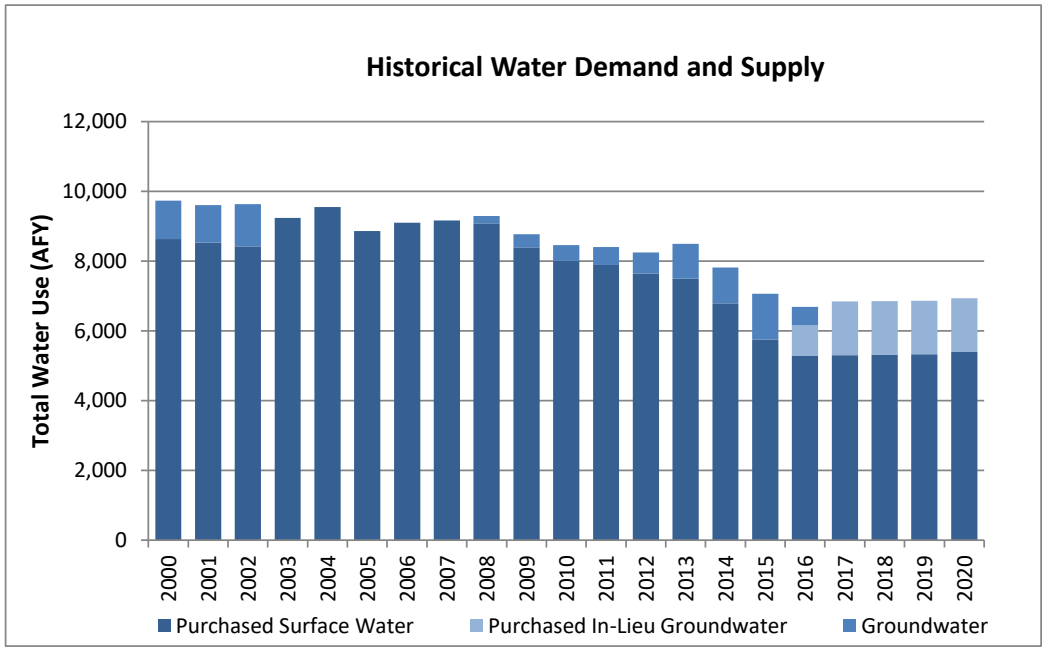
Table 3 also shows the projected water demands for the SSF District inclusive of the estimated proposed Project water demands. As shown, with the implementation of the District's Water Neutral Development Policy and given the fact that growth associated with the proposed Project was included in the 2020 UWMP demand projections for the SSF District, the proposed Project is expected to result in a net decrease in water demands to Cal Water's SSF District (i.e., inclusive of the proposed Project the total annual water demand will be approximately 7,896 AFY in 2045).

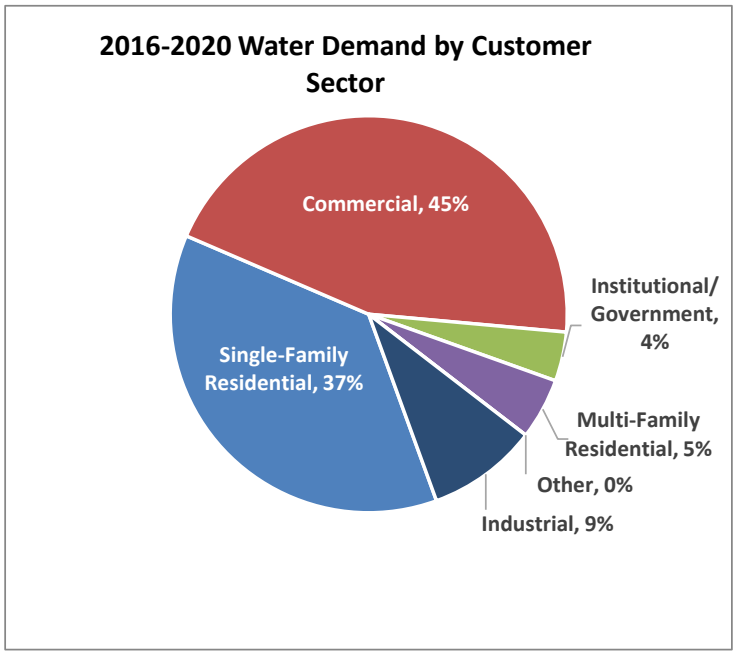
Table 2

Historical Water Demand for South San Francisco District

Southline Specific Plan, South San Francisco, California

Category	Cal Water Historical Annual Water Demand (AFY) (a)																				
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Purchased Surface Water	8,632	8,531	8,426	9,245	9,549	8,869	9,101	9,169	9,086	8,397	8,013	7,892	7,644	7,500	6,787	5,751	5,296	5,308	5,322	5,332	5,397
Purchased In-Lieu Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	863	1,535	1,535	1,535	1,539
Groundwater	1,106	1,076	1,207	0	0	0	0	0	206	380	452	515	606	995	1,028	1,312	527	0	0	0	0
Total Water Demand	**9,738**	**9,606**	**9,633**	**9,245**	**9,549**	**8,869**	**9,101**	**9,169**	**9,292**	**8,777**	**8,465**	**8,408**	**8,250**	**8,495**	**7,816**	**7,064**	**6,687**	**6,842**	**6,857**	**6,867**	**6,936**





Abbreviations:

"AFY" = acre feet per year

Notes:

(a) Historical water demands for per Reference 1. 2016-2020 water use by customer sector per Reference 2.

References:

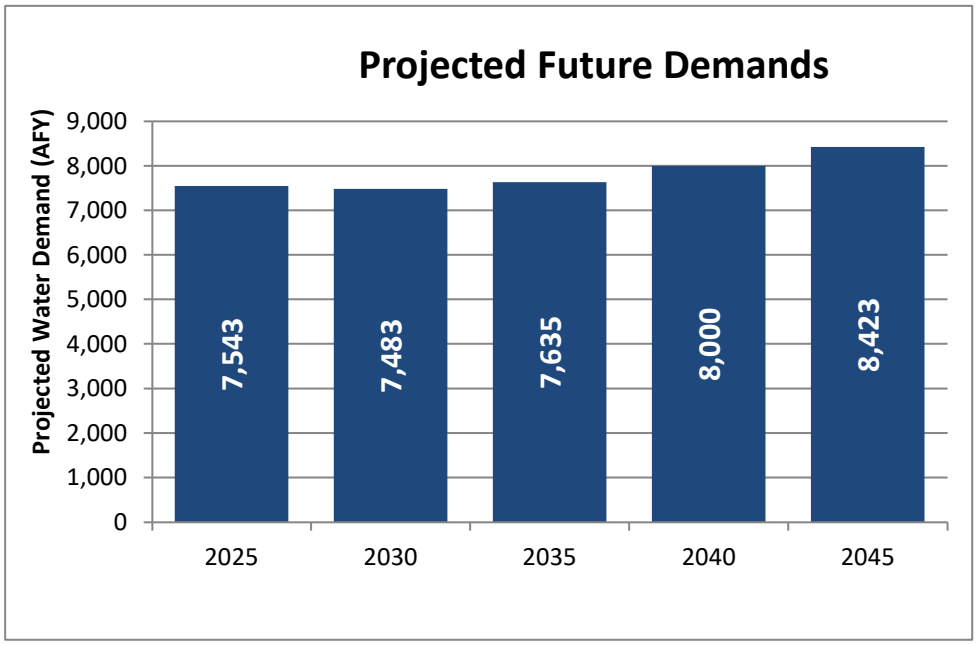
1. Cal Water Demand Model for the South San Francisco District, provided 3 March 2021.
2. 2021-2025 Conservation Master Plan, South San Francisco District, prepared by California Water Service, dated April 2021.
3. 2021-2025 Conservation Master Plan, South San Francisco District, prepared by California Water Service, dated April 2021.

Table 3

Projected Future Water Demand for the South San Francisco District

Southline Specific Plan, South San Francisco, California

	Projected Annual Water Demand (a) (AFY)				
Year	**2025**	**2030**	**2035**	**2040**	**2045**
Water Demand (b)	7,543	7,483	7,635	8,000	8,423



Abbreviations:

"AFY" = acre feet per year

Notes:

(a) Water demand projections for the South San Francisco District were updated in 2021, and are presented per Reference 1.

(b) The total water demand is the sum of total water use and distribution system losses.

References:

1. Cal Water Demand Model for the South San Francisco District, provided 3 March 2021.

6 CAL WATER SSF DISTRICT WATER SUPPLY

This section identifies Cal Water SSF District's water supplies and discusses the vulnerability of the various supplies to drought and other factors affecting water supply reliability. The Cal Water SSF District utilizes both groundwater supply from the Westside Basin and imported surface water supply purchased from the SFPUC. Both sources are expected to constitute the water supply for the proposed Project.

6.1 Identification of Water Supply Rights

Water Code Section 10910

(d) (1) The assessment required by this section shall include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts.

Pursuant to Water Code §10910(d)(1), a WSA is required to include identification of all water supply entitlements, water rights, and water service contracts relevant to the identified water supply for the proposed Project. In accordance with these requirements, this WSA includes a summary of Cal Water's water supply sources in the SSF District service area and the agreements between Cal Water and its wholesale supplier, the SFPUC, and other parties.

As discussed further below, three Cal Water Districts share one contractual allocation of supply from the City and County of San Francisco's RWS, and thus manage the supplies for all three Peninsula Districts collectively. Therefore, the consideration of supply availability below for the SSF District considers the collective supply available to all three Peninsula Districts (i.e., the SSF, Bear Gulch, and Mid-Peninsula Districts).

6.1.1 SFPUC Regional Water System

6.1.1.1 RWS Supply Sources and Allocation

The majority of the water supply to the Cal Water SSF District (i.e., approximately 89% from 2005-2020) is treated water purchased from the City and County of San Francisco's RWS, which is operated by the SFPUC. Within the SSF District, Cal Water takes delivery from eleven active and two standby metered turnouts from RWS transmission lines.

The RWS supply originates predominantly from the Sierra Nevada but also includes treated water produced by the SFPUC from its local watersheds and facilities in Alameda and San Mateo Counties. Approximately 85% of the RWS supply is from the Tuolumne River via the Hetch-Hetchy Reservoir and aqueducts. The Cal Water RWS supply is sourced from the remaining 15%, which is derived from local watersheds and the San Antonio, Calaveras, Crystal Springs, Pilarcitos, and San Andreas Reservoirs.

The business relationship between the City and County of San Francisco and its Wholesale Customers (including Cal Water) is largely defined by the Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County, and Santa Clara County (Agreement) entered into in July 2009. The Agreement, which has a 25-year term, addresses water supply availability for the RWS as well as the methodology used by the SFPUC in setting wholesale water rates. This Agreement supersedes an earlier 25-year agreement signed in 1984, and was amended in 2019. The amendments included extending the deadline for SFPUC to decide whether to make San Jose and Santa Clara permanent customers, a revision to the drought allocation formula, and a deadline extension for completion of its Water Supply Improvement Plan, among other things. A copy of this Agreement (without signatures) is included in **Appendix B**.

The Agreement provides a 184 million gallons per day (MGD) Supply Assurance to the SFPUC's Wholesale Customers collectively (Cal Water, 2021a). This allocation was reached through negotiation in the early 1990s between the SFPUC and the Bay Area Water Users Association (BAWUA), the predecessor organization to BAWSCA, and was first signed by Cal Water, along with 29 other Bay Area water suppliers, as part of the 1984 Settlement Agreement and Master Water Sales Contract with San Francisco, supplemented by individual Water Supply Contracts (Cal Water, 2016a). The Supply Assurance is subject to reduction during periods of water shortage due to drought, emergencies, or other scenarios resulting in a water shortage. Each wholesale customer's share of the 184 MGD is referred to as their Individual Supply Guarantee (ISG). Although the Agreement expires in 2034, the Supply Assurance and ISG continue in perpetuity as both are subject to separate binding water allocation agreements described above, and would continue beyond the term of the Agreement. At expiration of the Agreement, it is likely that a new agreement will be entered into as was done at the termination of the prior 1984 agreement.

Cal Water's contractual allocation of SFPUC supply is shared among its Bear Gulch, Mid-Peninsula, and SSF Districts. Cal Water's ISG for the three Peninsula Districts was originally 35.39 MGD (39,642 AFY). However, the acquisition of the Los Trancos County Water District in July 2005 resulted in the transfer of 0.11 MGD of ISG to Cal Water and in 2009 Cal Water acquired the Skyline County Water District, which also transferred its 0.181 MGD ISG to Cal Water. These acquisitions increased Cal Water's total ISG to 35.68 MGD (39,993 AFY) (Cal Water, 2016a).

Information regarding the Agreement and subsequent amendments was provided by BAWSCA in coordination with SFPUC in support of 2020 UWMP development and is provided verbatim below.

> *In the 2009 Water Supply Agreement, the SFPUC committed to make three decisions before 2018 that affect water supply development:*
>
> - *Whether or not to make the cities of San Jose and Santa Clara permanent customers,*
> - *Whether or not to supply the additional unmet supply needs of the Wholesale Customers beyond 2018, and*

- *Whether or not to increase the wholesale customer Supply Assurance above 184 mgd.*

Events since 2009 made it difficult for the SFPUC to conduct the necessary water supply planning and CEQA analysis required to make these three decisions before 2018. Therefore, in the 2018 Amended and Restated Water Supply Agreement, the decisions were deferred for 10 years to 2028.

Additionally, there have been recent changes to instream flow requirements and customer demand projections that have affected water supply planning beyond 2018. As a result, the SFPUC has established an Alternative Water Supply Planning program to evaluate several regional and local water supply options. Through this program, the SFPUC will conduct feasibility studies and develop an Alternative Water Supply Plan by July 2023 to support the continued development of water supplies to meet future needs.

Cal Water's collective current and projected purchase quantities are approximately equal to an average of 29.38 MGD in 2020 and 30.35 MGD in 2045,[7] respectively (Cal Water, 2021a). Both current and projected quantities are less than Cal Water's ISG of 35.68 MGD.

6.1.1.2 RWS Supply Reliability

The RWS has historically met demand in its service area in all year types. Factors that will affect future reliability of the RWS are discussed below. Detailed information regarding factors that impact the SFPUC RWS supply reliability are provided in the 2020 UWMP.

The water available to SFPUC's Retail and Wholesale Customers from the RWS is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River (Cal Water, 2021a). In addition, statewide regulations and other factors can impact the system reliability. For example, the adoption of the Water Quality Control Plan for the San Francisco/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan Amendment) is anticipated to impact the reliability of the RWS supplies in the future.

Based on an analysis by BAWSCA, if the current Bay-Delta Plan Amendment (July 2018) is implemented, the proposed unimpaired flow volumes would significantly reduce water supply available through the RWS during future drought conditions, and BAWSCA member agencies (including the Cal Water SSF District) would be required to reduce their water use by as much as 50% during drought years (BAWSCA, 2018b).

In support of 2020 UWMP development, SFPUC provided a detailed discussion of the factors contributing to the significant uncertainties surrounding the Bay-Delta Plan Amendment. This discussion is excerpted below:

[7] Projected RWS purchase volumes are based on having full local supply (i.e., 840 AFY in the Bear Gulch Reservoir and 1,534 AFY from the South San Francisco wells).

In December 2018, the State Water Resources Control Board (SWRCB) adopted amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan Amendment) to establish water quality objectives to maintain the health of the Bay-Delta ecosystem. The SWRCB is required by law to regularly review this plan. The adopted Bay-Delta Plan Amendment was developed with the stated goal of increasing salmonid populations in three San Joaquin River tributaries (the Stanislaus, Merced, and Tuolumne Rivers) and the Bay-Delta. The Bay-Delta Plan Amendment requires the release of 30-50% of the "unimpaired flow"[8] on the three tributaries from February through June in every year type. In SFPUC modeling of the new flow standard, it is assumed that the required release is 40% of unimpaired flow.

If the Bay-Delta Plan Amendment is implemented, the SFPUC will be able to meet the projected water demands presented in this Urban Water Management Plan (UWMP) in normal years but would experience supply shortages in single dry years or multiple dry years. Implementation of the Bay-Delta Plan Amendment will require rationing in all single dry years and multiple dry years. The SFPUC has initiated an Alternative Water Supply Planning Program (AWSP) to ensure that San Francisco can meet its Retail and Wholesale Customer water needs, address projected dry years shortages, and limit rationing to a maximum 20 percent system-wide in accordance with adopted SFPUC policies. This program is in early planning stages and is intended to meet future water supply challenges and vulnerabilities such as environmental flow needs and other regulatory changes; earthquakes, disasters, and emergencies; increases in population and employment; and climate change. As the region faces future challenges – both known and unknown – the SFPUC is considering this suite of diverse non-traditional supplies and leveraging regional partnerships to meet Retail and Wholesale Customer needs through 2045.

The SWRCB has stated that it intends to implement the Bay-Delta Plan Amendment on the Tuolumne River by the year 2022, assuming all required approvals are obtained by that time. But implementation of the Plan Amendment is uncertain for multiple reasons.

First, since adoption of the Bay-Delta Plan Amendment, over a dozen lawsuits have been filed in both state and federal courts, challenging the SWRCB's adoption of the Bay-Delta Plan Amendment, including a legal challenge filed by the federal government, at the request of the U.S. Department of Interior, Bureau of Reclamation. This litigation is in the early stages and there have been no dispositive court rulings as of this date.

Second, the Bay-Delta Plan Amendment is not self-implementing and does not automatically allocate responsibility for meeting its new flow requirements to the SFPUC or any other water rights holders.

…

[8] "Unimpaired flow represents the natural water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds." (Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Dec. 12, 2018) p.17, fn. 14, available at: https://www.waterboards.ca.gov/plans_policies/docs/2018wqcp.pdf.)

Third, in recognition of the obstacles to implementation of the Bay-Delta Plan Amendment, the SWRCB Resolution No. 2018-0059 adopting the Bay-Delta Plan Amendment directed staff to help complete a "Delta watershed-wide agreement, including potential flow measures for the Tuolumne River" by March 1, 2019, and to incorporate such agreements as an "alternative" for a future amendment to the Bay-Delta Plan to be presented to the SWRCB "as early as possible after December 1, 2019." In accordance with the SWRCB's instruction, on March 1, 2019, SFPUC, in partnership with other key stakeholders, submitted a proposed project description for the Tuolumne River that could be the basis for a voluntary substitute agreement with the SWRCB ("March 1st Proposed Voluntary Agreement"). On March 26, 2019, the Commission adopted Resolution No. 19-0057 to support the SFPUC's participation in the Voluntary Agreement negotiation process. To date, those negotiations are ongoing under the California Natural Resources Agency and the leadership of the Newsom administration.[9,10]

The 2020 UWMP further summarized the current sources of uncertainty regarding RWS dry year water supply projections. This discussion is excerpted (with minor refinements) below:

- *Benefits of the AWSP are not accounted for in current supply projections.* As discussed in above, SFPUC is exploring options to increase its supplies through the AWSP. Implementation of feasible projects developed under the AWSP is not yet reflected in the supply reliability scenarios presented herein and is anticipated to reduce the projected RWS supply shortfalls.
- *Methodology for Tier One and Tier Two Wholesale drought allocations have not been established for wholesale shortages greater than 20%.* As discussed further in Section 6.1.1.4, the current Tier One and Tier Two Plans are not designed for RWS supply shortages of greater than 20%. For UWMP planning purposes per BAWSCA guidance, the Tier One Wholesale share for a 16% to 20% supply reduction (62.5%) has been applied for reductions greater than 20% and an equal percent reduction has been applied across all Wholesale Customers. BAWSCA member agencies have not formally agreed to adopt this shortage allocation methodology and are in discussions about jointly developing an alternative allocation method that would consider additional equity factors if SFPUC is unable to deliver its contractual supply volume and cutbacks to the RWS supply exceed 20%.
- *RWS demands are subject to change.* The RWS supply availability is dependent upon the system demands. The supply scenarios are based on the total projected Wholesale Customer purchases provided by BAWSCA to SFPUC in January 2021. Many BAWSCA agencies have refined their projected demands during the UWMP process after these

[9] California Natural Resources Agency, "Voluntary Agreements to Improve Habitat and Flow in the Delta and its Watersheds," available at https://files.resources.ca.gov/voluntary-agreements/.

[10] As of 29 October 2021, state regulators announced that the Voluntary Agreement negotiations process has ceased, with no agreement reached. San Francisco Chronicle, "California Drought: Key Talks Over Water Use Break Down, SF May Face Tighter Regulation," available at https://www.sfchronicle.com/sf/article/California-drought-Key-talks-over-water-use-16576132.php

estimates were provided to SFPUC. Furthermore, the RWS demand projections are subject to change in the future based upon future housing needs, increased conservation, and development of additional local supplies.

- *Frequency and duration of cutbacks are also uncertain.* While the projected shortfalls presented in the UWMP appear severe, the actual frequency and duration of such shortfalls are uncertain. Based on the Hetch Hetchy and Local Simulation Model (HHLSM) simulations provided by BAWSCA for the with Bay-Delta Plan Amendment scenario, rationing is anticipated to be required 20% of years for base year 2025 through 2035, 23% of all years for base year 2040, and 25% of years for base year 2045. In addition to the supply volumes, the above listed uncertainties would also impact the projected frequency and duration of shortfalls. As such, in addition to evaluating local options to increase supply reliability, Cal Water has placed high priority on working with BAWSCA and SFPUC in the upcoming years to better refine the estimates of RWS supply reliability and may amend the 2020 UWMP when new information becomes available.

The 2020 UWMP also discusses that the implementation of the Bay-Delta Plan Amendment was under negotiation, through Voluntary Settlement Agreement negotiations between SFPUC and SWRCB. However, as of October 2021, these negotiations have ceased,[10] and no agreement has been reached. However, implementation of the Bay-Delta Plan Amendment is still pending. The SWRCB has yet to approve an implementation policy for water supply cutbacks associated with the Bay-Delta Plan Amendment, particularly during droughts. Further, there are currently over a dozen active lawsuits challenging the SWRCB's adoption of the Bay-Delta Plan Amendment. This litigation is in the early stages and there have been no dispositive court rulings as of this date. This is a dynamic situation and the projected drought cutback allocations may need to be revised before the next (i.e., 2025) UWMP depending on court decisions and/or an adopted implementation policy.

Evidently, numerous uncertainties remain surrounding the implementation of the Bay-Delta Plan Amendment. The water supply projections presented in the 2020 UWMP likely represent a worst-case scenario in which the Bay-Delta Plan Amendment is implemented as written and do not account for implementation of SFPUC's AWSP. Additional information regarding drought allocations can be found in Chapter 7 of the SSF District's 2020 UWMP.

6.1.1.3 Efforts to Increase RWS Supply Reliability

On 2 June 2021, the SFPUC released a memorandum which outlines numerous options the SFPUC is pursuing to improve the supply reliability projected in its 2020 UWMP and meet its Level of Service (LOS) Goals. This memorandum is included as **Appendix C**. Furthermore, the SFPUC's Water Supply Improvement Program (WSIP) and its Water Management Action Plan (Water MAP) articulate the SFPUC's goals and objectives to improve the delivery reliability of the RWS, including water supply reliability.

The WSIP program goal is to improve the SFPUC's ability to reliably meet its Retail and Wholesale Customers water needs in non-drought and drought periods. In 2008, the SFPUC adopted LOS Goals and Objectives in conjunction with the adoption of the WSIP. The SFPUC's LOS Goals and

Objectives include: (a) meeting average annual water demand of 265 MGD from the SFPUC watersheds for Retail and Wholesale Customers during non-drought years for system demands through 2028; (b) meeting dry-year delivery needs through 2028 while limiting rationing to a maximum 20% system-wide reduction in water service during extended droughts; (c) diversifying water supply options during non-drought and drought periods; and (d) improving use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers (SFPUC, 2018). The anticipated completion date of the overall WSIP is May 2023. As of September 2020, WSIP local projects are 100% complete and regional projects are 98.8% complete (SFPUC, 2021c).

The SFPUC also developed a Water MAP in 2016 to provide the information necessary to begin developing a water supply program for the 2019 to 2040 planning horizon. The SFPUC intends that the Water MAP will guide its efforts to continue to meet its commitments and responsibilities to its customers, including the BAWSCA member agencies (BAWSCA, 2017). The Water MAP was developed with consideration of the 2018 SFPUC's supply decisions (now postponed to 2028; as discussed above), as well as recent changes to instream flow requirements and customer demand projections. The Water MAP has identified water supply needs on the RWS by 2040 and prioritized those needs in the following order:

1. Meeting existing obligations to existing permanent customers (3.5 MGD).
2. New supply in order to make the City of San Jose a permanent customer of the SFPUC (Up to 9.5 MGD).
3. New supply in order to make the City of Santa Clara a permanent customer of the SFPUC (Up to 5.0 MGD).
4. New supply to meet the City of East Palo Alto's projected needs above its ISG (Up to 1.5 MGD).

Through implementation of its Long-Term Water Supply Reliability Strategy (LTWSRS), BAWCSA is also actively evaluating opportunities to increase the supply reliability of the RWS (BAWSCA, 2015). The strategy includes short- and long-term implementation plans including water supply management projects that could be implemented to meet identified needs. Potential projects include recycled water projects, desalination projects, water transfer projects, and local capture and reuse projects.

6.1.1.4 RWS Water Shortage Allocations

The Agreement includes a Water Shortage Allocation Plan (WSAP) that allocates water from the RWS to Retail and Wholesale Customers during system-wide shortages of 20% or less. As described in detail in the 2020 UWMP, the WSAP has two components:

1. The Tier One Plan, which allocates water between San Francisco and the Wholesale Customers collectively; and
2. The Tier Two Plan, which allocates the collective wholesale customer share among the Wholesale Customers.

We note that the dry year supply reliability projections provided herein (Section 6.1.4) are obtained from the 2020 UWMP based on application of BAWSCA-provided revised methodology to allocate RWS supplies during projected future single dry and multiple dry years in the instance where the supply shortfalls are greater than 20%.[11] However, BAWSCA member agencies are in discussions about jointly developing an allocation method that would consider additional equity factors in the event that SFPUC is not able to deliver its contractual supply volume, and its cutbacks to the RWS supply exceed 20%. While Cal Water is working independently and with the other BAWSCA agencies to identify regional mitigation measures to improve reliability for regional and local water supplies and meet its customers' water needs, Cal Water expects that SFPUC's LOS Goals and Objectives will be met and is comfortable assuming its contract with SFPUC will be honored as written.

6.1.2 Surface Water Supply

Surface water supplies a small portion of the three Peninsula Districts' water demands. From 2016 to 2020, it supplied an average of 537 AFY, or less than 2% of total supplies (Cal Water, 2021b). Surface water is collected from the Bear Gulch Creek by two diversion facilities and is stored in Bear Gulch Reservoir prior to use.

The Bear Gulch District diverts water from two points of diversion (PODs) along the creek – the Upper POD (with an upstream area of 2.5 square miles) and the Lower POD (with an upstream area of 9.4 square miles). Diversions from the Upper and Lower PODs are each governed by separate SWRCB-administered water rights (i.e., pre-1914 claimed water rights and post-1914 SWRCB-issues diversion permits/licenses) that specify the volumes, rates, and timing of allowed diversions at each POD. In addition to these SWRCB-administered water rights, diversions are further constrained by certain diversion limitations and minimum instream flow requirements imposed by the California Department of Fish and Wildlife (CDFW) at the Upper POD and by the National Oceanic and Atmospheric Administration (NOAA) at the Lower POD. There also exists a 1936 agreement with Stanford University that prohibits Cal Water from diverting more than 50% of the flows that pass by (i.e., are not diverted at) the Upper POD.

Water diverted from the Upper POD flows through a gravity conveyance pipeline to a junction point where it is joined by water diverted from the Lower POD, at which point the water is pumped into the Bear Gulch District-owned Bear Gulch Reservoir, a man-made storage facility impounded by an earthen dam. The Bear Gulch Reservoir is operated to have a minimum "dead pool" storage of 50 million gallons (MG), or approximately 153 AF. The maximum storage capacity of the reservoir has been reduced from 149 MG (547 AF) to 142.7 MG (438 AF), a limit imposed by the California Division of Safety of Dams (DSOD), based on a maximum storage elevation of 230 feet above mean sea level. Cal Water is undertaking capital improvements to Bear Gulch Reservoir to address DSOD's seismic safety concerns, and may also considered increasing the

[11] The projected SFPUC RWS supplies presented in this WSA are based on dry year allocation projections included in the SSF, Bear Gulch, and Mid-Peninsula District 2020 UWMPs based on the methodology, assumptions and information utilized and provided by SFPUC and BAWSCA; however, actual future supply allocations may vary based on actual shortage levels and the then-applicable allocation methodology being applied by BAWSCA and SFPUC.

maximum storage capacity. Outflows from Bear Gulch Reservoir are currently limited by the DSOD to the rate that causes a water surface elevation decline of 0.3 feet per day.

Water stored in Bear Gulch Reservoir is released and sent through the Bear Gulch District-owned Bear Gulch Water Treatment Plant (BGWTP) prior to addition to the distribution system. The BGWTP, which was placed into operation in 1977, has a rated capacity of 6.0 MGD. There the water is clarified, filtered, and chloraminated in compliance with the Surface Water Treatment Rule and the Safe Drinking Water Act. Based on data from Water Years 1981 through 2019, annual production from the reservoir has ranged from a high of 2,809 AF (915 MG) in 1983 to a low of 0 AF (0 MG) in 2014.

Recent analysis by the Bear Gulch District has shown that the projected long-term average annual diversion amount by the Bear Gulch District from the Bear Gulch local surface water system is approximately 840 AFY. This estimate considers the hydrology of the watershed, the various regulatory constraints that govern diversions (i.e., water rights and instream flow requirements), and current infrastructure limitations (i.e., pump, pipeline and treatment plant capacity). The storage capacity of Bear Gulch Reservoir is relatively small compared to average annual diversion/production, and therefore there is typically no carryover storage from one year to the next. Furthermore, given the various constraints on diversions at the Bear District's two PODs under the SWRCB-administered water rights and the CDFW/NOAA-governed minimum instream flow requirements, the allowable diversions by the Bear Gulch District are significantly lower during dry years even though the creek itself maintains flow. Although local surface water diversions (and subsequent treatment and use of local surface water) have occurred historically during dry years, and the Bear District's analysis indicates that some diversions are likely to occur in future dry years[12], for the purposes of its 2020 UWMP the Bear Gulch District conservatively assumed that local surface water supplies will be zero during single dry and multiple dry years over the planning horizon.

6.1.3 Groundwater Supply

Water Code Section 10910

(f) If a water supply for a proposed project includes groundwater, the following additional information shall be included in the water supply assessment:

(1) A review of any information contained in the urban water management plan relevant to the identified water supply for the proposed project.

(2) (A) A description of any groundwater basin or basins from which the proposed project will be supplied.

(B) For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has the legal right to pump under the order or decree.

[12] Diversions from the Bear Gulch Creek system are estimated at 291 AF with a 90% exceedance probability.

(C) For a basin that has not been adjudicated that is a basin designated as high- or medium-priority pursuant to Section 10722.4, information regarding the following:

(i) Whether the department has identified the basin as being subject to critical conditions of overdraft pursuant to Section 12924.

(ii) If a groundwater sustainability agency has adopted a groundwater sustainability plan or has an approved alternative, a copy of that alternative or plan.

(D) For a basin that has not been adjudicated that is a basin designated as low- or very low priority pursuant to Section 10722.4, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current bulletin of the department that characterizes the condition of the groundwater basin, and a detailed description by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), of the efforts being undertaken in the basin or basins to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the amount and location of groundwater pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), for the past five years from any groundwater basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), from any basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(5) An analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project. A water supply assessment shall not be required to include the information required by this paragraph if the public water system determines, as part of the review required by paragraph (1), that the sufficiency of groundwater necessary to meet the initial and projected water demand associated with the project was addressed in the description and analysis required by paragraph (4) of subdivision (b) of Section 10631.

Groundwater pumped from the Westside Basin constitutes a portion of supply to the Cal Water SSF District. Additional detail regarding basin description, groundwater management, and historical groundwater use is included below.

6.1.3.1 Basin Description

The Westside Basin (California Department of Water Resources [DWR] Basin No. 2-35) underlies the proposed Project and the Cal Water SSF District service area, as shown on **Figure 3**.[13] The Westside Basin (Basin) covers an area of approximately 25,400 acres and is separated from the

[13] A very small portion (approximately 8%) of the SSF District service area overlies the Visitacion Valley Basin (DWR Basin No. 2-32). However, no groundwater is used from this basin and so the basin is not discussed further herein.

Lobos Basin to the north by a northwest trending bedrock ridge through the northeastern part of Golden Gate Park. The San Bruno Mountains bound the Basin on the east. The San Andreas Fault and Pacific Ocean form its western boundary and its southern limit is defined by bedrock high that separates it from the San Mateo Plain Subbasin. The Basin is connected to the Pacific Ocean on the northwest and San Francisco Bay on the southeast (Cal Water, 2021a). The Basin is not adjudicated and, in its recent evaluation of California groundwater basins, DWR determined that the Basin was not in a condition of critical overdraft and designated the Basin as low priority (DWR, 2019).

Geologically, the Basin is comprised of two groups, consisting of bedrock and unconsolidated materials. The impermeable bedrock is composed of consolidated sediment of the Franciscan Complex and the Great Valley Sequence of late Jurassic and Cretaceous age. Unconsolidated materials overlying the bedrock comprise the water bearing formations. These consist of dune sands, the Colma Formation of Pleistocene age and the Merced Formation of Pleistocene/ Pliocene age (Phillips and others, 1993; DWR, 2006).

Groundwater used for water supply within the Basin is generally pumped from in the Merced and Colma Formations. The Merced Formation is composed of sand and thin interbedded silt and clay layers of shallow marine depositional origin. The Colma Formation overlies the Merced Formation and consists of fine-grained sand, silty sand, and inter-fingered clay layers (DWR, 2006; 2016). Water is produced from the coarse-grained layers within these complex, layered formations (WRIME, 2012).

The Basin is subdivided for management purposes into northern and southern portions by the county line separating San Francisco and San Mateo counties. The county-line boundary between the “North Westside Basin” and the “South Westside Basin” does not have hydrogeological significance other than influencing the jurisdictional distribution of groundwater pumping. No geologic features restrict groundwater flow between the northern and southern parts of the Basin (SFPUC, 2016). Groundwater pumping has historically provided up to 50% of local water supply in the South Westside Basin for the communities of San Bruno, Daly City, and South San Francisco (WRIME, 2012), although current usage is significantly less as a proportion.

The Basin is not adjudicated and, in its recent evaluation of California groundwater basins, DWR determined that the Basin was not in a condition of critical overdraft and was a low priority basin (DWR, 2019). Recent evaluations by others have also found that current pumping is estimated to be within the Basin’s safe yield (WRIME, 2012).

Legend

- Proposed Project
- SSF District Service Area
- County Boundary
- Groundwater Basin

Abbreviations

Cal Water = California Water Service
DWR = California Department of Water Resources
SSF = South San Francisco

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world aerial map, obtained 21 September 2020.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118-2016 Update.
3. Boundary data for Cal Water districts' service areas received from Cal Water on 16 October 2017.

N

0 2.5 5

(Scale in Miles)

Regional Setting and Groundwater Basin

Southline Specific Plan
South San Francisco, CA
July 2021
EKI C00070.00

Figure 3

eki environment & water

Path: X:\C00070.00\Maps\Fig3_DWRGWBasinLocation.mxd

6.1.3.2 Groundwater Management

As described below, several groundwater management programs are actively implemented within the Basin that have relevance to the Cal Water SSF District.

South Westside Basin Groundwater Management Plan

The South Westside Basin Groundwater Management Plan (GWMP) was completed in July 2012 as a joint effort between Cal Water, the SFPUC, and the Cities of Daly City and San Bruno that superseded prior groundwater management and planning efforts (WRIME, 2012). The GWMP was prepared pursuant to Assembly Bill 3030 (AB 3030; codified in CWC §10750 et seq.).[14]

The goal of the GWMP is to ensure a sustainable, high quality, reliable water supply at a fair price for beneficial uses achieved through local groundwater management (WRIME, 2012). The GWMP development was supported by a companion effort by the City of Daly City to develop a numerical groundwater model for the Basin. The GWMP includes the following elements:

- Groundwater Storage and Quality Monitoring
- Control of Saltwater Intrusion
- Conjunctive Use
- Recycled Water
- Source Water Protection

Among other things, the GWMP provides steps for monitoring water quality and quantity in the South Westside Basin. Each groundwater well identified in the GWMP has defined triggers for overdraft, seawater intrusion, and various water quality measures. The GWMP also identifies two levels of trigger thresholds for each groundwater well based on historical water levels, and actions to address the trigger that is met.

Regional Groundwater Storage and Recovery Project

In a joint effort between SFPUC, Cal Water, Daly City, and San Bruno, the Regional Groundwater Storage and Recovery Project (RGSR Project) was developed to support groundwater and surface water management in the South Westside Basin and improve the reliability of the RWS (Cal Water, 2021a). The RGSR Project agreement was signed in December 2014 following two phases of successful pilot programs. As part of the RGSR project agreement, the municipal pumpers within the South Westside Basin agreed to self-limit pumping within the South Westside basin to no more than 6.9 MGD, of which Cal Water's designated quantity is an annual average rate of 1.37 MGD or 1,534 AFY.

[14] AB 3030 provided a systematic procedure to develop a groundwater management plan by local agencies overlying DWR Bulletin 118 groundwater basins. Upon adoption of such plan, these agencies could possess the same authority as a water replenishment district to "fix and collect fees and assessments for groundwater management" (CWC §10754) (WRIME, 2012).

Under the RGSR project, the SFPUC will provide supplemental RWS water to Cal Water and the other "Partner Agencies" (i.e. Cal Water, Daly City, and San Bruno) during normal and wet years and in turn the Partner Agencies will reduce their groundwater pumping in their own wells to allow the Basin to recharge.[15] During dry years, the Partner Agencies may pump from RGSR project wells in addition to resuming use of their own wells up to designated quantities. The in-lieu recharge (i.e. "put") and additional groundwater pumping from RGSR wells (i.e. "take") under the RGSR project are tracked under the Westside Basin Storage Account. Production wells in the Basin are considered to be either a RGSR Well Facility or a Partner Agency Facility, where only production from RGSR Well facilities is tracked under the RGSR project.

The RGSR Project is one of the SFPUC's WSIP projects and provides additional dry-year water supply to help achieve the WSIP goals to increate RWS supply reliability. The RGSR Project consists of the construction of up to 16 new recovery wells and associated facilities, such as pumping systems, pipelines, and chemical treatment equipment. Construction for this project began in April 2015 and is anticipated to be complete in winter 2021 (SFPUC, 2021b).

Sustainable Groundwater Management Act

In 2014, the California State Legislature enacted the Sustainable Groundwater Management Act (SGMA), with subsequent amendments in 2015. The SGMA requires the formation of Groundwater Sustainability Agencies (GSAs) and the development and implementation of Groundwater Sustainability Plans (GSPs) for groundwater basins that are designated by DWR as medium or high priority.

The Basin is currently categorized by DWR as a very low priority basin (DWR, 2019). As such, the Basin is not subject to the requirements of SGMA. However, as discussed above, the Basin has been actively managed for years, including the establishment of pumping limitations.

6.1.3.3 Groundwater Use

Cal Water operates five groundwater production wells within its SSF District service area (Cal Water, 2021a). The Basin is not adjudicated and, in its recent evaluation of California groundwater basins, DWR determined that the Basin was not in a condition of critical overdraft and designated the Basin as low priority (DWR, 2019). As shown in **Table 4**, from 2005 to 2019, the Cal Water SSF District met up to 19% of its water demand from groundwater, excluding purchased in-lieu groundwater credits, and up to 22% including in-lieu groundwater credits purchased from SFPUC. Groundwater use was reduced in 2016 and later due to in-lieu recharge as part of the RGSR Project discussed above in Section 6.1.3.2.

Historical groundwater pumping from 2010 through 2019 and projected groundwater pumping through 2045 for the four municipal groundwater users in the Basin are shown in **Table 5**. From 2010 through 2019, the average total groundwater production by these entities was approximately 5,329 AFY, of which 550 AFY was by Cal Water. The total projected groundwater

[15] Supplemental deliveries do not count towards the Member Agencies' ISGs.

pumping by the RGSR Partner Agencies is conservatively assumed to be equal to each agency's agreed-upon pumping limitation from 2020 through 2045, of which Cal Water is projecting to pump up to 1,534 AFY (Cal Water, 2021a). The projected groundwater pumping by the City of San Francisco is based on projected pumping values included in Table 6-5 of SFPUC's 2020 UWMP (SFPUC, 2021a).

6.1.4 Cal Water Bay Area Water Supply Reliability Study

Cal Water is currently in the process of developing the Bay Area Regional Water Supply Reliability Study (WSRS), which employs integrated resource planning practices to create a long-term supply reliability strategy through 2050 for the three Peninsula Districts. The study will create long-term strategies to address a wide range of water supply challenges including climate change, new regulatory requirements (e.g., the Bay-Delta Plan Amendment), and potential growth in demands due to new development. The Bay Area WSRS is anticipated to be complete by 2024.

6.1.4.1 Potential Recycled Water Development

The Bay Area WSRS will explore potential recycled water developments to augment supply in the three Peninsula Districts. Recycled water is not currently provided in the SSF District service area and Cal Water has not projected recycled water use in its 2020 UWMP (Cal Water, 2021a). However, there is currently a coordinated effort between Cal Water and other partners to potentially develop recycled water for various uses.

Cal Water is participating in the development of the Crystal Springs Purified Water (PREP) Project, a purified water project that could provide 6 to 12 MGD of water supply through reservoir water augmentation at Crystal Springs Reservoir, which is a facility of the RWS. Treated wastewater from Silicon Valley Clean Water (SVCW) and/or the City of San Mateo would go through an advanced water treatment plant to produce purified water that meets state and federal drinking water quality standards. The purified water would then be transmitted 10 to 20 miles (depending on the alignment) to Crystal Springs Reservoir, blended with regional surface water supplies and treated again at Harry Tracy Water Treatment Plant. Project partners include Cal Water, the SFPUC, BAWSCA, SVCW, Redwood City, Foster City, and the City of San Mateo. Partner agencies are contributing financial and staff resources towards the work effort. Potential scenarios include a direct connection to the Bear Gulch District or the Mid-Peninsula District. The SSF District will benefit indirectly through increased supply availability to the three Peninsula Districts collectively. This WSA does not rely on an assumption of recycled water as a supply source.

6.2 Total Potable Supply in Normal, Single Dry, and Multiple Dry Years

Water Code Section 10910

(c) (3) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.

The projected potable water supply sources, as described above, are surface water purchased from the RWS, local surface water from the Bear Gulch Reservoir, and groundwater. Historical supplies from 2016 through 2020 and projected normal year supplies through 2045 for each source are shown in **Table 6**.[16] This table also shows the historical and projected demand for each of the three Peninsula Districts, based on updated demand projections included in their respective 2020 UWMPs. **Table 7** shows the projected demand by the three Peninsula Districts, with the inclusion of the proposed Project, and the total available supply through 2045. The current and planned future water supply within the three Peninsula Districts for normal hydrologic years is expected to meet all projected demands, which are estimated to be 35,869 AFY by 2045.

The anticipated dry-year supply estimates presented below are based on the delivery estimates provided by Cal Water as part of the 2020 UWMP (Cal Water, 2021a).[17] As discussed above, BAWSCA provided a revised methodology to allocate RWS supplies during projected future single dry and multiple dry years in the instance where the supply shortfalls are greater than 20% in support of 2020 UWMP development. However, BAWSCA member agencies are in discussions about jointly developing an allocation method that would consider additional equity factors in the event that SFPUC is not able to deliver its contractual supply volume, and its cutbacks to the RWS supply exceed 20%.

During single dry years, the annual supply within the three Peninsula Districts' service areas will be reduced to 21,039 AFY by 2045. Supply shortfalls relative to total demands during single dry years are estimated to range between 33% in 2025 and 43% in 2045 (see **Table 8**).

During multiple dry years, the 2020 UWMP estimates that annual supply within the three Peninsula Districts' service areas will be reduced to 23,615 AFY in 2025 during the first year of a drought, and 20,492 AFY in 2025 in the second, third, fourth, and fifth years of drought. The 2020 UWMP further estimates that in 2045, annual supply will be reduced to 20,954 AFY during the first three years of a drought, and 18,061 AFY in fourth and fifth years of drought. Supply shortfalls relative to total demands are estimated to range between 35% during the first year of a drought in 2025 to 52% during the fifth year of a drought in 2045 (see **Table 9**).

If the "worst-case" supply scenario described under Section 6.1.1.2 in which the Bay-Delta Plan Amendment is implemented as written, and not accounting for the implementation of actions identified as part of SFPUC's AWSP, BAWSCA's LTWSRS, or Cal Water's WSRS, shortfalls of up to 52% are projected during drought years. To address this issue, under Rule 14.1, Cal Water plans to enact its Water Shortage Contingency Plan (WSCP), which includes Mandatory Staged

[16] Projected groundwater and Bear Gulch Reservoir supply is shown based on the 2020 UWMP. Projected purchased SFPUC supply in normal years is based on Cal Water's contract allocation of 35.68 MGD (39,993 AFY).

[17] The projected SFPUC RWS supplies presented in this WSA are based on dry year allocation projections included in the SSF, Bear Gulch, and Mid-Peninsula District 2020 UWMPs based on the methodology, assumptions and information utilized and provided by SFPUC and BAWSCA; however, actual future supply allocations may vary based on actual shortage levels and the then-applicable allocation methodology being applied by BAWSCA and SFPUC.

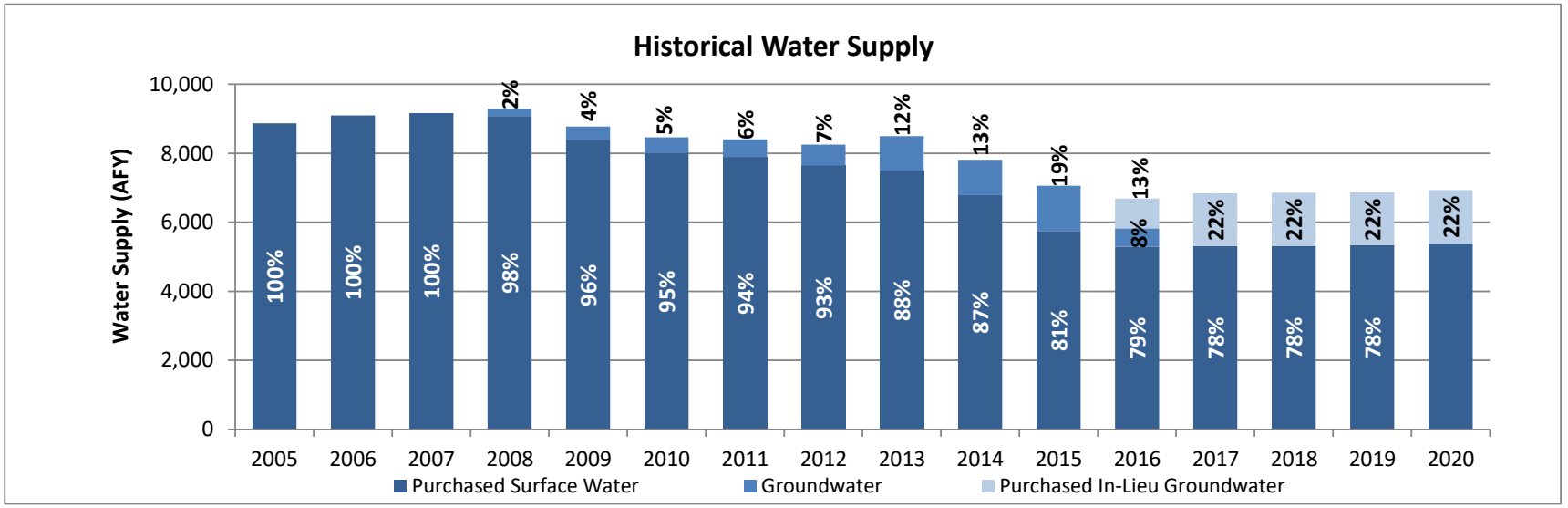
Restrictions of Water Use. The WSCP systematically identifies ways in which the SSF, Bear Gulch, and Mid-Peninsula Districts can reduce water demands during dry years. The overall reduction goals in the WSCP are established for six drought stages and address water demand reductions over 50%. The WSCPs for all three Peninsula Districts were revised as part of the 2020 UWMP update process, and include detailed information about how drought risks are evaluated by Cal Water on an annual basis to determine the potential need for reductions.

Table 4

Historical Water Supply for the South San Francisco District

Southline Specific Plan, South San Francisco, California

Water Supply Source	Historical Water Supply (AFY) (a)															
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Purchased Surface Water	8,869	9,101	9,169	9,086	8,397	8,013	7,892	7,644	7,500	6,787	5,751	5,296	5,308	5,322	5,332	5,397
Purchased In-Lieu Groundwater	0	0	0	0	0	0	0	0	0	0	0	863	1,535	1,535	1,535	1,539
Groundwater	0	0	0	206	380	452	515	606	995	1,028	1,312	527	0	0	0	0
Total Water Supply	**8,869**	**9,101**	**9,169**	**9,292**	**8,777**	**8,465**	**8,408**	**8,250**	**8,495**	**7,816**	**7,064**	**6,687**	**6,842**	**6,857**	**6,867**	**6,936**



Abbreviations:

"AFY" = acre feet per year

Notes:

(a) Historical water demands for per Reference 1.

References:

1. Cal Water Demand Model for the South San Francisco District, provided by 3 March 2021.

Table 5

Historical and Projected Groundwater Pumping from the Westside Basin

Southline Specific Plan, South San Francisco, California

Water Supplier	Historical Groundwater Production (AFY) (a)										Projected Groundwater Production (AFY) (b)				
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2025	2030	2035	2040	2045
Cal Water, SSF District	453	515	606	995	1,028	1,312	528	0.4	35	31	1,534	1,534	1,534	1,534	1,534
Daly City	1,743	2,699	3,772	3,351	3,452	1,980	941	62	59	56	3,840	3,840	3,840	3,840	3,840
San Bruno	2,364	2,129	1,596	2,198	2,025	2,164	937	303	333	277	2,350	2,350	2,350	2,350	2,350
San Francisco Municipal and Irrigation (c)	1,256	1,197	1,339	1,651	1,672	1,570	1,359	1,435	1,911	1,960	1,569	2,690	3,811	4,932	4,932
Total Groundwater Supply	5,816	6,540	7,313	8,195	8,177	7,026	3,765	1,800	2,338	2,324	9,293	10,414	11,535	12,656	12,656

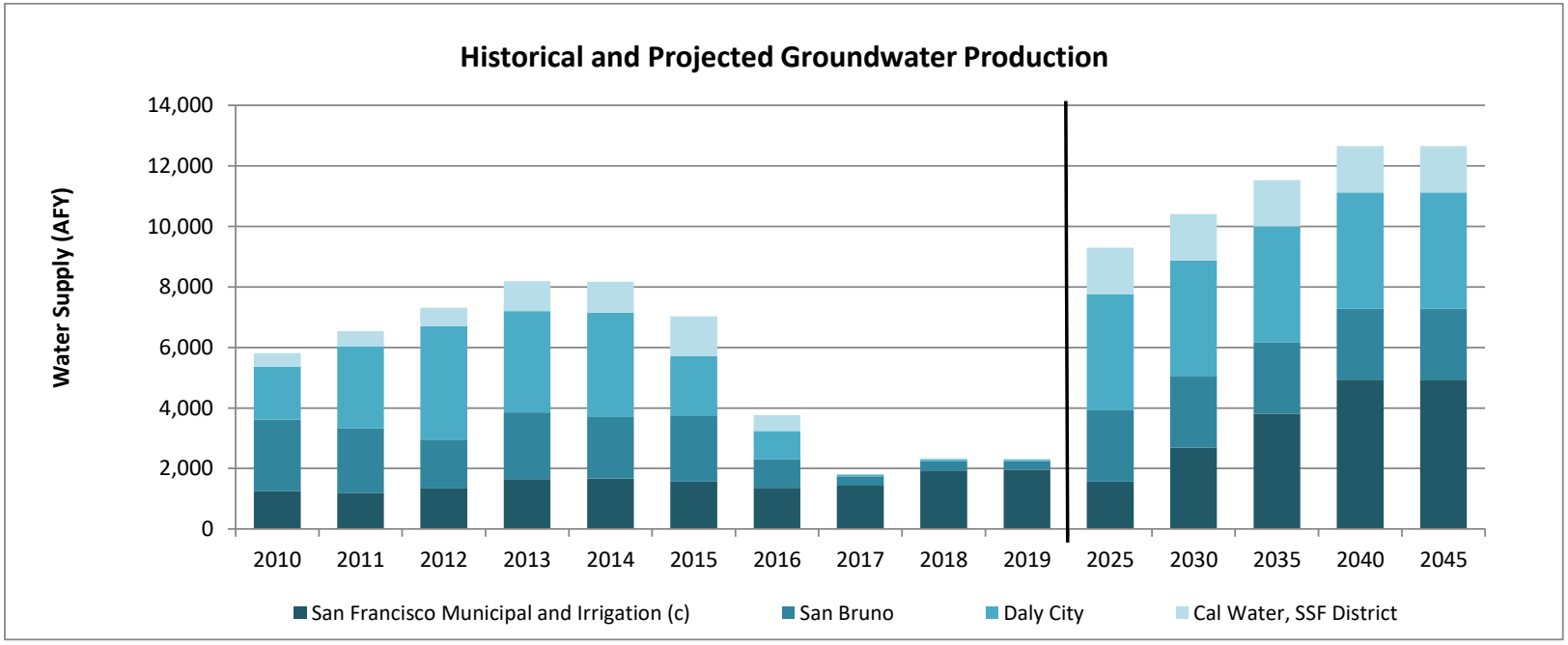


Table 5

Historical and Projected Groundwater Pumping from the Westside Basin

Southline Specific Plan, South San Francisco, California

Abbreviations:

"AFY" = acre feet per year

"SSF" = South San Francisco District

Notes:

(a) Historical groundwater pumping as reported on Table 1 in Reference 1.

(b) Projected groundwater pumping by the South San Francisco District, City of Daly City, and City of San Bruno is conservatively estimated as the maximum apportionment for each partner agency as dictated by the Regional Groundwater Storage and Recovery Project, per Reference 2.

(c) Projected groundwater pumping by the City of South San Francisco provided per Reference 3.

References:

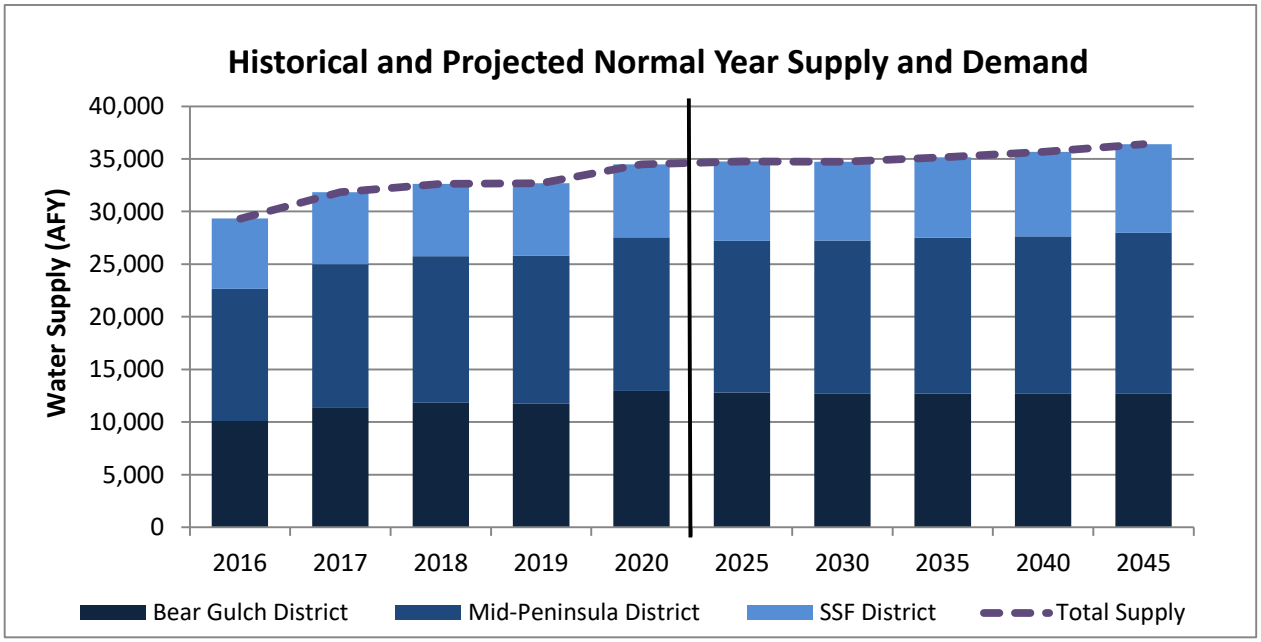
1. 2019 Annual Groundwater Monitoring Report, Westside Baisn, San Francisco and San Mateo Counties, California prepared by the San Francisco Public Utilities Commission, dated April 2020.
2. Draft Environmental Impact Report for the San Francisco Public Utilities Commission's Regional Groundwater Storage and Recovery Project, dated April 2013.
3. 2020 Urban Water Management Plan for the City and County of San Francisco, prepared by the San Francisco Public Utilities Commission, dated June 2021.

Table 6

Historical and Projected Supplies by Source

Southline Specific Plan, South San Francisco, California

Water Supplier	Historical Supply and Demand (AFY)					Projected Supply and Demand (AFY)				
	2016	**2017**	**2018**	**2019**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
Historical and Projected Demand (a)										
SSF District	6,687	6,842	6,857	6,867	6,936	7,543	7,483	7,635	8,000	8,423
Mid-Peninsula District	12,534	13,601	13,924	14,046	14,563	14,418	14,530	14,786	14,977	15,279
Bear Gulch District	10,105	11,395	11,834	11,772	12,972	12,796	12,699	12,730	12,675	12,694
Total Demand	**29,326**	**31,838**	**32,614**	**32,684**	**34,471**	**34,757**	**34,712**	**35,151**	**35,652**	**36,396**
Historical and Projected Supply (All Districts) (b)										
Purchased (SFPUC)	27,180	29,204	30,909	30,310	32,932	32,383	32,338	32,777	33,278	34,022
Bear Gulch Reservoir (c)	757	1,100	170	839	0	840	840	840	840	840
Groundwater	1,390	1,535	1,535	1,535	1,539	1,534	1,534	1,534	1,534	1,534
Total Supply	**29,326**	**31,838**	**32,614**	**32,684**	**34,471**	**34,757**	**34,712**	**35,151**	**35,652**	**36,396**
Supply Minus Demand	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***



Abbreviations:

"AFY" = acre feet per year

"MGD" = millions gallons per day

"SFPUC" = San Francisco Public Utilities Commission

"SSF" = South San Francisco District

Table 6

Historical and Projected Supplies by Source

Southline Specific Plan, South San Francisco, California

Notes:

(a) Cal Water updated its water demand projections for the South San Francisco, Bear Gulch, and Mid-Peninsula Districts in 2021, per Reference 2.

(b) Projected supply is assumed equal to projected demands and inclusive of supplies available for all three districts that share the same contractual allocation of water from SFPUC, per Reference 1. The projected purchase volumes are based on having full local supply (i.e., 840 AFY in the Bear Gulch Reservoir and 1,534 AFY from the South San Francisco wells), per Reference 1. Projected SFPUC supply is based on Cal Water's contractual allocation of 35.68 MGD, or 39,993 AFY.

References:

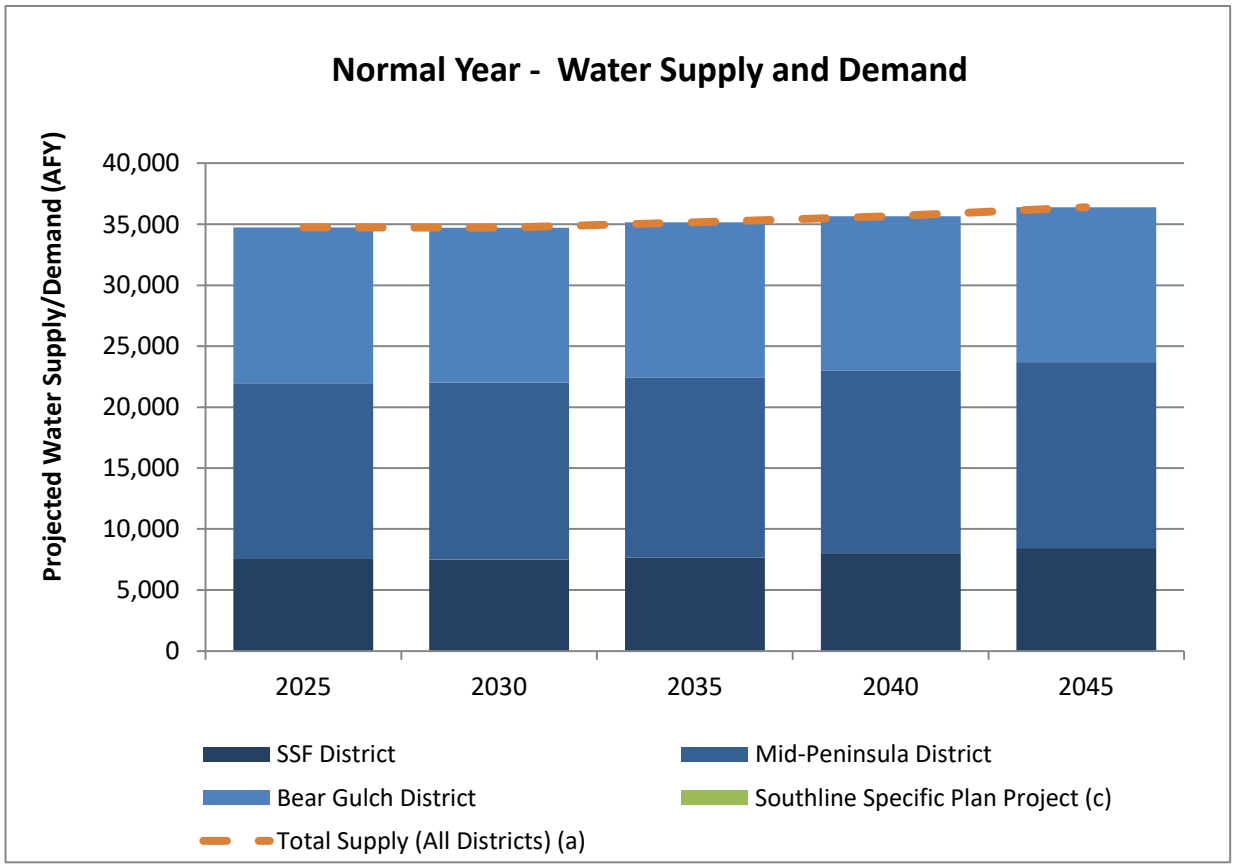
1. 2020 Urban Water Management Plan, South San Francisco District, prepared by California Water Service, dated June 2021.
2. Cal Water Demand Model for the South San Francisco District, provided 3 March 2021.
   Cal Water Demand Model for the Bear Gulch District, provided 26 February 2021.
   Cal Water Demand Model for the Mid-Peninsula District, provided 26 February 2021.

Table 7

Projected Normal Year Water Supply and Demand

Southline Specific Plan, South San Francisco, California

Water Supply Source	Projected Normal Year Supply and Demand (AFY)				
	2025	**2030**	**2035**	**2040**	**2045**
Total Supply (All Districts) (a)	34,757	34,712	35,151	35,652	36,396
Demand (b)					
SSF District	7,543	7,483	7,635	8,000	8,423
Mid-Peninsula District	14,418	14,530	14,786	14,977	15,279
Bear Gulch District	12,796	12,699	12,730	12,675	12,694
Southline Specific Plan Project (c)	0	0	0	0	0
Total Potable Water Demand Inclusive of Project	**34,757**	**34,712**	**35,151**	**35,652**	**36,396**
Supply Shortfall (% demand)	***0.0%***	***0.0%***	***0.0%***	***0.0%***	***0.0%***



Abbreviations:

"AFY" = acre feet per year

"MGD" = millions gallons per day

"SSF" = South San Francisco District

Table 7

Projected Normal Year Water Supply and Demand

Southline Specific Plan, South San Francisco, California

Notes:

(a) Projected supply is assumed equal to projected demands and inclusive of supplies available for all three districts that share the same contractual allocation of water from SFPUC, per Reference 1. The projected purchase volumes are based on having full local supply (i.e., 840 AFY in the Bear Gulch Reservoir and 1,534 AFY from the South San Francisco wells), per Reference 1. Projected SFPUC supply is based on Cal Water's contractual allocation of 35.68 MGD, or 39,993 AFY.

(b) Cal Water updated its water demand projections for the South San Francisco, Bear Gulch, and Mid-Peninsula Districts in 2021, per Reference 2.

(c) In accordance with and through implementation of Cal Water's Water Neutral Development Policy, the Project will not result in a net increase in demands for the district.

References:

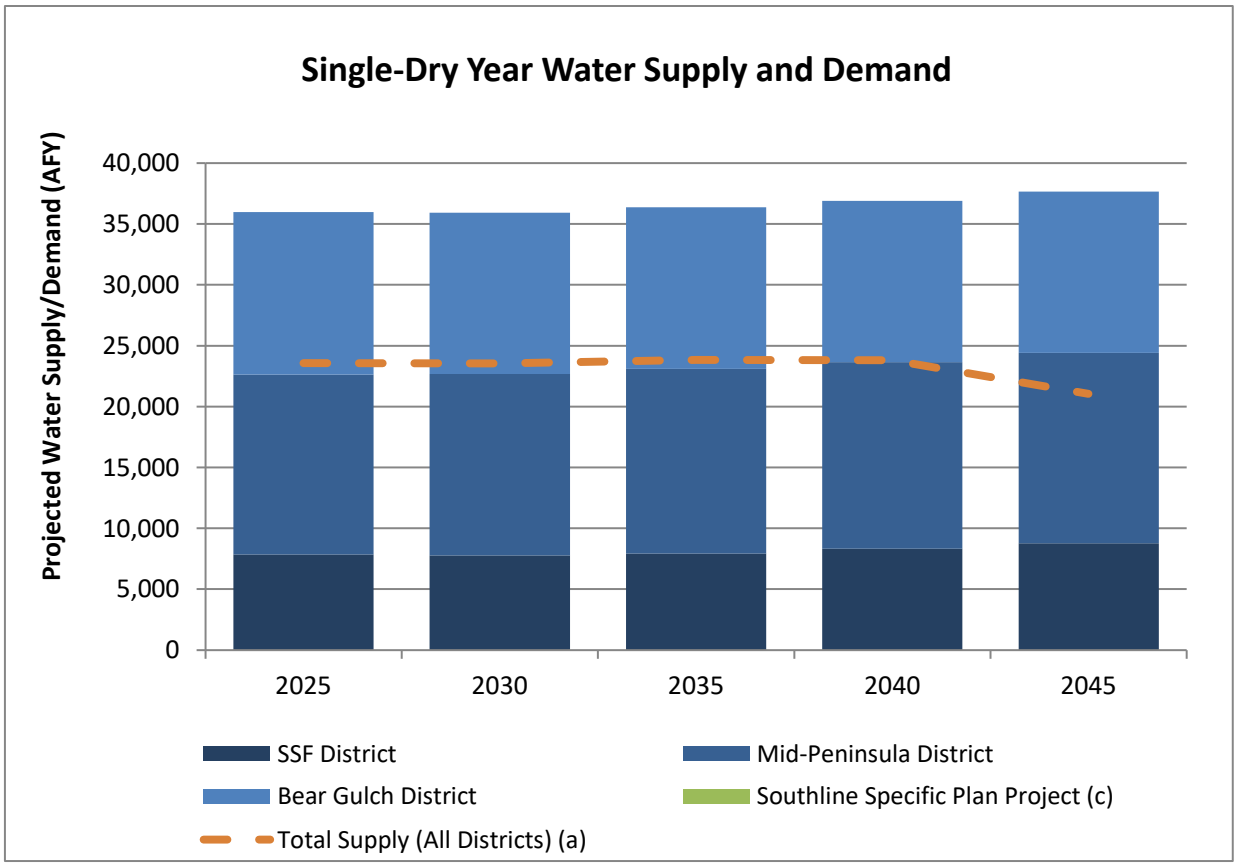
1. 2020 Urban Water Management Plan, South San Francisco District, prepared by California Water Service, dated June 2021.
2. Cal Water Demand Model for the South San Francisco District, provided 3 March 2021.
   Cal Water Demand Model for the Bear Gulch District, provided 26 February 2021.
   Cal Water Demand Model for the Mid-Peninsula District, provided 26 February 2021.

Table 8

Single Dry Year Water Supply and Demand

Southline Specific Plan, South San Francisco, California

Water Supply Source	Projected Dry Year Supply and Demand (AFY)				
	2025	**2030**	**2035**	**2040**	**2045**
Total Supply (All Districts) (a)	23,580	23,546	23,835	23,809	21,039
Demand (b)					
SSF District	7,831	7,767	7,925	8,304	8,743
Mid-Peninsula District	14,797	14,908	15,168	15,359	15,662
Bear Gulch District	13,354	13,253	13,285	13,228	13,248
Southline Specific Plan Project (c)	0	0	0	0	0
Total Potable Water Demand Inclusive of Project	**35,982**	**35,928**	**36,378**	**36,891**	**37,653**
Supply Shortfall (% demand)	***34%***	***34%***	***34%***	***35%***	***44%***



Abbreviations:

"AFY" = acre feet per year

"MGD" = millions gallons per day

"SFPUC" = San Francisco Public Utilities Commission

"SSF" = South San Francisco District

Table 8

Single Dry Year Water Supply and Demand

Southline Specific Plan, South San Francisco, California

Notes:

(a) Projected supply is inclusive of supplies available for all three districts that share the same contractual allocation of water from SFPUC, per Reference 1. The projected purchase volumes are based on having full local supply (i.e., 1,534 AFY) from the South San Francisco wells. Although local surface water diversions in the Bear Gulch District (and subsequent treatment and use of local surface water) have occurred historically during dry years, the Bear Gulch District conservatively assumes that local surface water supplies will be zero during single dry and multiple dry years over the planning horizon, per Reference 2. Projected SFPUC supply is based on Cal Water's contractual allocation of 35.68 MGD, or 39,993 AFY.

(b) Cal Water updated its water demand projections for the South San Francisco, Bear Gulch, and Mid-Peninsula Districts in 2021, per Reference 3.

(c) In accordance with and through implementation of Cal Water's Water Neutral Development Policy, the Project will not result in a net increase in demands for the district.

References:

1. 2020 Urban Water Management Plan, South San Francisco District, prepared by California Water Service, dated June 2021.
2. 2020 Urban Water Management Plan, Bear Gulch District, prepared by California Water Service, dated June 2021.
3. Cal Water Demand Model for the South San Francisco District, provided 3 March 2021.
   Cal Water Demand Model for the Bear Gulch District, provided 26 February 2021.
   Cal Water Demand Model for the Mid-Peninsula District, provided 26 February 2021.

Table 9

Multiple Dry Year Water Supply and Demand

Southline Specific Plan, South San Francisco, California

	Projected Water Supply and Demand During Multiple Dry Years (AFY) (a)																									
	2025					2030					2035					2040					2045				
Supply Source	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5
Total Supply (All Districts) (b)	23,615	20,492	20,492	20,492	20,492	23,483	20,383	20,383	20,383	20,383	23,647	20,313	20,313	20,313	18,849	23,762	20,594	20,594	18,424	18,424	20,954	20,954	20,954	18,061	18,061
Demand (c)																									
SSF District	8,009	8,009	8,009	8,009	8,009	7,943	7,943	7,943	7,943	7,943	8,104	8,104	8,104	8,104	8,104	8,492	8,492	8,492	8,492	8,492	8,940	8,940	8,940	8,940	8,940
Mid-Peninsula District	15,031	15,031	15,031	15,031	15,031	15,143	15,143	15,143	15,143	15,143	15,405	15,405	15,405	15,405	15,405	15,595	15,595	15,595	15,595	15,595	15,900	15,900	15,900	15,900	15,900
Bear Gulch District	13,699	13,699	13,699	13,699	13,699	13,595	13,595	13,595	13,595	13,595	13,629	13,629	13,629	13,629	13,629	13,570	13,570	13,570	13,570	13,570	13,591	13,591	13,591	13,591	13,591
Southline Specific Plan Project (d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Potable Water Demand Inclusive of Project	**36,739**	**36,739**	**36,739**	**36,739**	**36,739**	**36,681**	**36,681**	**36,681**	**36,681**	**36,681**	**37,138**	**37,138**	**37,138**	**37,138**	**37,138**	**37,657**	**37,657**	**37,657**	**37,657**	**37,657**	**38,431**	**38,431**	**38,431**	**38,431**	**38,431**
Supply Shortfall (% demand)	***36%***	***44%***	***44%***	***44%***	***44%***	***36%***	***44%***	***44%***	***44%***	***44%***	***36%***	***45%***	***45%***	***45%***	***49%***	***37%***	***45%***	***45%***	***51%***	***51%***	***45%***	***45%***	***45%***	***53%***	***53%***

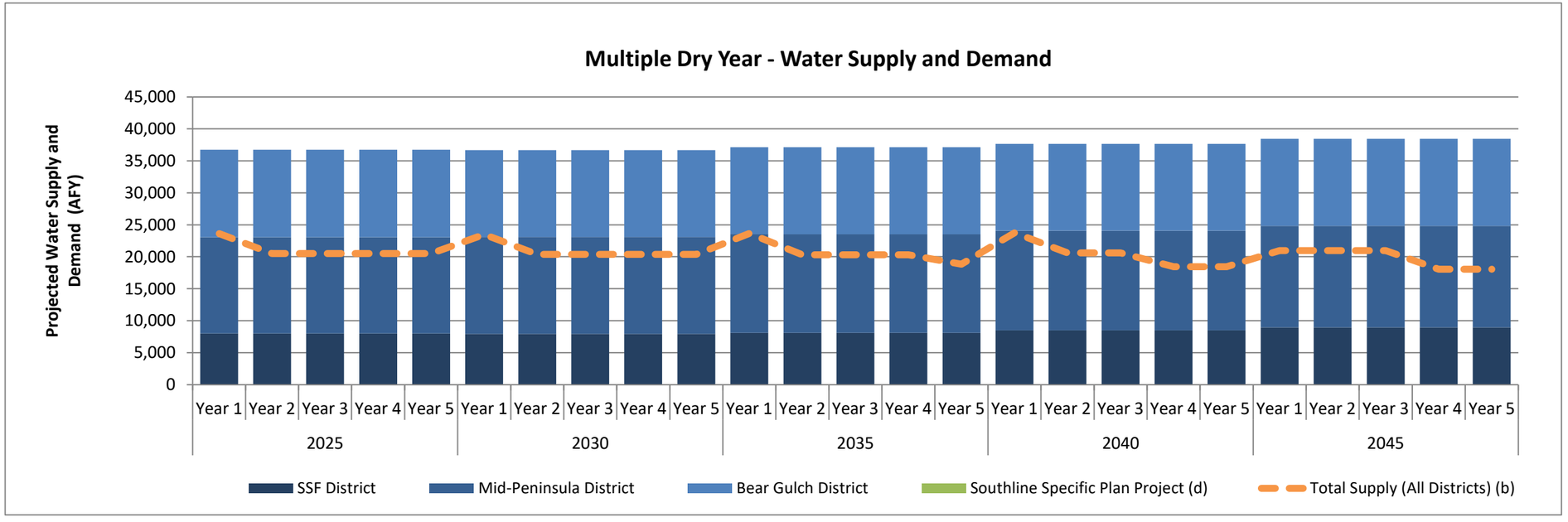


Table 9

Multiple Dry Year Water Supply and Demand

Southline Specific Plan, South San Francisco, California

Abbreviations:

"AFY" = acre feet per year
"MGD" = millions gallons per day
"SFPUC" = San Francisco Public Utilities Commission
"SSF" = South San Francisco District
"UWMP" = Urban Water Management Plan
"WSA" = Water Supply Assessment

Notes:

(a) While WSA regulations only require an analysis of a three-year drought scenario, UWMP regulations were updated in 2018 to include a five-year drought scenario (California Water Code §10635), Therefore, a five-year drought scenario is presented here.

(b) Projected supply is inclusive of supplies available for all three districts that share the same contractual allocation of water from SFPUC, per Reference 1. The projected purchase volumes are based on having full local supply (i.e., 1,534 AFY) from the South San Francisco wells. Although local surface water diversions in the Bear Gulch District (and subsequent treatment and use of local surface water) have occurred historically during dry years, the Bear Gulch District conservatively assumes that local surface water supplies will be zero during single dry and multiple dry years over the planning horizon, per Reference 2. Projected SFPUC supply is based on Cal Water's contractual allocation of 35.68 MGD, or 39,993 AFY.

(c) Cal Water updated its water demand projections for the South San Francisco, Bear Gulch, and Mid-Peninsula Districts in 2021, per Reference 3.

(d) In accordance with and through implementation of Cal Water's Water Neutral Development Policy, the Project will not result in a net increase in demands for the district.

References:

1. 2020 Urban Water Management Plan, South San Francisco District, prepared by California Water Service, dated June 2021.
2. 2020 Urban Water Management Plan, Bear Gulch District, prepared by California Water Service, dated June 2021.
3. Cal Water Demand Model for the South San Francisco District, provided 3 March 2021.
Cal Water Demand Model for the Bear Gulch District, provided 26 February 2021.
Cal Water Demand Model for the Mid-Peninsula District, provided 26 February 2021.

7 COMPARISON OF SUPPLY AND DEMAND

Water Code Section 10910

(c) (3) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.

Pursuant to CWC §10910c(3), this WSA must include an estimate of the projected water supplies available to the SSF District under normal, single dry, and multiple dry years, and a discussion of whether those supplies will meet the projected demand associated with the proposed Project, in addition to the water system's existing and planned future uses. This assessment is parallel to the multiple-dry year supply reliability analysis required for UWMPs under CWC §10635. In 2018, CWC §10635 was revised to require UWMPs to extend this analysis to consider "a drought lasting five consecutive water years." Although CWC §10910c(3) has not yet been updated to require this for WSAs, a five-year drought scenario is also evaluated herein. However, as discussed in Section 5, with the implementation of the District's Water Neutral Development Policy, the proposed Project is expected to result in a net decrease in water demands to Cal Water's SSF District relative to those projected in the 2020 UWMP.

Tables 7 through **9** provide a comparison of the demands and supplies in normal year, single-dry year, and multiple-dry year hydrologic scenarios for the SSF, Bear Gulch, and Mid-Peninsula Districts. It is projected that available water supplies will be sufficient to meet the demands under normal year hydrologic conditions through 2045, inclusive of the proposed Project. However, in drought periods, shortfalls of up to 52% are possible if, as discussed above, the "worst-case" supply scenario is realized in which the Bay-Delta Plan Amendment is implemented as written, and not accounting for the implementation of actions identified as part of SFPUC's AWSP, BAWSCA's LTWSRS, or Cal Water's WSRS. As discussed in Section 6.1.1.4, Cal Water is working independently and with the other BAWSCA agencies to identify regional mitigation measures to improve reliability for regional and local water supplies and meet its customers' water needs. As a result, Cal Water expects that SFPUC's LOS Goals and Objectives will be met and is comfortable assuming its contract with SFPUC will be honored as written. Thus, any dry year shortfalls would be expected to be lower than those shown in **Tables 8** and **9**.

As described in Section 6, in response to anticipated future dry-year shortfalls, Cal Water has developed a WSCP that systematically identifies ways in which the SSF District can reduce water demands during dry years. The overall reduction goals in the WSCP are established for six drought stages ranging from 10% to greater than 50% shortfalls.

On 12 July 2021, the SFPUC called for voluntary 15% rationing for all wholesale and retail customers in alignment with Governor Newsom's Executive Order N-10-21. The RWS has historically met demand in its service area in all year types, and prior to 2021, only called for

voluntary 10% rationing during 2007 to 2009 and 2014 to 2015. Although the SSF District has not experienced any shortage of RWS deliveries, during the recent drought, it was subject to the SWRCB's mandatory water reduction target at 8% between June 2015 and May 2016.[18] During this period, the SSF District surpassed its reduction targets in each month and achieved an average water demand reduction of 20% compared to its water use in 2013 (SWRCB, 2016). The Mid-Peninsula and Bear Gulch Districts were required to reduce water use by 16% and 36%, respectively, and through May 2016 exceeded their targets with cumulative reductions of 24.1% and 36.7%, respectively (SWRCB, 2016).

While RWS reliability is constrained by hydrology, physical facilities, institutional parameters including state and federal regulations, the SFPUC is implementing both capital improvement and planning processes to enhance RWS reliability and meet its contractual commitment to Wholesale Customers through 2045 (see SFPUC memorandum included as **Appendix C**). Within and outside the RWS, BAWSCA is also leading multiple efforts to develop additional water supply for its member agencies through implementation of its LTWSRS.

Cal Water is also striving to increase the water supply portfolio for the SSF, Mid-Peninsula, and Bear Gulch Districts through: (1) investment in water conservation, (2) participation in the RGSR Project and the regional water recycling project (i.e., PREP), and (3) development of a regional WSRS using integrated resource planning practices to create a long-term supply reliability strategy through 2050 for Cal Water districts in the Bay Area, among other things as described in the 2020 UWMPs for each District. As described above, the three Peninsula Districts share access to Cal Water's SFPUC supply and, as such, any supply added to one of these Districts will benefit the others.

[18] On 5 May 2015, the SWRCB adopted Resolution 2015-0032 that mandates minimum actions by water suppliers and their customers to conserve water supplies into 2016 and assigned a mandatory water conservation goal to each water supplier based on their R-GPCD. The Resolution was adopted pursuant to Executive Order B-29-15 that directed SWRCB to impose mandatory restrictions on urban water suppliers to achieve a statewide 25% reduction in potable urban water usage to address California's severe drought conditions. Based on its R-GPCD, SSF District was required to reduce water use by 8% relative to its 2013 water use. The Mid-Peninsula and Bear Gulch Districts were required to reduce water use by 16% and 36%, respectively. All three Peninsula Districts exceeded their mandatory savings targets by May 2016.

8 CONCLUSIONS

As listed in Water Code §10910(c)(4), the primary purpose of this WSA is to evaluate whether sufficient water supply is available to meet all future water demands within the water supplier's service area, including those associated with the proposed Project, during normal and dry hydrologic years for a 20-year time horizon.

As described in Section 4, the water demand of the proposed Project (i.e., 557 AFY at buildout) has been conservatively estimated, and as discussed in Section 4.1, due to implementation of the District's Water Neutral Development Policy, the proposed Project is not expected to result in a net increase in water demands to Cal Water's SSF District. The findings of this WSA are contingent on the proposed Project's compliance with the requirements included in the SSF District's Water Neutral Development Policy.

It should be noted that if the "worst-case" supply scenario described under Section 6.1.1.2 in which the Bay-Delta Plan Amendment is implemented as written and not accounting for the implementation of actions identified as part of SFPUC's AWSP, BAWSCA's LTWSRS, or Cal Water's WSRS, shortfalls of up to 52% are projected during drought years. However, as described in Section 6.1.1, Cal Water expects that SFPUC's LOS Goals will be met and is comfortable assuming its contract with SFPUC will be honored as written. If drought conditions should arise, Cal Water will meet its demands through the implementation of its WSCP, as described in Section 7. In addition, Cal Water, through local and regional efforts, is striving to increase its water supply portfolio for the SSF District and the other two Peninsula Districts.

Therefore, this WSA concludes that, through the (1) development of supplemental water supplies and/or (2) implementation of conservation or demand management measures equal to the Project's estimated net new demands consistent with the Cal Water's Water Neutral Development Policy, the proposed Project will not affect water supply reliability within the South San Francisco District. Based on currently available information and conservative estimates of projected demand, Cal Water expects to be able to meet all future demands within its existing South San Francisco District service area (as well as the Mid-Peninsula and Bear Gulch Districts), inclusive of the proposed Project in normal hydrologic years. The shortfalls that are currently projected during dry years will be addressed through planned implementation of the South San Francisco District Water Shortage Contingency Plan (WSCP). In addition, as described herein and in Cal Water's 2020 UWMP, BAWSCA, Cal Water, and SFPUC are pursuing the development of additional water supplies to improve the RWS and South San Francisco District supply reliability.

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Appendix A

Project Proponent Demand Projections

SOUTHLINE PROJECT - WATER DEMAND

11/25/2020

PROPOSED DOMESTIC WATER DEMAND - LIFE SCIENCE										
PROPOSED BUILDING	NO. OF STORIES	BUILDING HEIGHT[2] (FT)	TOTAL AREA (GSF)	DESIGN USE (SF)		DEMAND (GPD)		INDOOR DEMAND (GPD)	LANDSCAPE AREA (SF)[6]	IRRIGATION[5] (GPD) 0.07
				AMENITY	R&D	AMENITY[3]	R&D[1] 0.21			
1	6	113	317,495		317,495		66,674	66,674	260,400	18,228
2[3]	4	71	88,200	88,200		53,040	0	53,040		
7	6	113	295,220		295,220		61,996	61,996		
3	6	113	447,335		447,335		93,940	93,940		
4	6	113	411,000		411,000		86,310	86,310		
6	6	113	465,800		465,800		97,818	97,818		
		TOTAL:	**2,025,050**	**88,200**	**1,936,850**	**53,040**	**406,739**	**459,779**		**18,228**

Total Annual Indoor Demand = 515 AFY[4]

Total Annual Irrigation Demand = 20 AFY

Notes:

1 Demand factors based on Redwood City values for Water Demand per SF: R&D = 0.21 GPD / SF

2 Building heights include 15' mechanical roof screen

3 See Table A "Amenity Building - Water Demand" for modeling of Amenity Building water uses based on Redwood City demand factors.

4 Annual indoor water demand (Acre-Feet per Year) based on 365 days of use per year.

5 Irrigation demand = 3.5 CF / SF / Year (0.07 GPD/SF), per Redwood City demand factors.

6 Landscape area based on conceptual landscape plans as contemplated under Southline Specific Plan; calculated across entire pr

7 Fire Flow requirement to be 3,000 GPM, 4-hour duration, per hydrant.

SOUTHLINE PROJECT - WATER DEMAND

WSA SUPPORT INFORMATION

PROPOSED DOMESTIC WATER DEMAND - 60% OFFICE / 40% R&D MIX									
PROPOSED BUILDING	NO. OF STORIES	BUILDING HEIGHT[2] (FT)	TOTAL AREA (GSF)	DESIGN USE (SF)		DEMAND (GPD)		IRRIGATION[4] (GPD) 0.07	TOTAL DEMAND (GPD)
				OFFICE	R&D	OFFICE[1] 0.13	R&D[1] 0.21		
1	6	101	323,975	194,385	129,590	25,270	27,214	3,780	**56,264**
2[3]	4	71	88,200	88,200	0	11,466	0	1,544	**13,010**
3	6	101	560,525	336,315	224,210	43,721	47,084	6,539	**97,345**
4	7	115	439,175	263,505	175,670	34,256	36,891	4,392	**75,538**
5	7	115	325,885	195,531	130,354	25,419	27,374	3,259	**56,052**
6	7	115	707,975	424,785	283,190	55,222	59,470	7,080	**121,772**
7	6	101	301,245	180,747	120,498	23,497	25,305	3,515	**52,316**
		TOTAL:	**2,746,980**	**1,683,468**	**1,063,512**	**218,851**	**223,338**	**30,108**	**472,296**

Notes:

1 Demand factors based on Redwood City values for Water Demand per SF:
Office = 0.13 GPD / SF; R&D = 0.21 GPD / SF

2 Building heights include 15' mechanical roof screen

3 Building 2, the Amenity Building (Retail / Event / Fitness), is modeled as Office

4 Irrigation demand = 3.5 CF / SF / Year (0.07 GPD/SF); Area assumed to be footprint of one floor for multi-story buildings

5 Fire Flow requirement to be 3,000 GPM, 4-hour duration, per hydrant.

Appendix B

Documentation of Water Supply Agreements (excluding attachments)

AMENDED AND RESTATED

WATER SUPPLY AGREEMENT

between

THE CITY AND COUNTY OF SAN FRANCISCO

and

WHOLESALE CUSTOMERS

in

ALAMEDA COUNTY, SAN MATEO COUNTY AND

SANTA CLARA COUNTY

NOVEMBER 2018

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AMENDED AND RESTATED
WHOLESALE WATER SUPPLY AGREEMENT

Introductory Statement

Both San Francisco□as the Regional Water System owner and operator□and its Wholesale Customers share a commitment to the Regional Water System providing a reliable supply of high □uality water at a fair price□and achieving these goals in an environmentally sustainable manner.

Article 1. Parties, Effective Date, And Defined Terms

1.01. Definitions

The capitalized terms used in this Agreement shall have the meanings set forth in Attachment A.

1.02. Parties

The parties to this Agreement are the City and County of San Francisco and such of the following entities (all of which purchase water from San Francisco) as have executed this Agreement:

Alameda County Water District
California Water Service Company
City of Brisbane
City of Burlingame
City of Daly City
City of East Palo Alto
City of Hayward
City of Menlo Park
City of Millbrae
City of Milpitas
City of Mountain View
City of Palo Alto

City of Redwood City
City of San Bruno
City of San □os□
City of Santa Clara
City of Sunnyvale
Coastside County Water District
Estero Municipal Improvement District
Guadalupe Valley Municipal Improvement District
Mid-Peninsula Water District
North Coast County Water District
Purissima Hills Water District
Stanford University
Town of Hillsborough
Westborough Water District

The entities listed above which have executed this Agreement shall be collectively referred to as the □Wholesale Customers.□

1.03. Effective Date

A. Except as provided in subsection C□this Agreement shall become effective only when it has been approved by San Francisco and by each of the entities listed in Section 1.02 and when San Francisco and each of those entities (except for the City of Hayward) have entered into an Individual Water Sales Contract as provided in Section 9.01.

B. If San Francisco and all of the entities listed in Section 1.02 approve this Agreement and (except for the City of Hayward) an Individual Water Sales Contract on or before □uly 1□2009□the effective date shall be □uly 1□2009. If San Francisco and all of the entities listed in Section 1.02 approve this Agreement and (except for the City of Hayward) an Individual Water Sales Contract after □uly 1□2009 but on or before September 1□2009□the effective date shall be the date on which the last entity listed in Section 1.02 approves this Agreement and□if re□uired□an Individual Water Sales Contract.

C. If by September 1□2009 this Agreement has been approved by fewer than all of the entities listed in Section 1.02 or fewer than all of such entities (other than the City of Hayward) have entered into an Individual Water Sales Contract□but it has been approved by entities representing at least 75□ in number and 75□ of the water purchased from SFPUC by

all listed agencies during F 2007-08 (i.e. 173.39 MGD) then San Francisco shall have the option to waive the re uirement in subsection A that all listed agencies have approved this Agreement and an Individual Water Sales Contract as a condition precedent to this Agreement and any Individual Water Sales Contract becoming effective. San Francisco shall have 60 days from September 1 2009 (i.e. until October 31 2009) within which to decide whether or not to waive the condition. If San Francisco decides to waive the condition those listed agencies that have approved this Agreement and Individual Water Sales Contract before October 31 2009 will be bound thereby and this Agreement and Individual Water Sales Contracts will become effective as to them as of the date of San Francisco s waiver. For purposes of determining whether listed agencies that have approved this Agreement represent at least 75 of the water purchased during F 2007-08 the uantity of water attributable to each listed entity shall be as set forth on Attachment B.

D. he provisions of Article 9 that apply to fewer than all Wholesale Customers (i.e. Sections 9.02 - 9.07) shall not become effective unless San Francisco and the entity to which the section applies have each approved (1) this Agreement and (2) the underlying Individual Water Sales Contract unless otherwise provided in Article 9. This provision does not affect the continued enforceability of provisions in those sections that derive from independently enforceable judgments orders or agreements.

Article 2. Term; Amendments During Term

2.01. Term

The term ("Term") of this Agreement shall be twenty five (25) years. The Term shall begin on July 1, 2009, regardless of whether the Effective Date is before or after that date, and shall end on June 30, 2034. Except as provided in Article 9, the term of all Individual Water Sales Contracts shall also begin on July 1, 2009 and end on June 30, 2034.

2.02. Extension and Renewal of Term

A. In December 2031, the SFPUC may provide written notice to the Wholesale Customers that it is willing to extend the Term of this Agreement. Between January 1, 2032 and June 30, 2032, any Wholesale Customer may accept the SFPUC's offer to extend the Term by providing a written notice of extension to the SFPUC. If such notices of extension are received from Wholesale Customers representing at least two-thirds in number as of June 30, 2032 and seventy five percent (75%) of the quantity of water delivered by the SFPUC to all Wholesale Customers during fiscal year 2030-31, the Term shall be extended for another five (5) years ("First Extension Term"), through June 30, 2039. No party to this Agreement which does not wish to remain a party during the Extension Term shall be compelled to do so by the actions of other parties under this section.

B. In December 2036, the SFPUC may provide written notice to the Wholesale Customers that it is willing to extend the Term of this Agreement. Between January 1, 2037 and June 30, 2037, any Wholesale Customer may accept the SFPUC's offer to extend the Term by providing a written notice of extension to the SFPUC. If such notices of extension are received from Wholesale Customers representing at least two-thirds in number as of June 30, 2037 and seventy five percent (75%) of the quantity of water delivered by the SFPUC to all Wholesale Customers during fiscal year 2035-36, the Term shall be extended for another five (5) years ("Second Extension Term"), through June 30, 2044. No party to this Agreement which does not wish to remain a party during the Extension Term shall be compelled to do so by the actions of other parties under this section.

C. After the expiration of the Term, and, if applicable, the Extension Terms, this Agreement may be renewed by mutual consent of the parties, subject to any modifications thereof which may be determined at that time. If fewer than all of the parties desire to renew this Agreement beyond its Term, with or without modifications, the SFPUC and the Wholesale

Customers who wish to extend the Agreement shall be free to do so provided that no party to this Agreement which does not wish to become a party to such a renewed Agreement shall be compelled to do so by the actions of other parties under this section.

2.03. Amendments

A. **Amendments to Agreement; General**

1. This Agreement may be amended with the written consent of all parties.

2. This Agreement may also be amended with the written consent of San Francisco and of Wholesale Customers representing at least two-thirds in number (i.e. 18 as of uly 1 2009) and seventy five percent (75) of the uantity of water delivered by San Francisco to all Wholesale Customers during the fiscal year immediately preceding the amendment.

3. No amendment which adversely affects a Fundamental Right of a Wholesale Customer may be made without the written consent of that customer. Amendments to Article 5 which merely affect the allocation of costs between City Retail customers on the one hand and Wholesale Customers collectively on the other and amendments to Articles 6 and 7 which merely alter budgetary accounting and auditing procedures do not affect Fundamental Rights and may be made with the consent of parties meeting the re uirements of Section 2.03.A.2.

4. When an amendment has been approved by San Francisco and the number of Wholesale Customers re uired in Section 2.03.A.2 San Francisco shall notify each of the Wholesale Customers in writing of the amendment s adoption. Notwithstanding any provision of law or this Agreement any Wholesale Customer that claims that the amendment violates its Fundamental Rights under Section 2.03.A.3 shall have 30 days from the date San Francisco delivers the notice of its adoption in which to challenge the amendment s validity through a judicial action. If no such action is filed within 30 days the amendment shall be finally and conclusively deemed to have been adopted in compliance with this section.

B. **Amendments to Article 9**

1. Notwithstanding the provisions of Sections 2.03.A.2 and 2.03.A.3 any provision of Article 9 which applies only to an individual Wholesale Customer may be amended with the written concurrence of San Francisco and the Wholesale Customer to which it applies

provided that the amendment will not directly or indirectly adversely affect the Fundamental Rights of the other Wholesale Customers.

2. Before making any such amendment effective San Francisco shall give notice with a copy of the text of the proposed amendment to all other Wholesale Customers. The Wholesale Customers shall have 30 days in which to object to the amendment on the ground that it is not permissible under this subsection. If no such objection is received by San Francisco the proposed amendment shall become effective. If one or more Wholesale Customers object to the amendment San Francisco the individual Wholesale Customer with which San Francisco intends to effect the amendment and the Wholesale Customer(s) which lodged the objection shall meet to discuss the matter.

3. If the dispute cannot be resolved and San Francisco and the Wholesale Customer involved elect to proceed with the amendment either San Francisco or the Wholesale Customer shall give written notice of such election to each Wholesale Customer that has objected. Any Wholesale Customer that has objected to such amendment shall have 30 days from receipt of this notice within which to commence an action challenging the validity of such amendment and such amendment shall be deemed effective as of the end of this 30-day period unless restrained by order of court.

C. **Amendments to Attachments**. The following attachments may be amended with the written concurrence of San Francisco and BAWSCA on behalf of the Wholesale Customers:

Attachment	Name
G	anuary 2006 Water Quality Notification and Communications Plan
	Water Use Measurement and Tabulation
L-1	Identification of WSIP Projects as Regional/Retail
N-1	Balancing Account/Rate Setting Calculation Table
N-2	Wholesale Revenue Re uirement Schedules
N-3	Schedule of Projected Water Sales Wholesale Revenue Re uirement and Wholesale Rates
P	Management Representation Letter

R	Classification of Existing System Assets (subject to Section 5.11)

Amendments to these attachments shall be approved on behalf of San Francisco by the Commission and on behalf of BAWSCA by its Board of Directors unless the Commission by resolution delegates such authority to the General Manager of the SFPUC or the Board of Directors by resolution delegates such authority to the General Manager/CEO of BAWSCA.

D. **Amendments to Individual Water Sales Contracts**. Individual Water Sales Contracts described in Section 9.01 may be amended with the written concurrence of San Francisco and the Wholesale Customer which is a party to that Individual Water Sales Contract provided that the amendment is not inconsistent with this Agreement or in derogation of the Fundamental Rights of other Wholesale Customers under this Agreement.

Article 3. Water Supply

3.01. Supply Assurance

A. San Francisco agrees to deliver water to the Wholesale Customers up to the amount of the Supply Assurance. The Supply Assurance is for the benefit of the entities listed in Section 1.02, irrespective of whether or not they have executed this Agreement. Water delivered by San Francisco to Retail Customers shall not be included in the Supply Assurance. Until December 31, 2018, the foregoing commitment is subject to Article 4.

B. Both the Supply Assurance and the Individual Supply Guarantees identified in Section 3.02 are expressed in terms of daily deliveries on an annual average basis and do not themselves constitute a guarantee by San Francisco to meet peak daily or hourly demands of the Wholesale Customers, irrespective of what those peak demands may be. The parties acknowledge, however, that the Regional Water System has been designed and constructed to meet peak daily and hourly demands and that its capacity to do so has not yet been reached. San Francisco agrees to operate the Regional Water System to meet peak requirements of the Wholesale Customers to the extent possible without adversely affecting its ability to meet peak demands of Retail Customers. This Agreement shall not preclude San Francisco from undertaking to meet specific peak demand requirements of individual Wholesale Customers in their Individual Water Sales Contracts.

C. The Supply Assurance is perpetual and shall survive the expiration or earlier termination of this Agreement. Similarly, the Individual Supply Guarantees identified in Section 3.02 and/or the Individual Water Sales Contracts are perpetual and shall survive the expiration or earlier termination of this Agreement or the Individual Water Sales Contracts.

D. Notwithstanding the Supply Assurance established by this section, the Individual Supply Guarantees identified in Section 3.02 and the Individual Water Sales Contracts, the amount of water made available by San Francisco to the Wholesale Customers is subject to reduction, to the extent and for the period made necessary by reason of water shortage, Drought Emergencies, or by malfunctioning or rehabilitation of facilities in the Regional Water System. Any such reduction will be implemented in accordance with Section 3.11. The amount of water made available to the Wholesale Customers may not be reduced, however, merely because the water recycling and groundwater projects which the WSIP envisions to be constructed within San Francisco, or the conservation programs intended to reduce water use

by Retail Customers that are included in the WSIP □do not generate the yield or savings (10 MGD combined) anticipated by San Francisco.

3.02. Allocation of Supply Assurance

A. Pursuant to Section 7.02 of the 1984 Agreement□a portion of the Supply Assurance has been allocated among 24 of the 26 Wholesale Customers. These Individual Supply Guarantees are also expressed in terms of annual average metered deliveries of millions of gallons per day and are listed in Attachment C.

B. Three Wholesale Customers do not have Individual Supply Guarantees. The cities of San □ose and Santa Clara do not have an Individual Supply Guarantees because San Francisco has provided water to them on a temporary and interruptible basis as described in Sections 4.05 and 9.06. The City of Hayward does not have an Individual Supply Guarantee because of the terms of the 1962 contract between it and San Francisco□as further described in Section 9.03.

C. If the total amount of water delivered by San Francisco to Hayward and to the Wholesale Customers that are listed on Attachment C exceeds 184 MGD over a period of three consecutive fiscal years (i.e.□□uly 1 through □une 30)□then the Individual Supply Guarantees of those Wholesale Customers listed on Attachment C shall be reduced pro rata so that their combined entitlement and the sustained use by Hayward does not exceed 184 MGD. The procedure for calculating the pro rata reduction in Individual Supply Guarantees is set out in Attachment D.

1. The provisions of this subsection C are not in derogation of the reservation of claims to water in excess of the Supply Assurance which are contained in Section 8.07. Nor do they constitute an acknowledgement by Wholesale Customers other than Hayward that San Francisco is obligated or entitled to reduce their Individual Supply Guarantees in the circumstances described herein. The provisions of this subsection C shall□ however□be operative unless and until a court determines that its provisions violate rights of the Wholesale Customers derived independently of this Agreement.

2. The foregoing paragraph is not intended to and shall not constitute a contractual commitment on the part of San Francisco to furnish more water than the Supply Assurance to the Wholesale Customers or a concession by San Francisco that the provisions of this subsection violate any rights of the Wholesale Customers.

D. Notwithstanding the reservation of claims contained in Sections 3.02.C and 8.07, it shall be the responsibility of each Wholesale Customer to limit its purchases of water from San Francisco so as to remain within its Individual Supply Guarantee. San Francisco shall not be liable to any Wholesale Customer or be obligated to supply more water to any Wholesale Customer individually or to the Wholesale Customers collectively than the amount to which it or they are otherwise entitled under this Agreement due to the use by any Wholesale Customer of more water than the amount to which it is entitled under this Agreement.

E. San Francisco shall install such new connections between the Regional Water System and the distribution system of any Wholesale Customer that are necessary to deliver the quantities of water to which the Wholesale Customer is entitled under this Agreement. San Francisco shall have the right to determine the location of such connections, in light of the need to maintain the structural integrity of the Regional Water System and, where applicable, the need to limit peaking directly off of Regional Water System pipelines by a Wholesale Customer's individual retail customers, the need to ensure that a Wholesale Customer's individual retail customers have access to alternative sources of water in the event of a reduction in San Francisco's ability to provide them with water, and other factors which may affect the desirability or undesirability of a particular location. San Francisco's decisions regarding the location of new connections and the location, size and type of any new meters shall not be reviewable by a court except for an abuse of discretion or failure to provide a Wholesale Customer with connections and meters adequate to deliver the quantity of water to which it is entitled under this Agreement.

3.03. <u>Wholesale Customer Service Areas</u>

A. Each of the Individual Water Sales Contracts described in Section 9.01 will contain, as an exhibit, a map of the Wholesale Customer's service area. A Wholesale Customer may not deliver water furnished to it by San Francisco outside the boundary of its service area without the prior written consent of San Francisco, except for deliveries to another Wholesale Customer on an emergency and temporary basis pursuant to Section 3.07.B.

B. If a Wholesale Customer wishes to expand its service area, it shall request San Francisco's consent to the expansion and provide information reasonably requested by San Francisco about the amount of water projected to be purchased from San Francisco to meet demand within the area proposed to be added to the service area.

C. San Francisco may refuse a Wholesale Customer's request to expand its service area on any reasonable basis. If San Francisco denies a request by a Wholesale Customer to expand its service area or fails to act on the request for six months after it has been submitted, the Wholesale Customer may challenge San Francisco's denial or delay in court. Such a challenge may be based on the Wholesale Customers' claim reserved in Section 8.07 that San Francisco is obligated under federal or state law to furnish water included within its Individual Supply Guarantee to it for delivery outside its then-existing service area and that it is entitled to enlarge its service area to supply water to such customers. San Francisco reserves the right to contest any such claim on any applicable ground. This subsection does not apply to San Jose and Santa Clara whose maximum service areas are fixed pursuant to Section 9.06.

D. This section will not prevent San Francisco and any Wholesale Customer other than San Jose and Santa Clara from agreeing in an Individual Water Sales Contract or an amendment thereto that:

- the Wholesale Customer may expand its service area without subsequent San Francisco approval to a definitive size but no larger or
- the Wholesale Customer will not expand its service area beyond its present limits without San Francisco approval

and waiving the provisions of this section with respect to any additional expansion.

E. If two or more Wholesale Customers agree to adjust the boundaries of their respective service areas so that one assumes an obligation to serve customers in an area that was previously within the service area of another Wholesale Customer they may also correspondingly adjust their respective Individual Supply Guarantees. Such adjustments are not subject to the requirements of Section 3.04 and shall require only the consent of San Francisco and the Wholesale Customers involved so long as the Supply Assurance and the Individual Supply Guarantees of other Wholesale Customers are not affected. Service area boundary adjustments that would result in the expansion of any California Water Service Company service areas are subject to the requirements of Section 9.02.D. Any adjustment of service area boundaries that would result in the supply of water in violation of this Agreement or the Act shall be void.

F. San Francisco acknowledges that it has heretofore consented in writing to deliveries of water by individual Wholesale Customers outside their service area boundaries and

agrees that nothing in this Agreement is intended to affect such prior authorizations which remain in full force and effect according to their terms. Such authorizations shall be identified in the Individual Water Sales Contracts.

3.04. Permanent Transfers of Individual Supply Guarantees

A. A Wholesale Customer that has an Individual Supply Guarantee may transfer a portion of it to one or more other Wholesale Customers as provided in this section.

B. Transfers of a portion of an Individual Supply Guarantee must be permanent. The minimum quantity that may be transferred is 1/10th of a MGD.

C. Transfers of portions of Individual Supply Guarantees are subject to approval by the SFPUC. SFPUC review is limited to determining (1) whether a proposed transfer complies with the Act and (2) whether the affected facilities in the Regional Water System have sufficient capacity to accommodate delivery of the increased amount of water to the proposed transferee.

D. The participants in a proposed transfer shall provide notice to the SFPUC specifying the amount of the Individual Supply Guarantee proposed to be transferred the proposed effective date of the transfer which shall not be less than 60 days after the notice is submitted to the SFPUC and the Individual Supply Guarantees of both participants resulting from the transfer. The SFPUC may require additional information reasonably necessary to evaluate the operational impacts of the transfer. The SFPUC will not unreasonably withhold or delay its approval if the SFPUC does not act on the notice within 60 days the transfer will be deemed to have been approved.

E. Within 30 days after the transfer has become effective both the transferor and the transferee will provide notice to the SFPUC and BAWSCA. By September 30 of each year during the Term the SFPUC and BAWSCA will prepare an updated Attachment C to reflect transfers occurring during the immediately preceding fiscal year.

F. Amounts transferred will remain subject to pro rata reduction under the circumstances described in Section 3.02.C and according to the formula set forth in Attachment D.

3.05. Restrictions on Resale

Each Wholesale Customer agrees that it will not sell any water purchased from San Francisco to a private party for resale by such private party to others in violation of the Act.

Each Wholesale Customer also agrees that it will not sell water purchased from San Francisco to another Wholesale Customer without prior written approval of the SFPUC, except on a temporary and emergency basis as permitted in Section 3.07.B.2. The SFPUC agrees that it will not unreasonably withhold its consent to a request by a Wholesale Customer to deliver water to another Wholesale Customer for resale.

3.06. Conservation; Use of Local Sources; Water Management Charge

A. In order to support the continuation and expansion of water conservation programs, water recycling, and development of alternative supplies within the Wholesale Customers' service areas, the SFPUC will, if requested by BAWSCA, include the Water Management Charge in water bills sent to Wholesale Customers. The SFPUC will deliver all Water Management Charge revenue to BAWSCA monthly and shall deliver an annual accounting of Water Management Charge revenue to BAWSCA within 90 days after the end of each fiscal year. The SFPUC's obligations to collect and deliver Water Management Charge revenue to BAWSCA under this subsection are conditioned on BAWSCA's delivery to the SFPUC of an annual report describing the projects and programs on which Water Management Charge funds received from the SFPUC during the previous fiscal year were expended and an estimate of the amount of water savings attributable to conservation programs and of the yield of alternative supplies developed. This report will be due within 180 days after the end of each fiscal year during which Water Management Charge funds were received.

B. The SFPUC will work together with BAWSCA to explore ways to support water conservation programs, recycling projects, and conjunctive use alternatives outside the Wholesale Service Area, in particular projects and programs that have the potential to increase both flows in the lower Tuolumne River (downstream of New Don Pedro Reservoir) and water deliveries to the Regional Water System.

C. Each Wholesale Customer shall take all actions within its legal authority related to water conservation that are necessary to insure that the SFPUC (a) remains eligible for (i) state and federal grants and (ii) access to the Drought Water Bank operated by the California Department of Water Resources, as well as other Drought-related water purchase or transfer

programs and (b) complies with future legal requirements imposed on the Regional Water System by the federal government the State or any other third party as conditions for receiving funding or water supply.

D. San Francisco and each Wholesale Customer agree that they will diligently apply their best efforts to use both surface water and groundwater sources located within their respective service areas and available recycled water to the maximum feasible extent taking into account the environmental impacts the public health effects and the effects on supply reliability of such use as well as the cost of developing such sources.

3.07. Restrictions on Purchases of Water from Others; Minimum Annual Purchases

A. Each Wholesale Customer (except for Alameda County Water District and the cities of Milpitas Mountain View and Sunnyvale) agrees that it will not contract for purchase or receive with or without compensation directly or indirectly from any person corporation governmental agency or other entity any water for delivery or use within its service area without the prior written consent of San Francisco.

B. The prohibition in subsection A does not apply to:

1. recycled water

2. water necessary on an emergency and temporary basis provided that the Wholesale Customer promptly gives San Francisco notice of the nature of the emergency the amount of water that has been or is to be purchased and the expected duration of the emergency or

3. water in excess of a Wholesale Customer s Individual Supply Guarantee.

C. Alameda County Water District and the cities of Milpitas Mountain View and Sunnyvale may purchase water from sources other than San Francisco provided that San Francisco shall require that each purchase a minimum annual quantity of water from San Francisco. These minimum quantities are set out in Attachment E and shall also be included in the Individual Water Sales Contracts between San Francisco and each of these four Wholesale Customers. The minimum purchase requirement in these Individual Water Sales Contracts will be waived during a Drought or other period of water shortage if the water San Francisco makes available to these Wholesale Customers is less than its minimum purchase quantity.

3.08. Water Quality

A. San Francisco shall deliver treated water to Wholesale Customers (except Coastside County Water District which receives untreated water from Crystal Springs and Pilarcitos Reservoirs) that complies with primary maximum contaminant level and treatment techni ue standards at the regulatory entry points designated in the San Francisco Regional Water System Domestic Water Supply Permit (currently Permit No. 02-04-04P3810001) issued by the California Department of Public Health (CDPH).

B. San Francisco will provide notice to the Wholesale Customers in accordance with the Water Quality Notification and Communications Plan (current version dated anuary 2006) attached hereto as Attachment G. San Francisco will regularly update its plan in consultation with the Wholesale Customers and the CDPH. The next update will be completed one year after the Effective Date and include expanded coverage of secondary maximum contaminant level exceedances and water uality communication triggers. The plan will note that the Wholesale Customers will receive the same notification no later than the San Francisco water system (currently Permit No. 02-04-01P3810011) except for distribution-related issues.

C. San Francisco and the Wholesale Customers will establish a Water Quality Committee. The Water Quality Committee will meet at least uarterly to collaboratively address water uality issues such as Water Quality Notification and Communications Plan updates regulatory issues and water uality planning studies/ applied research. San Francisco and each Wholesale Customer will designate a representative to serve on the committee. There will be a Chair and Vice Chair position for the Water Quality Committee. The Chair and Vice Chair positions will be held by San Francisco and the Wholesale Customers and rotate between them on an annual basis.

3.09. Completion of WSIP

San Francisco will complete construction of the physical facilities in the WSIP by December 30 2021. The SFPUC agrees to provide for full public review and comment by local and state interests of any proposed changes that delay previously adopted project completion dates or that delete projects. The SFPUC shall meet and consult with BAWSCA before proposing to the Commission any changes in the scope of WSIP projects which reduce their capacity or ability to achieve adopted Level of Service Goals and Objectives. The SFPUC

retains discretion to determine whether to approve the physical facilities in the WSIP until after it completes the CEQA process as set forth in Section 4.07.

3.10. Regional Water System Repair, Maintenance and Operation

A. San Francisco will keep the Regional Water System in good working order and repair consistent with prudent utility practice.

B. San Francisco will submit reports to its Retail and Wholesale Customers on the "State of the Regional Water System" including reports on completed and planned maintenance, repair or replacement projects or programs, by September of every even-numbered year, with reports to start in September 2010.

C. San Francisco will cooperate with any audit of the SFPUC's asset management practices that may be initiated and financed by BAWSCA or the Wholesale Customers. BAWSCA may contract with third parties to conduct the audits. San Francisco will consider the findings and recommendations of such audits and will provide a written response indicating agreement with the recommendations or disagreement with particular recommendations and the reasons why, within 90 calendar days after receipt.

D. San Francisco will continue to operate its reservoirs in a manner that assigns higher priority to the delivery of water to the Bay Area and the environment than to the generation of electric power. The SFPUC, as the Regional Water System operator, is solely responsible for making day-to-day operational decisions.

3.11. Shortages

A. **Localized Water Reductions**. Notwithstanding San Francisco's obligations to deliver the Supply Assurance to the Wholesale Customers collectively and the Individual Supply Guarantees to Wholesale Customers individually, San Francisco may reduce the amount of water available or interrupt water deliveries to specific geographical areas within the Regional Water System service area to the extent that such reductions are necessary due to Emergencies, or in order to install, repair, rehabilitate, replace, investigate or inspect equipment in, or perform other maintenance work on, the Regional Water System. Such reductions or interruptions may be imposed by San Francisco without corresponding reductions or interruptions in the amount of water available to SFPUC water users outside the specific geographical area where reductions or interruptions are necessary, if the system's ability to supply water outside the specific geographical area has not been impaired. In the event of such

a reduction or interruption□San Francisco will restore the supply of water to the specific geographical area as soon as is possible. Except in cases of Emergencies (during which oral notice shall be sufficient)□San Francisco will give the affected Wholesale Customer(s) reasonable written notice of such localized reductions or interruptions□the reasons therefor□and the probable duration thereof.

B. **System-Wide Shortages and SFPUC Response to Regional Emergencies**. Following a major system emergency event□the SFPUC will work closely with its Wholesale Customers to monitor customer demand□including the demand source. In the event that any individual Wholesale Service Area or Retail Service Area customer□s uncontrolled distribution system leaks could result in major water waste and endanger the supply provided by the Regional Water System as a whole□flow through some customer connections may need to be temporarily reduced or terminated. SFPUC will work closely with customers to assess the nature of the demand (e.g. fire-fighting versus leakage)□so that public health and safety protection can be given top priority.

1. All emergencies that re□uire use of non-potable source water will re□uire use of chlorine□or other suitable disinfectant□if feasible.

2. San Francisco will use its best efforts to meet the seismic reliability and delivery reliability Level of Service Goals and Objectives adopted by the Commission in conjunction with the WSIP. San Francisco will distribute water on an e□uitable basis throughout the Regional Water System service area following a regional Emergency□subject to physical limitations caused by damage to the Regional Water System.

3. San Francisco□s response to Emergencies will be guided by the then-current version of the ERRP. The SFPUC shall periodically review□and the Commission may amend□the ERRP to ensure that it remains an up-to-date and effective management tool.

4. The SFPUC will give the Wholesale Customers notice of any proposal to amend the ERRP in a manner that would affect them. The notice will be delivered at least thirty days in advance of the date on which the proposal is to be considered by the Commission and will be accompanied by the text of the proposed amendment.

C. **Shortages Caused by Drought; Acquisition of Dry Year Supplies**. Notwithstanding San Francisco□s obligations to deliver the Supply Assurance to the Wholesale Customers collectively and the Individual Supply Guarantees to Wholesale Customers

individually San Francisco may reduce the amount of water available to the Wholesale Customers in response to Drought.

1. The Tier 1 Shortage Plan (Attachment H) will continue to be used to allocate water from the Regional Water System between Retail and Wholesale Customers during system-wide shortages of 20 or less.

2. San Francisco and the Wholesale Customers may negotiate in good faith revisions to the Tier 1 Shortage Plan to adjust for and accommodate anticipated changes due to demand hardening in the SFPUC s Wholesale and Retail Service Areas. Until agreement is reached the current Tier 1 Shortage Plan will remain in effect.

3. The SFPUC will honor allocations of water among the Wholesale Customers (Tier 2 Allocations) provided by BAWSCA or if unanimously agreed to by all Wholesale Customers. If BAWSCA or all Wholesale Customers do not provide the SFPUC with Tier 2 Allocations then the SFPUC may make a final allocation decision after first meeting and discussing allocations with BAWSCA and the Wholesale Customers. For Regional Water System shortages in excess of 20 San Francisco shall (a) follow the Tier 1 Shortage Plan allocations up to the 20 reduction (b) meet and discuss how to implement incremental reductions above 20 with the Wholesale Customers and (c) make a final determination of allocations above the 20 reduction. After the SFPUC has made the final allocation decision the Wholesale Customers shall be free to challenge the allocation on any applicable legal or e uitable basis.

4. San Francisco will use its best efforts to identify potential sources of dry year water supplies and establish the contractual and other means to access and deliver those supplies in sufficient uantity to meet a goal of not more than 20 percent system-wide shortage in any year of the design drought.

5. San Francisco will cooperate with BAWSCA to improve water supply reliability. As an example of such cooperation San Francisco may invite a representative of BAWSCA to attend and participate in meetings with third parties for development of dry year water supplies. If San Francisco does not invite a BAWSCA representative to attend a specific scheduled meeting it will promptly (within 30 days of any such meeting) provide BAWSCA with a written or oral report on the meeting including any decisions reached at it as well as information about planned subse uent meetings. Progress in securing dry year water supplies

will be reported to the SFPUC and the BAWSCA board of directors during the first quarter of each calendar year.

3.12. Wheeling of Water from Outside SFPUC System

Subject to the Wheeling Statute, the SFPUC will not deny use of Regional Water System unused capacity for wheeling when such capacity is available for wheeling purposes during periods when the SFPUC has declared a water shortage emergency under Water Code Section 350 if the following conditions are met:

A. The transferor pays reasonable charges incurred by the SFPUC as a result of the wheeling, including capital, operation, maintenance, administrative and replacement costs (as such are defined in the Wheeling Statute).

B. Wheeled water that is stored in the Regional Water System spills first.

C. Wheeled water will not unreasonably: (1) impact fish and wildlife resources in Regional Water System reservoirs, (2) diminish the quality of water delivered for consumptive uses, or (3) increase the risk of exotic species impairing Regional Water System operations. The transferor may at its own expense provide for treatment to mitigate these effects.

D. Priority will be given to wheeling by Wholesale Customers or BAWSCA over arrangements for third-party public entities.

3.13. Limits on New Customers

A. **New Wholesale Customers Prior to December 31, 2028**. Until December 31, 2028, San Francisco will not enter into contracts to supply water to any entity other than a Wholesale Customer (whether permanent or temporary, firm or interruptible) unless:

1. It completes any necessary environmental review under CEQA of the proposed new wholesale water service obligations as provided in Section 4.07,

2. It concurrently completes any necessary environmental review under CEQA as provided in Section 4.07 and commits to make both San Jose and Santa Clara permanent customers with Individual Supply Guarantees equal to at least 9 MGD, and

3. This Agreement is amended to incorporate any commitments to proposed new wholesale customers and to San Jose and Santa Clara, and to address the effects, if any,

of the new customer(s) on water supply reliability□water □uality and cost to existing customers of the Regional Water System.

B. **New Wholesale Customers After December 31, 2028**. As of □anuary 1□2029□ San Francisco will not enter into contracts to supply water to any entity other than a Wholesale Customer (whether permanent or temporary□firm or interruptible) unless:

1. It completes any necessary environmental review under CEQA of the proposed new wholesale water service obligations as provided in Section 4.07□

2. It concurrently completes any necessary environmental review under CEQA as provided in Section 4.07 and commits to make both San □ose and Santa Clara permanent customers with Individual Supply Guarantees e□ual to at least 9 MGD□

3. Doing so increases the reliability of the Regional Water System□and

4. This Agreement is concurrently amended (a) to reflect that increased reliability by means of an increased commitment by San Francisco to deliver water during Droughts and (b) to address the effects□if any□of the new customer(s) on water supply□water □uality and cost to existing customers of the Regional Water System.

C. **New Retail Customers**. San Francisco may enter into new retail water service obligations outside of the City and County of San Francisco:

1. Only in Alameda□San Mateo□Santa Clara□San □oa□uin and Tuolumne Counties□

2. That are within or immediately adjacent to areas in which it currently serves other Retail Customers□and

3. Until the aggregate additional demand represented by the new retail customers reaches 0.5 MGD.

The limitations on serving new Retail Customers described in this subsection do not apply to historical obligations to supply water that may be contained in prior agreements between the SFPUC or its predecessor the Spring Valley Water Company□and individual users or property owners located adjacent to Regional Water System transmission pipelines.

D. **Water Exchanges and Cost Sharing Agreements with Other Water Suppliers**. Subject to completion of necessary environmental review under CEQA□San

Francisco may at any time enter into water exchanges or cost sharing agreements with other water suppliers to enhance dry year or normal year water deliveries, provided that San Francisco cannot incur new water service obligations to such other water suppliers unless the requirements for taking on new wholesale customers in subsections A and B above are met.

3.14. Measurement of Water

A. The parties recognize that continuous and accurate measurement of water deliveries to and from the Regional Water System and maintenance of complete and accurate records of those measurements is necessary (1) for the costs of the Regional Water System to be allocated in accordance with this Agreement, (2) for implementation of other provisions of this Agreement, and (3) for effective operation and maintenance of a water system serving a large urbanized region.

B. It is the responsibility of the SFPUC to obtain and record these measurements. To do so, the SFPUC shall install, maintain and operate measuring and recording equipment at the following locations: (1) inputs to the Regional Water System from all water sources ("System Input Meters"), (2) internal flow meters to support operation of the Regional Water System ("In-Line Meters"), (3) deliveries to the City at the San Francisco-San Mateo County line ("County-Line Meters") and to three reservoirs in San Francisco ("In-City Terminal Reservoir Meters"), (4) deliveries to SFPUC Retail Customers located outside the boundaries of the City, and (5) deliveries to the Wholesale Customers, as described and illustrated in Attachment .

C. The SFPUC shall inspect, test, service, and calibrate the measuring and recording equipment installed at the locations described in subsection B and will repair or replace them when necessary, in order to ensure that their accuracy is consistent with specifications provided in Attachment .

D. The SFPUC shall continue to contract with a qualified independent metering consultant to perform periodic inspection, testing, servicing and calibration of the County-Line Meters, the In-City Terminal Reservoir Meters, and the System Input and In-Line Meters described in Attachment , as well as the portion of the SFPUC's Supervisory Control and Data Acquisition (SCADA) system that utilizes the flow signals produced by that measuring and recording equipment. The method, schedule and frequency for calibration and maintenance of the County-Line Meters and the In-City Terminal Reservoir Meters are specified in Attachment . The SFPUC shall provide copies of the metering consultant's reports to BAWSCA.

E. System Input Meters measure water deliveries into the Regional Water System from sources such as Hetch Hetchy and the SFPUC's water treatment plants. System Input Meters also measure deliveries from the Regional Water System to outside sources or from such sources to the Regional Water System through interties with the Santa Clara Valley Water District and the East Bay Municipal Utility District. In-Line Meters measure internal system flows and are located on the Bay Division Pipelines and other main transmission pipelines. These meters are collectively referred to as the "System Input and In-line Meters." Similar to the County-Line Meters, the System Input and In-Line Meters have secondary metering equipment, such as differential pressure transmitters and flow recorders. The System Input and In-Line Meters, and all associated secondary metering equipment, shall be calibrated and maintained according to the method, schedule, and frequency specified in the Procedures Manual described in subsection G, below.

F. The locations of the smaller and more numerous meters described in subsection B (4) and (5) are not illustrated in Attachment ___, however, they are also critical in the determination of cost allocations, and accordingly require continued maintenance and calibration. It is the responsibility of the SFPUC to maintain the accuracy of these meters and their secondary metering equipment.

G. The SFPUC will prepare a Procedures Manual which will describe in detail the procedures for periodic inspection, testing, servicing and calibration of the measuring and recording equipment described in subsection B. Once the Procedures Manual is completed, the SFPUC and BAWSCA may agree that it should supersede some or all of the requirements in Attachment ___ regarding the County-Line and the In-City Terminal Reservoir Meters. Unless and until such an agreement is reached and documented, however, the requirements in Attachment ___, Section D will continue in force as minimum standards for meter maintenance and calibration of the County-Line and In-City Terminal Reservoir Meters (subject to modification under the circumstances described in Attachment ___, Section A.4).

H. If BAWSCA and the SFPUC are unable to agree on the water use calculations required by Attachment ___ for a particular year, the Wholesale Customers may file a demand for arbitration challenging the SFPUC's determination of the Wholesale Revenue Requirement for that year on the basis of its reliance on disputed water use calculations. Such a challenge must be brought in the manner and within the time specified in Section 8.01.

3.15. New Sources of Water Supply to Maintain Supply Assurance

A. **Urgent Reductions of Existing Surface Water Supplies**. Sudden and unanticipated events may re□uire San Francisco to act promptly to protect the health□safety and economic well-being of its Retail and Wholesale Customers. Such sudden events include□but are not limited to drought□earth□uakes□terrorist acts□catastrophic failures of facilities owned and operated by San Francisco□and other natural or man-made events. If such events diminish San Francisco□s ability to maintain the Supply Assurance□San Francisco may increase the Wholesale Revenue Re□uirement to pay for planning□evaluation and implementation of replacement sources of supply when such needs arise and without the prior approval of the Wholesale Customers. San Francisco will keep the Wholesale Customers informed of actions being taken under this subsection□progress made□and contingency actions the Wholesale Customers may need to consider taking. To the extent appropriate and applicable□San Francisco will act in accordance with Section 3.11 and the ERRP. Nothing in this subsection limits San Francisco□s obligations under Section 3.11 to pursue additional sources of supply to augment supplies available during drought.

B. **Non-Urgent Reductions of Existing Surface Water Supplies**. Climate change□regulatory actions and other events may impact San Francisco□s ability to maintain the Supply Assurance from its existing surface water supplies□but on timescales long enough to permit San Francisco to collaborate with its Wholesale Customers on how best to address possible impacts to water supply. If such events diminish San Francisco□s ability to maintain the Supply Assurance□San Francisco may increase the Wholesale Revenue Re□uirement to pay for planning□evaluation and implementation of replacement sources of supply when such needs arise and without the prior approval of the Wholesale Customers. San Francisco will keep the Wholesale Customers informed of actions being taken under this subsection□progress made□ and contingency actions the Wholesale Customers may need to consider taking. San Francisco will solicit input and recommendations from BAWSCA and the Wholesale Customers□and take those recommendations into consideration. Prior to Commission approval of plans or taking other actions that would impact the Wholesale Revenue Re□uirement□San Francisco will hold a public hearing to receive written and oral comments. Nothing in this subsection modifies San Francisco□s obligation to maintain the ability to provide the Supply Assurance under this Agreement.

3.16. New Sources of Water Supply to Increase Supply Assurance

A. **Surface Water Supplies From Existing Watersheds After 2018**. The Commission action in SFPUC Resolution Number 08-0200 adopted October 30 2008 re uires certain decisions by San Francisco regarding whether to supply more than 265 MGD from its watersheds following 2018. Such decisions are to be made by December 31 2018 subject to the exercise of San Francisco s retained CEQA discretion in Section 4.07. San Francisco s future decisions may include an offer to increase the Supply Assurance at the re uest of some or all of its Wholesale Customers. Costs associated with providing additional water from its existing water supplies in San Mateo Santa Clara Alameda Tuolumne and Stanislaus Counties shall be allocated to Wholesale and Retail Customers as described in Article 5.

B. **New Water Supplies**. If San Francisco seeks to develop additional water supplies from new sources to increase the Supply Assurance available to Wholesale Customers studies and resulting water supply projects will be conducted jointly with BAWSCA under separate agreement(s) specifying the purpose of the projects the anticipated regional benefits and how costs of studies and implementation will be allocated and charged. Nothing in this Agreement shall serve as precedent for the allocation of such new supply capital costs between Retail and Wholesale Customers or associated operational expenses which shall only occur following approval of both parties and amendment of this Agreement if necessary under Section 2.03.

3.17. Westside Basin Groundwater Storage and Recovery Project

In August 2014 the SFPUC approved a WSIP project called the Groundwater Storage and Recovery Project (Project) which authorized the SFPUC to enter into an agreement governing the operation of the Project with the Participating Pumpers entitled Agreement for Groundwater Storage and Recovery from the Southern Portion of the Westside Groundwater Basin by and among the San Francisco Public Utilities Commission the City of Daly City the City of San Bruno and California Water Service Company (Project Operating Agreement) which became effective on December 16 2014. The Project produces Regional benefits for all customers of the Regional Water System by making use of available groundwater storage capacity in the Southern portion of the Westside Basin through the supply of additional surface water (In Lieu Water) to the Participating Pumpers from the Regional Water System in exchange for a corresponding reduction in groundwater pumping at existing wells owned by the Participating Pumpers. The new groundwater supply that accrues to storage as a result of

delivery of In Lieu Water will be recovered from the SFPUC Storage Account during water shortages using new Regional Project Facilities or Shared Facilities operated by the Participating Pumpers and the SFPUC. Project mitigation capital costs and annual Project operations and maintenance expenses and water supplies shall be allocated as follows:

A. All In Lieu Water delivered to the Participating Pumpers shall be (1) temporary and interruptible in nature and (2) at the sole discretion of the SFPUC based on the total volume of water available to the Regional Water System.

B. All In Lieu Water delivered to the Participating Pumpers shall be considered a delivery of water to storage and shall not be construed to affect or increase the Individual Supply Guarantees of these Wholesale Customers or to otherwise entitle them to any claim of water in excess of their Individual Supply Guarantees.

C. In the event that it is necessary to reduce the Participating Pumpers' aggregate designated quantity of groundwater production allocation pursuant to Section 4.7 of the Project Operating Agreement, the SFPUC may supply an annual maximum of up to 500 acre feet of Participating Pumper Replacement Water from the Regional Water System at a price comparable to the Participating Pumpers' then-current groundwater cost, as may be adjusted annually as provided for in Section 4.7 of the Project Operating Agreement. Each of the Participating Pumpers may elect to take delivery of its share of Participating Pumper Replacement Water either as interruptible surface water deliveries from the Regional Water System or as a transfer of storage credits from the SFPUC Storage Account. All revenue received from such water sales or transfers shall be considered revenue related to the sale of water and allocated between Retail Customers and Wholesale Customers on the basis of Proportional Water Use. All volumes of Participating Pumper Replacement Water delivered shall not be construed to affect or increase the Individual Supply Guarantees of these Wholesale Customers or to otherwise entitle them to any claim of water in excess of their Individual Supply Guarantees.

D. Any operation and maintenance expenses incurred by the Participating Pumpers and the SFPUC that are related to the operation of Project Facilities and Shared Facilities for Project purposes shall be included as Regional pumping expenses under Section 5.05.B of this Agreement and included as part of the Wholesale Revenue Requirement. For rate setting purposes, estimated Project operation and maintenance expenses shall be used as set forth in

Section 6.01 of this Agreement. Operation and maintenance expenses associated with the Participating Pumpers' Existing Facilities that do not provide Regional benefits shall not be included in the Wholesale Revenue Requirement. On a case-by-case basis, the SFPUC may include operation and maintenance expenses associated operation of the Participating Pumpers' Existing Facilities in the Wholesale Revenue Requirement provided that such expenses (1) are solely attributable to Project operations for a Regional benefit and (2) are not caused by the Participating Pumper's failure to operate and maintain its existing wells in a reasonable and prudent manner consistent with water utility industry standards. The SFPUC shall provide the Wholesale Customers with copies of Project Operation and Maintenance Expenses documentation provided by the Participating Pumpers under Section 9.2 of the Project Operating Agreement.

E. The Project Mitigation, Monitoring and Reporting Program ("MMRP") adopted by the SFPUC included mitigation measure H-6 to prevent well interference impacts to the Irrigation Well Owners. In mitigation measure H-6, the SFPUC agreed to provide standby supplies of Irrigation Well Owner Replacement Water from the Regional Water System, to alter Project operations, and implement other actions (e.g., well replacement) to avoid well interference impacts that require the consent of the Irrigation Well Owners. The SFPUC's Project mitigation and other obligations to the Irrigation Well Owners are memorialized in substantially identical "Groundwater Well Monitoring and Mitigation Agreements" with one or more of the Irrigation Well Owners. For purposes of this Agreement, water supplies, and the capital costs and operations and maintenance expenses associated with providing Irrigation Well Owner Replacement Water and implementing other mitigation actions identified in the Project MMRP, shall be allocated as follows:

1. Irrigation Well Owner Replacement Water shall be limited to a cumulative maximum of 1.76 mgd and shall be delivered only in volumes necessary for mitigating well interference impacts as provided in the Project MMRP. The supply of Irrigation Well Owner Replacement Water by the SFPUC shall not be considered a new water supply commitment to Retail Customers or Wholesale Customers under Section 3.13 of this Agreement. The annual volume of Irrigation Well Owner Replacement Water supplied shall be metered and allocated as water from the Regional Water System during shortages between Retail Customers and Wholesale Customers in proportion to and consistent with the provisions of the Shortage Allocation Plan. All revenue received from Irrigation Well Owners for metered deliveries of Irrigation Well Owner Replacement Water shall be considered revenue related to the sale of

water and allocated between Retail Customers and Wholesale Customers on the basis of Proportional Water Use.

2. All Project capital costs incurred by the SFPUC in complying with the mitigation measures in the Project MMRP shall be considered Regional capital costs under Section 5.04 of this Agreement.

3. Operations and maintenance expenses incurred by the SFPUC in maintaining Project mitigation assets described in the Project MMRP shall be considered Regional transmission and distribution expenses under Section 5.05.D of this Agreement. Well pumping expenses that are required to be paid by the SFPUC in the agreements with the Irrigation Well Owners shall be considered Regional pumping expenses under Section 5.05.B of this Agreement.

4. Any wheeling charges imposed by California Water Service Company for delivery of Irrigation Well Owner Replacement Water shall be considered Regional transmission and distribution expenses under Section 5.05.D of this Agreement.

F. F. The SFPUC will audit (1) operation and maintenance expenses submitted by the Participating Pumpers and (2) well pumping expenses submitted by the Irrigation Well Owners for reimbursement to confirm that such costs were incurred respectively as a result of (1) operating Project Facilities and Shared Facilities for a Regional benefit and (2) complying with mitigation obligations in the Project MMRP. Costs associated with the use of Project Facilities or Shared Facilities for Direct Retail or Direct Wholesale purposes or that do not otherwise provide Regional benefits shall not be included in the Wholesale Revenue Requirement. The SFPUC is responsible for resolving disputes with the Participating Pumpers and Irrigation Well Owners concerning expense allocations. Project expense documentation including documentation of negotiation and settlement of disputed costs will be available for review during the Compliance Audit described in Section 7.04 of this Agreement. The Wholesale Customers may dispute the SFPUC's resolution of expense allocations through the arbitration provisions in Section 8.01 of this Agreement.

G. The SFPUC may direct the Participating Pumpers to recover water from the SFPUC Storage Account for any type of shortage referenced in Section 3.11 of this Agreement. Water recovered from the SFPUC Storage Account using Project Facilities and Shared Facilities may be used for (1) the benefit of all Regional Water System customers (2) Retail Customers or (3) one or more of the Participating Pumpers. The Wholesale Revenue Requirement shall

only include operation and maintenance expenses incurred due to the operation of Project Facilities and Shared Facilities for Regional benefits□including expenses incurred due to compliance with mitigation measures in the Project MMRP.

H. All water recovered during shortages caused by drought from the SFPUC Storage Account for Regional benefit□by the Participating Pumpers and by the SFPUC for delivery to Retail and Wholesale Customers□shall be used to free up a comparable volume of surface water from the Regional Water System for allocation in accordance with the Tier 1 Shortage Plan.

I. If the Project is terminated for any reason□including breach of the Project Operating Agreement by one or more of the Participating Pumpers or the SFPUC□a force majeure event as specifically defined by the Project Operating Agreement□or due to regulatory action or legal action□then:

1. Any water remaining in the SFPUC Storage Account shall be used for the benefit of all customers of the Regional Water System□

2. Outstanding eligible operation and maintenance expenses□including costs incurred during recovery of remaining stored water□will be allocated as provided in this Section 3.17 of this Agreement□and

3. If Project Facilities are no longer capable of being used for a Regional benefit□the Wholesale Customers will be credited with their share of proceeds from disposition of Project Facilities or reimbursed their share of such capital costs for any Project Facilities which are retained by the SFPUC for Direct Retail benefit and not used for the benefit of the Wholesale Customers□on the basis of (a) original cost less depreciation and outstanding related Indebtedness or (b) original cost less accumulated depreciation for revenue funded Project Facilities.

□. In the event that a Participating Pumper establishes the occurrence of a force majeure event as defined in the Project Operating Agreement□the SFPUC may enter into negotiations with the Participating Pumper to take over the operation of the portion of any Shared Facilities used for Project purposes for continued Regional use. If the SFPUC cannot reach agreement regarding the continued use of Shared Facilities for ongoing Regional benefit□ the Participating Pumper shall reimburse the SFPUC and the Wholesale Customers for their respective shares of previously incurred Project capital costs used to upgrade the Shared

Facilities on the basis of (a) original cost less depreciation and outstanding related Indebtedness or (b) original cost less accumulated depreciation for revenue funded Shared Facilities. In the event that the SFPUC seeks to take over the operation of Shared Facilities for Direct Retail use or one or more Wholesale Customers seeks to negotiate with a Participating Pumper to take over the operation of Shared Facilities for individual use or Direct Wholesale use the party or parties benefiting from such transfer of Shared Facilities shall reimburse the other parties to this Agreement with their respective shares of previously incurred Project capital costs on the basis described in the previous sentence or as the parties may otherwise agree.

3.18. Water Supply Agreement Amendment Required.

San Francisco may not change the existing condition of the Hetch Hetchy Reservoir by:

1. Abandoning or decommissioning O'Shaughnessy Dam or
2. Draining Hetch Hetchy Reservoir except for purposes of (i) repair rehabilitation maintenance improvement or reconstruction of O'Shaughnessy Dam or appurtenances (ii) supplying water to the Bay Area during drought or (iii) meeting water release requirements under the Raker Act or federal or state law

unless the parties enter into an amendment to the Water Supply Agreement in full force and effect adopted in accordance with Section 2.03.

The amendment shall state or restate as the case may be:

A. The level of service goals for seismic reliability and delivery reliability adopted by the Commission in conjunction with such proposed changes to the Regional Water System provided such goals are at least as protective of the Wholesale Customers as the Level of Service Goals and Objectives

B. The level of water quality to be delivered which is currently provided for in Section 3.08 and

C. The specific cost allocation procedures written as an amendment to Article 5 which apply to (1) the abandonment or decommissioning of O'Shaughnessy Dam or (2) the draining of Hetch Hetchy Reservoir and (3) the development operation and maintenance of New Regional Assets

that may be required to replace water supplied by Hetch Hetchy Reservoir and delivered to the Bay Area.

In the event that the parties are not able to agree upon and approve an amendment to the Water Supply Agreement as set forth above, San Francisco may not abandon or decommission O'Shaughnessy Dam or drain Hetch Hetchy Reservoir.

Article 4. Implementation of Interim Supply Limitation.

4.01. Interim Supply Limitation Imposed by SFPUC

In adopting the WSIP in Res. No. 08-0200, the Commission included full implementation of all proposed WSIP capital improvement projects to achieve Level of Service Goals and Objectives relating to public health, seismic safety, and delivery reliability, but decided to adopt a water supply element that includes the Interim Supply Limitation. This article describes how the parties will implement the Interim Supply Limitation imposed by the SFPUC between the Effective Date and December 31, 2018, and how the SFPUC will conduct water supply planning after December 31, 2018.

4.02. Retail and Wholesale Customer Allocations Under Interim Supply Limitation

The Interim Supply Limitation is allocated as follows between Retail and Wholesale Customers:

Retail Customers' allocation: 81 MGD

Wholesale Customers' allocation: 184 MGD

The Wholesale Customers' collective allocation of 184 MGD under the Interim Supply Limitation includes the demand of the cities of San Jose and Santa Clara, whose demand is not included in the Supply Assurance, as provided in Section 3.02.B. By December 31st, 2010, the Commission will establish each Wholesale Customer's Interim Supply Allocation at a public meeting.

4.03. Transfers of Interim Supply Allocations

A. Any Wholesale Customer, including Hayward, may transfer a portion of its Interim Supply Allocation to one or more other Wholesale Customers, as provided in this section. All Wholesale Customers are also eligible transferees, including California Water Service Company up to its Individual Supply Guarantee.

B. Transfers of a portion of an Interim Supply Allocation must be prospective. The duration of a transfer cannot be less than the balance of the fiscal year. The minimum quantity that may be transferred is 1/10th of a MGD.

C. Transfers of portions of Interim Supply Allocations are subject to approval by the SFPUC. SFPUC review is limited to determining (1) whether a proposed transfer complies with

the Act and (2) whether the affected facilities in the Regional Water System have sufficient capacity to accommodate delivery of the increased amount of water to the proposed transferee.

D. The participants in a proposed transfer shall provide notice to the SFPUC specifying the amount of the Interim Supply Allocation proposed to be transferred and the proposed effective date of the transfer which shall not be less than 60 days after the notice is submitted to the SFPUC. The SFPUC may require additional information reasonably necessary to evaluate the operational impacts of the transfer. The SFPUC will not unreasonably withhold or delay its approval if the SFPUC does not act on the notice within 60 days the transfer will be deemed to have been approved.

E. Within 30 days after the transfer has become effective both the transferor and the transferee will provide written notice to the SFPUC and BAWSCA.

F. Transfers of Interim Supply Allocations shall continue in effect until the earlier of (1) delivery of written notice to the SFPUC by the transfer participants that the transfer has been rescinded or (2) December 31 2018.

4.04. Environmental Enhancement Surcharge

A. **Establishment of Environmental Enhancement Surcharge**. Beginning with wholesale water rates for fiscal year 2011-2012 and continuing for the duration of the Interim Supply Limitation the Commission will establish the Environmental Enhancement Surcharge concurrently with the budget-coordinated rate process set forth in Article 6 of this Agreement. The monetary amount of the Environmental Enhancement Surcharge per volume of water such as dollars per acre-foot will be equivalent for Retail Customer use in excess of 81 MGD and Wholesale Customer use in excess of 184 MGD. The Environmental Enhancement Surcharge will be simple to calculate so that Wholesale Customers can estimate potential surcharges for budgeting purposes and establish retail rates within their service areas.

B. **Application of Environmental Enhancement Surcharge**. Beginning in fiscal year 2011-12 the Environmental Enhancement Surcharge will be levied only if and when combined Retail Customer and Wholesale Customer purchases exceed the Interim Supply Limitation of 265 MGD and if the fund described in subsection D below has been established by the San Francisco Board of Supervisors. In that event the Environmental Enhancement Surcharge will apply to Retail Customers for use in excess of 81 MGD and to individual

Wholesale Customers for use in excess of their Interim Supply Allocations established by the Commission pursuant to Section 4.02.

1. Environmental Enhancement Surcharges related to the Retail Customers use in excess of their 81 MGD Retail Customer Allocation will be paid by the SFPUC and no portion of such surcharges may be allocated to Wholesale Customers. The method of recovering the Environmental Enhancement Surcharges imposed upon Retail Customers shall be within the sole discretion of the SFPUC.

2. Environmental Enhancement Surcharges related to the individual Wholesale Customers use in excess of their respective Interim Supply Allocations will be paid to the SFPUC by individual Wholesale Customers.

C. **Collection of Environmental Enhancement Surcharge**. Notwithstanding the budget-coordinated rate setting process contemplated in Article 6 of this Agreement the Environmental Enhancement Surcharge for any given year will be determined retrospectively based on actual annual usage during the fiscal year in excess of the Interim Supply Allocation and paid in e ual monthly installments over the remainder of the immediately following fiscal year.

D. **Establishment of Fund for Environmental Enhancement Surcharge Proceeds**. Environmental Enhancement Surcharges paid by the SFPUC and by Wholesale Customers will be placed into a restricted reserve fund. The SFPUC will re uest the San Francisco Board of Supervisors to establish this fund by ordinance and if adopted the fund will be subject to the following restrictions:

1. Interest earnings will stay in the reserve fund.
2. The reserve fund shall (a) be subject to automatic appropriation (b) re uire unexpended and unencumbered fund balances to be carried forward from year to year and (c) not be transferred to the San Francisco General Fund.
3. The reserve fund may be used only for specific environmental restoration and enhancement measures for the Sierra and local watersheds such as those included in the Watershed Environmental Improvement Program.
4. Environmental Enhancement Surcharge proceeds shall be expended in an expeditious manner. Any Environmental Enhancement Surcharge

proceeds that remain in the reserve fund as of December 31□2018 shall be used to complete projects previously approved under subsection E. Upon completion of the identified projects□the balance of any unexpended sums in the reserve fund shall be distributed to BAWSCA and the SFPUC in proportion to the total amount of surcharges assessed to the Wholesale and Retail Customers□respectively.

E. **Use of Environmental Enhancement Surcharge Proceeds**. Specific uses of Environmental Enhancement Surcharges will be decided by the SFPUC and BAWSCA General Managers following input from environmental stakeholders and other interested members of the public. If parties are unable to agree□then they will jointly select a third person to participate in making the decision.

4.05. San Jose/ Santa Clara Interim Supply Allocation and Process for Reduction/ Termination.

San Francisco will supply a combined annual average of 9 MGD to the cities of San □ose and Santa Clara through 2028. Water supplied by San Francisco may only be used in the defined service areas of San □ose and Santa Clara shown on Attachment Q-1 and Q-2□ respectively. San Francisco may reduce the □uantity of water specified in this section when it establishes the Interim Supply Allocations for Wholesale Customers in Section 4.02. The establishment of Interim Supply Allocations for San □ose and Santa Clara shall not be considered a reduction of supply within the meaning of this section□provided that the Interim Supply Allocations assigned to San □ose and Santa Clara do not effect a reduction greater than the aggregate average reduction in Individual Supply Guarantees for Wholesale Customers that have such guarantees. The application of Interim Supply Allocations to San □ose and Santa Clara□and water supply planning after December 31□2018□are subject to the following provisions:

A. In December 2010 and in each December thereafter through 2027□the SFPUC shall prepare and the Commission shall consider□at a regularly scheduled public meeting□a Water Supply Development Report detailing progress made toward (1) meeting the Interim Supply Limitation by □une 30□2018 and (2) developing additional water supplies that will allow the Commission to designate San □ose and Santa Clara as permanent Wholesale Customers of the Regional Water System with a combined Individual Supply Guarantee of up to 9 MGD by the end of the Term on □une 30□2034.

B. The annual Water Supply Development Report shall be based on water purchase projections and work plans prepared by the SFPUC for the Retail Customers and by BAWSCA for the Wholesale Customers□respectively□and submitted to the Commission in □une of each year beginning in 2010.

C. If the Commission finds that the projections in the Water Supply Development Report show that (1) the Interim Supply Limitation will not be met by □une 30□2018□as a result of Wholesale Customers□projected use exceeding 184 MGD□or (2) the purchases of the Wholesale Customers□including San □ose and Santa Clara□are projected to exceed 184 MGD before □une 30□2028□the Commission may issue a conditional ten year notice of interruption or reduction in supply of water to San □ose and Santa Clara.

D. Upon issuance of the conditional notice of interruption or reduction□the SFPUC will prepare a new analysis of water supply that will be utilized by the San Francisco Planning Department in its preparation of any necessary documentation under CEQA pursuant to Section 4.07 on the impacts of interrupting or reducing service to San □ose and Santa Clara.

E. Such notice of interruption or reduction will be rescinded if the Commission finds□ based upon a subse□uent annual Water Supply Development Report□that (1) sufficient progress has been made toward meeting the Interim Supply Limitation□or (2) projections show that the projected purchases of the Wholesale Customers□including San □ose and Santa Clara□ will not exceed 184 MGD by □une 30□2028.

F. In no case shall any interruption or reduction of service to San □ose or Santa Clara pursuant to this section become effective less than two years from the completion of the CEQA process (not including resolution of any appeals or litigation) or ten years from the notice□ whichever is longer. If the ten year notice is issued after 2018□such interruption or reduction would be effective after 2028.

G. If deliveries to San □ose and Santa Clara are interrupted□existing turnout facilities to San □ose and Santa Clara will remain in place for possible use during emergencies.

H. San Francisco and the cities of San □ose and Santa Clara will cooperate with BAWSCA and the Santa Clara Valley Water District in the identification and implementation of additional water sources and conservation measures for the cities□service areas that are

relevant to the water supply and the possible offer of permanent status for the two cities by the SFPUC.

4.06. San Francisco Decisions in 2028 Regarding Future Water Supply

A. By December 31, 2028, San Francisco will have completed any necessary CEQA review pursuant to Section 4.07 that is relevant to making San Jose and Santa Clara permanent customers of the Regional Water System and will decide whether or not to make San Jose and Santa Clara permanent customers of the Regional Water System with a combined Individual Supply Guarantee of 9 MGD allocated equally between the two cities, as well as how much water in excess of 9 MGD it will supply to San Jose and Santa Clara. San Francisco will make San Jose and Santa Clara permanent customers only if, and to the extent that, San Francisco determines that Regional Water System long term water supplies are available. In the event that San Francisco decides to afford permanent status to San Jose and Santa Clara, this Agreement will be amended pursuant to Section 2.03.

B. By December 31, 2028, San Francisco will have completed any necessary CEQA review pursuant to Section 4.07 and will decide how much water, if any, in excess of the Supply Assurance it will supply to Wholesale Customers from the Regional Water System to meet their projected future water demands until the year 2040, and whether to offer a corresponding increase in the Supply Assurance as a result of these determinations.

4.07. Retained Discretion of SFPUC and Wholesale Customers

A. This Agreement contemplates discretionary actions that the SFPUC and the Wholesale Customers may choose to take in the future that could result in physical changes to the environment ("Discretionary Actions"). The Discretionary Actions include decisions to:

1. Develop additional or alternate water resources by the SFPUC or one or more Wholesale Customers;
2. Implement the physical facilities comprising the WSIP by December 30, 2021;
3. Approve wheeling proposals by Wholesale Customers;
4. Approve new wholesale customers and water exchange or cost sharing agreements with other water suppliers;
5. Provide additional water to San Jose and/or Santa Clara;
6. Offer permanent status to San Jose and/or Santa Clara;

7. Reduce or terminate supply to San □ose and/or Santa Clara□
8. Provide additional water to Wholesale Customers in excess of the Supply Assurance to meet their projected future water demands□
9. Offer a corresponding volumetric increase in the Supply Assurance□and
10. Implement the Hetch Hetchy Water and Power projects listed in Attachment R-2.

The Discretionary Actions may re□uire the SFPUC or Wholesale Customers to prepare environmental documents in accordance with CEQA prior to the SFPUC or the Wholesale Customers determining whether to proceed with any of the Discretionary Actions. Accordingly□ and notwithstanding any provision of this Agreement to the contrary□nothing in this Agreement commits the SFPUC or the Wholesale Customers to approve or carry out any Discretionary Actions that are subject to CEQA. Furthermore□the SFPUC□s or Wholesale Customers□ decisions to approve any of these Discretionary Actions are subject to the re□uirement that San Francisco and each Wholesale Customer□as either a □Lead Agency□(as defined in Section 21067 of CEQA and Section 15367 of the CEQA Guidelines) or a □Responsible Agency□(as defined in Section 21069 of CEQA and Section 15381 of the CEQA Guidelines) shall have completed any CEQA-re□uired environmental review prior to approving a proposed Discretionary Action.

B. In considering any proposed Discretionary Actions□the SFPUC and Wholesale Customers retain absolute discretion to: (1) make such modifications to any of the proposed Discretionary Actions as may be necessary to mitigate significant environmental impacts□(2) select feasible alternatives to the proposed Discretionary Actions that avoid significant adverse impacts□(3) re□uire the implementation of specific measures to mitigate the significant adverse environmental impacts as part of the decision to approve the Discretionary Actions□(4) balance the benefits of the proposed Discretionary Actions against any significant environmental impacts before taking final actions to approve the proposed Discretionary Actions if such significant impacts cannot otherwise be avoided□or (5) determine not to proceed with the proposed Discretionary Actions.

Article 5. Wholesale Revenue Requirement

5.01. Scope of Agreement

This Article shall be applicable only to the water rates charged by San Francisco to the Wholesale Customers. Nothing contained in this Agreement shall limit, constrain, or in any way affect the rates which San Francisco may charge for water sold to Retail Customers or the methodology by which such rates are determined.

5.02. General Principles

This Article sets forth the method by which the Wholesale Customers' collective share of expenses incurred by the SFPUC in delivering water to them will be determined. This collective share is defined as the "Wholesale Revenue Requirement."

A. The SFPUC currently operates several enterprises, including the Water Enterprise, the Wastewater Enterprise, and the Hetch Hetchy Enterprise.

B. The Wastewater Enterprise is responsible for treating sewage within San Francisco and provides no benefit to the Wholesale Customers.

C. The Hetch Hetchy Enterprise is responsible for storing and transmitting water to the Water Enterprise, generating hydroelectric power and transmitting it to San Francisco, generating electric power within San Francisco, and distributing electricity and steam heat within San Francisco. Its water supply operations provide benefits to the Wholesale Customers.

D. The Water Enterprise delivers water to both Retail Customers, which are located both within and outside San Francisco, and to the Wholesale Customers, all of which are located outside San Francisco.

E. This Article implements two general principles as follows: (1) the Wholesale Customers should not pay for expenses of SFPUC operations from which they receive no benefit and (2) the Wholesale Customers should pay their share of expenses incurred by the SFPUC in delivering water to them on the basis of Proportional Annual Use unless otherwise explicitly provided in this Agreement.

F. To implement these general principles, the Wholesale Revenue Requirement will consist of, and be limited to, the Wholesale Customers' shares of the following categories of expense:

1. Capital cost recovery of Water Enterprise Existing Assets and Hetch Hetchy Enterprise Existing Assets classified as Water-Only and the Water-Related portion of joint assets (Section 5.03)

2. Contribution to the capital cost of Water Enterprise New Regional Assets (Section 5.04)

3. Water Enterprise operation and maintenance expenses including power purchased from the Hetch Hetchy Enterprise that is used in the operation of the Water Enterprise (Section 5.05)

4. Water Enterprise administrative and general expenses (Section 5.06)

5. Water Enterprise property taxes (Section 5.07)

6. The Water Enterprise's share of the Hetch Hetchy Enterprise's operation and maintenance administrative and general and property tax expenses (Section 5.08)

7. The Water Enterprise's share of the Hetch Hetchy Enterprise's capital cost of New Assets classified as Water-Only and the Water-Related portion of joint assets (Section 5.09)

In each of these cost categories Direct Retail Expenses will be allocated entirely to Retail Customers. Direct Wholesale Expenses will be allocated entirely to the Wholesale Customers. Regional Expenses will be allocated between Retail Customers and Wholesale Customers as provided in this Article.

G. For purposes of establishing the rates to be charged Wholesale Customers expenses will be based on the budget for and estimates of water purchases in the following fiscal year as provided in Article 6. For purposes of accounting the Wholesale Revenue Requirement will be determined on the basis of actual expenses incurred and actual water use as provided in Article 7.

H. In addition rates charged to Wholesale Customers may include the Wholesale Customers contribution to a Wholesale Revenue Coverage Reserve as provided in Section 6.06 which is not included in the Wholesale Revenue Requirement itself.

5.03. Capital Cost Recovery - Existing Regional Assets

A. SFPUC has previously advanced funds to acquire or construct Existing Assets used and useful in the delivery of water to both Wholesale Customers and Retail Customers. The parties estimate that the Wholesale Customers' share of the net book value of these assets as of the expiration of the 1984 Agreement on June 30, 2009, will be approximately $366,734,424 as shown on Attachment A-1.

B. In addition, SFPUC has also previously advanced funds received from Retail Customer revenues to acquire or construct assets included in Construction-Work-In-Progress (CWIP) as of June 30, 2009. The parties estimate that the Wholesale Customers' share of the book value of these revenue funded capital expenditures as of the expiration of the 1984 Agreement on June 30, 2009, will be approximately $15,594,990 as shown on Attachment A-2. The Wholesale Customers shall pay their share of the cost of Existing Assets and revenue-funded CWIP by amortizing the amounts shown on Attachment A-1 and Attachment A-2 over 25 years at an interest rate of 5.13 percent. The amounts to be included in the Wholesale Revenue Requirement pursuant to this section shall be the sum of the annual principal and interest amounts shown on Attachments A-3 (for Water Enterprise Regional Assets and the one Direct Wholesale Asset) and A-4 (for Hetch Hetchy Enterprise Water-Only Assets and the Water-Related portion [45 percent] of Joint assets) calculated on the basis of monthly amortization of principal as set forth on Attachments A-3 and A-4.

C. In addition, the Commission has previously appropriated funds advanced through rates charged to Retail Customers for construction of capital projects. Some of these projects are active and have unexpended balances of appropriated funds that are not included in CWIP as of June 30, 2009. These projects and the associated balances are shown on Attachment A-5. Expenditures of funds from these balances during FY 2009-10, FY 2010-11 and FY 2011-12 will be reviewed in FY 2012-13. The SFPUC will prepare a report showing the amount expended in each year on each project and the total expended during all years on all projects that are categorized as Regional or, in the case of Hetch Hetchy Enterprise, are categorized as either Water-Only or Joint. The wholesale share of that total will be determined using the allocation principles in this Agreement based on Proportional Water Use during those three years. The result, plus accrued interest at the rate specified in Section 6.05.B, will be calculated by the SFPUC and its calculation reviewed by the Compliance Auditor as part of the Compliance Audit for FY 2012-13. The audited total will be paid based on a schedule of level

annual principal and interest amounts over ten years at an interest rate of 4.00□ □calculated on a monthly amortization basis. All or any portion of the balance may be prepaid. The first year□s payment will be included in the Wholesale Revenue Re□uirement for F□ 2014-15.

D. The parties agree that the Wholesale Customers□share of the net book values of Existing Regional Assets as of □une 30□2008 as shown on Attachment □-1 are accurate. The compliance audit conducted on the calculation of the F□ 2008-09 Suburban Revenue Re□uirement re□uired by the 1984 Agreement will determine the actual amounts of depreciation on□and capital additions to□plant in service during that fiscal year. Those amounts will be compared to the corresponding estimates shown on Attachments □-1 and □-2. The differences will be added to or subtracted from the estimated asset values shown on Attachments □-1 and □-2 and the amortization schedules in Attachments □-3 and □-4 will be recalculated. The wholesale allocation factors shall be fixed at 70.1□ for the Water Enterprise Existing Assets and 64.2□ for Hetch Hetchy Enterprise Existing Assets for both the preliminary and final payment schedules. The SFPUC will prepare and provide to the Wholesale Customers revised Attachments □-1 through □-4 based on the Wholesale Customers□share of the net book value of the assets placed in service as of □une 30□2009 used to provide water service to the Wholesale Customers and the net book value of revenue-funded CWIP expended as of □une 30□2009. The revised Attachments □-1 through □-4 shall be approved by the General Manager of the SFPUC and the General Manager/CEO of BAWSCA and will be substituted for the original Attachments □-1 through □-4.

E. The original Attachments □-1 through □-4□based on estimates□shall be used for estimating the Wholesale Revenue Re□uirement for the fiscal year beginning □uly 1□2009. The revised Attachments□based on audited actuals□shall be used to determine the actual Wholesale Revenue Re□uirement for F□ 2009-10 and to determine the Wholesale Revenue Re□uirement(s) in all subse□uent years□except as may be provided elsewhere in this Agreement.

F. The Wholesale Customers□acting through BAWSCA□may prepay the remaining unpaid Existing Assets principal balance□in whole or in part□at any time without penalty or early payment premium. Any prepayments will be applied in the month immediately following the month in which the prepayment is made and the revised monthly amount(s) will be used to calculate the Wholesale Revenue Re□uirement. Any partial prepayments must be in an amount at least e□ual to □10 million. In the event of a partial prepayment□an updated schedule for the

remaining payments shall be prepared reflecting the unpaid balance after prepayment amortized through the end of F 2034 calculated as provided in this section. The updated schedule approved by the General Manager of the SFPUC and the General Manager/CEO of BAWSCA will be substituted for Attachment -3 and/or Attachment -4.

5.04. Capital Cost Contribution - New Regional Assets

A. **Debt-Funded Capital Additions**. The Wholesale Customers shall pay the wholesale share of Net Annual Debt Service for New Regional Assets. The Regional projects in the WSIP are identified in Attachment L-1.

1. The amount of Net Annual Debt Service for New Regional Assets will be determined for each series of Indebtedness issued. Until the proceeds of a particular series are Substantially Expended the amount attributable to specific projects will be based on the expected use of proceeds shown in the Certificate Regarding Use of Proceeds executed by the SFPUC General Manager on behalf of the Commission in connection with the sale of the Indebtedness provided such certificate identifies the use of proceeds at a level of detail e uivalent to that shown on Attachment L-2 which is a copy of the certificate prepared for the 2006 Revenue Bonds Series A. If a certificate does not identify the use of proceeds at that level of detail the SFPUC General Manager shall prepare and execute a separate certificate which does identify the use of proceeds at the level of detail shown on Attachment L-2 and deliver it to BAWSCA within 15 days from the closing of the sale of the Indebtedness.

2. After the proceeds of a series are Substantially Expended the SFPUC General Manager will prepare and execute a certificate showing the actual expenditure of proceeds at a level of detail e uivalent to the initial General Manager certificate. The resulting allocation of Net Debt Service to New Regional Assets for a series of bonds will be used in the fiscal year in which the proceeds have been Substantially Expended and thereafter. Differences between the amount of Net Debt Service paid by Wholesale Customers prior to that year and the amount of Net Debt Service that they should have paid during that time based on the actual expenditure of proceeds will be taken into account in calculation of the balancing account for the fiscal year in which the proceeds were Substantially Expended. The application of the remaining proceeds shall be proportionate to the allocation of the Net Debt Service to New Regional Assets.

3. The Wholesale Customers share of Net Annual Debt Service for the New Regional Assets that are categorized as Direct Wholesale will be 100 percent. (None of the

projects in the WSIP are categorized as Direct Wholesale.) The Wholesale Customers' share of Net Annual Debt Service for all other New Regional Assets will be determined each year and will be equal to the Wholesale Customers' Proportional Annual Use.

4. If Indebtedness is issued by the SFPUC to refund the 2006 Revenue Bonds, Series A or to refund any other long-term Indebtedness issued after July 1, 2009, the Net Annual Debt Service attributable to proceeds used for refunding will be allocated on the same basis as the Indebtedness being refunded.

5. The SFPUC will prepare an annual report showing for each issue of Indebtedness and through the most recently completed fiscal year: (1) net financing proceeds available to pay project costs, (2) actual earnings on proceeds, (3) actual expenditures by project. The report shall be substantially in the form of Attachment L-3 and shall be delivered to BAWSCA on or before November 30 of each year, commencing November 2009.

6. In addition to Net Debt Service, Wholesale Customers will pay a proportionate share of annual administrative costs associated with Indebtedness, such as bond trustee fees, credit rating agency fees, letter of credit issuer fees, San Francisco Revenue Bond Oversight Committee fees, etc., but only to the extent such fees are neither paid from proceeds of Indebtedness nor included in SFPUC operation and maintenance or administrative and general expenses.

B. **Revenue-Funded Capital Additions**. The Wholesale Customers shall pay the wholesale share of the appropriation contained in the SFPUC annual budget for each year to be used to acquire or construct New Regional Assets. If such appropriations are reimbursed from proceeds of Indebtedness, the Wholesale Customers will be credited for prior payments made under this Section 5.04.B.

The Wholesale Customers' share of the annual appropriation for revenue-funded New Regional Assets that are categorized as Direct Wholesale will be 100 percent. (None of the Repair and Replacement projects in the SFPUC's most recent capital improvement program updated on February 10, 2009, is categorized as Direct Wholesale.) The Wholesale Customers' share of the annual appropriation for all other revenue-funded New Regional Assets will be determined each year and will be equal to the Wholesale Customers' Proportional Annual Use in each fiscal year. The amount appropriated in each fiscal year for the wholesale share of New Regional Assets shall be contributed to the Wholesale Capital Fund described in Section 6.08 and reported on and administered as shown in that section and Attachments M-1 through M-3.

5.05. Water Enterprise Operation and Maintenance Expenses

There are five categories of Water Enterprise Operation and Maintenance Expenses described below:

A. Source of Supply

1. Description: This category consists of the costs of labor supervision and engineering materials and supplies and other expenses incurred in the operation and maintenance of collecting and impounding reservoirs dams wells and other water supply facilities located outside San Francisco watershed protection water supply planning and the purchase of water.

2. Allocation: Direct Retail expenses including water supply planning for Retail operations (such as City Retail water conservation programs) will be assigned to the Retail Customers. Regional expenses will be allocated between Retail Customers and Wholesale Customers on the basis of Proportional Annual Use. Direct Wholesale expenses will be assigned to the Wholesale Customers. (As of the Effective Date there are no Direct Wholesale expenses in the Source of Supply category.)

B. Pumping

1. Description: This category consists of the costs of labor supervision and engineering materials and supplies and other expenses incurred in the operation and maintenance of water pumping plants ancillary structures and e uipment and surrounding grounds and fuel and power purchased for pumping water.

2. Allocation: Direct Retail expenses will be assigned to the Retail Customers. Regional expenses will be allocated between Retail Customers and Wholesale Customers on the basis of Proportional Annual Use. Direct Wholesale expenses will be assigned to the Wholesale Customers. (As of the Effective Date there are no Direct Wholesale expenses in the Pumping category.)

C. Treatment

1. Description: This category consists of the costs of labor supervision and engineering materials and supplies and other expenses incurred in the operation and maintenance of water treatment plants and drinking water uality sampling and testing. The cost of water uality testing will not include expenses incurred on behalf of the Wastewater

Enterprise. Any remaining costs after adjusting for the Wastewater Enterprise will be reduced by the amount of revenue received for laboratory analyses of any type performed for agencies businesses and/or individuals other than the Water and Hetch Hetchy Enterprises.

2. Allocation: Direct Retail expenses will be assigned to the Retail Customers. Regional expenses will be allocated between Retail Customers and Wholesale Customers on the basis of Proportional Annual Use. Direct Wholesale expenses will be assigned to the Wholesale Customers. (As of the Effective Date there are no Direct Wholesale expenses in the Treatment category.)

D. **Transmission and Distribution**

1. Description: This category consists of the cost of labor supervision and engineering materials and supplies and other expenses incurred in the operation and maintenance of transmission and distribution pipelines appurtenances meters (other than those expenses payable by individual Wholesale Customers pursuant to Section 5.10.C.3) distribution reservoirs storing treated water craft shops and auto shops servicing vehicles used for operation and maintenance of the Regional Water System rather than for Direct Retail facilities and miscellaneous facilities related to the transmission and distribution of water.

2. Allocation: Direct Retail Transmission and Distribution expenses will be assigned to the Retail Customers. Regional Transmission and Distribution expenses will be allocated between Retail and Wholesale Customers on the basis of Proportional Annual Use. Expenses incurred for the operation and maintenance of three terminal reservoirs i.e. Sunset Reservoir (North and South Basins) University Mound Reservoir (North and South Basins) and Merced Manor Reservoir as well as transmission pipelines delivering water to them are classified as Regional expenses notwithstanding the location of the reservoirs within San Francisco. Direct Wholesale expenses will be assigned to the Wholesale Customers. (As of the Effective Date the only Direct Wholesale expenses in the Transmission and Distribution category are associated with the Palo Alto pipeline.)

E. **Customer Services**

1. Description: This category consists of labor materials and supplies and other expenses incurred for meter reading customer record keeping and billing and collection for the Water Enterprise.

2. Allocation: Customer Services expenses will be allocated among the Water Enterprise, the Wastewater Enterprise, and Hetch Hetchy Enterprise in proportion to the time spent by employees in Customer Services for each operating department/enterprise. The Water Enterprise's share of Customer Services expense will be allocated 98 percent to the Retail Customers and two percent to the Wholesale Customers, as illustrated on Attachment N-2, Schedule 1.

5.06. Water Enterprise Administrative and General Expenses

Administrative and General expenses consist of the Water Enterprise's share of the cost of general government distributed through the full-cost Countywide Cost Allocation Plan, the services of SFPUC support bureaus, Water Enterprise administrative and general expenses that cannot be directly assigned to a specific operating and maintenance category, and the cost of the Compliance Audit. These four subcategories, and the method by which costs in each are to be calculated and allocated, are as follows:

A. **Countywide Cost Allocation Plan**

1. Description: This subcategory consists of the Water Enterprise's share of the costs of San Francisco general government and other City central service departments which are not directly billed to the Water Enterprise or other operating departments. All San Francisco operating departments are assigned a prorated share of these costs through the full-cost Countywide Cost Allocation Plan (COWCAP) prepared annually by the San Francisco Controller.

2. Allocation: The Water Enterprise's assigned share of central government costs as shown in the annual full-cost COWCAP prepared by the San Francisco Controller, will be allocated between Retail Customers and Wholesale Customers on the basis of the composite percentage of the allocated expenses in the five categories of operation and maintenance expense described in Section 5.05. The composite wholesale percentage shown on Attachment N-2, Schedule 1 is 42.07 percent, derived by dividing the wholesale share of Operation and Maintenance expenses ($46,573,883) by total Operation and Maintenance expenses ($110,700,133).

B. **Services of SFPUC Bureaus**

1. Description: This subcategory consists of the support services provided to the Water Enterprise by the SFPUC Bureaus, which presently consist of the General

Manager's Office, Business Services, External Affairs, and Infrastructure Bureau. Business Services presently includes Financial Services, Information Technology Services, Human Resource Services, Fleet Management, and Customer Services.

2. Allocation: There are three steps involved in determining the Wholesale Customers' share of SFPUC Bureau costs.

a. Step One: Bureau expenses which have either been recovered separately or which provide no benefit to Wholesale Customers will be excluded. Examples of Bureau expenses recovered separately include (1) Customer Services expenses, which are recovered as provided in Section 5.05.E, and (2) Infrastructure expenses, which are assigned to individual projects and capitalized. An example of a Bureau expense that provides no benefit to Wholesale Customers is Information Technology Services expenses for support of the San Francisco Municipal Railway. In addition, the SFPUC will continue its practice of assigning City Attorney Office expenses charged to the General Manager's Office for projects or lawsuits that relate to only one enterprise directly to that enterprise. For example, costs related to a lawsuit involving the Wastewater Enterprise will not be assigned to the Water Enterprise.

b. Step Two: Bureau expenses adjusted as provided in Step One will be allocated among the Water Enterprise, the Wastewater Enterprise and the Hetch Hetchy Enterprise on the basis of the actual salaries of employees in each enterprise or department, as illustrated on Attachment N-2, Schedule 7.

c. Step Three: The amount allocated to the Water Enterprise through Step Two will be allocated between Retail Customers and Wholesale Customers on the basis of Proportional Annual Use.

C. **Water Enterprise Administrative and General**

1. Description: This category includes expenses incurred by the Water Enterprise that are not readily assignable to specific operating divisions. This category includes the following expenses:

a. Water Administration: This includes the costs of labor and other expenses of the administrative section of the Water Enterprise, supervision and engineering expenses, professional services, travel and training, equipment purchases, and materials and supplies not directly assignable to a specific operating unit.

b. Services Provided by Other City Departments: This includes charges of other San Francisco departments directly billed to the Water Enterprise

administration by other San Francisco departments for services ordered by the Water Enterprise such as legal services risk management telecommunications employee relations purchasing mail services and workers compensation claims paid.

c. Litigation and Claims Paid: This includes charges incurred for attorney services and claims and judgments paid in litigation arising from the operation of the Water Enterprise.

2. Allocation: In each of these three subcategories expenses that benefit only Retail Customers will be excluded. For example the cost of claims and judgments resulting from a break in or leak from pipelines or reservoirs in the Retail Service Area (with the exception of the three terminal reservoirs and pipelines delivering water to them) will be assigned to the Retail Customers. Remaining Water Enterprise Administrative and General expenses will be allocated between Retail Customers and Wholesale Customers on the basis of the composite percentage of allocated operation and maintenance expense categories described in Section 5.05.

D. Compliance Audit. The cost of the Compliance Audit described in Section 7.04 will be assigned 50 percent to the Retail Customers and 50 percent to the Wholesale Customers.

5.07. Water Enterprise Property Taxes

A. Description: This category consists of property taxes levied against property owned by San Francisco located in Alameda San Mateo and Santa Clara counties and used and managed by the SFPUC.

B. Allocation: All property taxes paid net of (1) reimbursements received from lessees and permit holders and (2) refunds from the taxing authority are Regional expenses. Net property taxes will be allocated between Retail Customers and Wholesale Customers on the basis of Proportional Annual Use.

5.08. Hetch Hetchy Enterprise Expenses

A. **Introduction**. There are two steps involved in determining the amount of the Wholesale Customers share of Hetch Hetchy Enterprise expenses.

1. The first step is to determine the Water Enterprise's share of Hetch Hetchy Enterprise operation expenses, maintenance expenses, administrative and general expenses, and property taxes.

2. The second step is to determine the Wholesale Customers' share of expenses allocable to the Water Enterprise.

B. **Determination of the Water-Related Portion of Hetch Hetchy Enterprise Expenses**

1. Operation and Maintenance Expenses: This category consists of the cost of labor, materials and supplies, and other expenses incurred in operating and maintaining Hetch Hetchy Enterprise physical facilities.

a. Description: Expenses associated exclusively with the production and distribution of hydroelectric power (e.g., generating plants and power transmission lines and towers, transformers and associated electric equipment, purchased power, wheeling charges, rental of power lines, etc.) are categorized as Power-Only and are allocated to power. Expenses associated exclusively with the operation and maintenance of facilities that serve only the water function (e.g., water transmission pipelines and aqueducts, activities related to compliance with federal and state drinking water quality laws, etc.) are categorized as Water-Only and are allocated entirely to water. Expenses associated with the operation and maintenance of facilities that serve both the water and power functions (e.g., dams, security programs, etc.) are categorized as Joint and are reallocated as 55 percent Power-Related and 45 percent Water-Related.

2. Administrative and General Expenses: There are three subcategories of Hetch Hetchy Enterprise Administrative and General expenses.

a. Full-Cost Countywide Cost Allocation Plan: This subcategory consists of the cost of San Francisco general government and other City central service departments which are not directly billed to operating departments but allocated through the full-cost Countywide Cost Allocation Plan described in Section 5.06.A. Costs in this subcategory are classified as Joint and are reallocated as 55 percent Power-Related and 45 percent Water-Related.

b. SFPUC Bureau Costs: This subcategory consists of the expenses described in Section 5.06.B. One hundred percent of Customer Services expenses allocated to the Hetch Hetchy Enterprise are categorized as Power-Only. The remaining amount of Bureau

expenses allocated to the Hetch Hetchy Enterprise pursuant to Section 5.06.B will be reallocated between power and water in proportion to the salaries of Hetch Hetchy Enterprise employees assigned to each function as shown on Attachment N-2 Schedule 7.1.

c. Other Administrative and General: This subcategory includes payments to the United States re uired by the Act labor supervision and engineering and other costs not readily assignable to a specific operation or maintenance function or program. Costs related to power administration (such as long range planning and policy analysis for energy development administration of power contracts and administration of work orders to City departments for energy services) are Power-Only costs. Costs related to water administration (such as legal and professional services for the protection of the City s water rights) are Water-Only costs and will be assigned to the Water Enterprise. Costs related to both power administration and water administration (such as general administration office rents office materials and supplies and services of other City departments benefitting to both power and water are oint administrative and general costs and are reallocated as 55 percent Power-Related and 45 percent Water-Related.

3. Property Taxes. This category consists of property taxes levied against property owned by San Francisco in Tuolumne Stanislaus San oa uin and Alameda counties and operated and managed by the Hetch Hetchy Enterprise.

Allocation: Property taxes are classified as oint costs. They will be reallocated as 55 percent Power-Related and 45 percent Water-Related.

C. **Calculation of Wholesale Customers' Share of Hetch Hetchy Enterprise Expenses**. The Water Enterprise s share of Hetch Hetchy Enterprise expenses consist of 100 percent of Water-Only expenses and the Water-Related portion (45) of oint expenses.

The Wholesale Customers share of the sum of the Water Enterprise s share of Hetch Hetchy Enterprise expenses determined under subsection B shall be calculated by multiplying that dollar amount by Adjusted Proportional Annual Use.

5.09. Hetch Hetchy Enterprise Capital Costs

A. **Introduction**. Wholesale Customers are also allocated a share of Hetch Hetchy Enterprise capital costs.

B. **Components of Capital Costs**. The components of Hetch Hetchy Enterprise capital costs are as follows:

1. Existing Assets Cost Recovery. The Wholesale Customers repayment of their share of Hetch Hetchy Existing Assets (Water-Only and the Water-Related portion [45 percent] of oint assets) is shown on Attachment -4 accompanying Section 5.03.

2. Debt Service on New Assets. The Water Enterprise will be assigned 100 percent of Net Annual Debt Service attributable to ac uisition and construction of New Hetch Hetchy Enterprise assets that are Water-Only and the Water-Related portion (45 percent) of Net Annual Debt Service on New Hetch Hetchy Enterprise oint assets. The provisions of Section 5.04.A apply to debt service on New Hetch Hetchy Enterprise assets.

3. Revenue-Funded Capital Additions. The Water Enterprise will be assigned 100 percent of capital expenditures from revenues for New Hetch Hetchy Enterprise assets that are Water-Only and the Water-Related portion (45 percent) of such expenditures for new Hetch Hetchy Enterprise oint assets. The provisions of Section 5.04.B apply to the payment of New revenue-funded Hetch Hetchy Enterprise assets.

C. **Calculation of Wholesale Customers' Share of Hetch Hetchy Enterprise Capital Costs**. The Wholesale Customers share of the Net Annual Debt Service and revenue funded capital expenditures determined under subsections B.2 and 3 shall be calculated by multiplying that dollar amount by Adjusted Proportional Annual Use.

5.10. Additional Agreements Related to Financial Issues

A. **Wholesale Customers Not Entitled to Certain Revenues**. The Wholesale Customers have no entitlement to any of the following sources of revenue to the SFPUC.

1. Revenues from leases or sales of SFPUC real property.

2. Revenues from the other utility services such as the sale of electric power natural gas and steam.

3. Revenues from the sale of water to customers and entities other than the Wholesale Customers.

4. Revenues earned from the investment of SFPUC funds other than funds contributed by the Wholesale Customers to the Wholesale Revenue Coverage Reserve described in Section 6.06 or the Wholesale Capital Fund described in Section 6.08. Wholesale Customers are also entitled to the benefit of earnings on proceeds of Indebtedness (through

expenditure on New Regional Assets and /or application to Debt Service) and to interest on the Balancing Account as provided in Section 6.05.B.

5. Revenues not related to the sale of water.

B. **Wholesale Customers Not Charged with Certain Expenses**. The Wholesale Customers will not be charged with any of the following expenses:

1. Capital costs for assets constructed or ac□uired prior to □uly 1□1984 other than Existing Asset costs that are repaid pursuant to Section 5.03.

2. Expenses incurred by the SFPUC for generation and distribution of electric power□including Hetch Hetchy Enterprise Power-Only expenses and the Power-Related share of Hetch Hetchy Enterprise □oint expenses. An exception to this is Regional energy costs incurred by the Water Enterprise□for which Wholesale Customers are charged on the basis of Proportional Annual Use.

3. Expenses incurred by SFPUC in providing water to Retail Customers.

4. Expenses associated with the SFPUC□s accruals or allocations for uncollectible Retail Water accounts.

5. Attorneys□fees and costs incurred by the Wholesale Customers that a court of competent jurisdiction orders San Francisco to pay as part of a final□binding judgment against San Francisco as provided in Section 8.03.B.2.

6. Any expenses associated with funding any reserves (other than the re□uired Wholesale Revenue Coverage Reserve described in Section 6.06) accrued and not anticipated to be paid within one year unless such reserve is established by mutual agreement of the SFPUC and BAWSCA.

7. Any expenses accrued in respect to pending or threatened litigation□ damage or personal injury claims or other loss contingencies unless projected to be paid within one year. Otherwise□such expenses will be charged to the Wholesale Customers when actually paid.

8. Any expense associated with installing□relocating□enlarging□removing or modifying meters and service connections at the re□uest of an individual Wholesale Customer.

9. The Retail Customers□portion of any Environmental Enhancement Surcharges imposed to enforce the Interim Supply Limitation set forth in Section 4.04.

C. **Revenues Not Credited to Payment of Wholesale Revenue Requirement**. The following payments by Wholesale Customers individually or collectively are not credited as Wholesale revenues for purposes of Section 6.05.B:

1. Payments by individual Wholesale Customers of the Environmental Enhancement Surcharge imposed to enforce the Interim Supply Limitation set forth in Section 4.04.
2. Payments of attorneys fees and costs incurred by San Francisco that a court of competent jurisdiction orders the Wholesale Customers to pay as part of a final binding judgment against the Wholesale Customers as provided in Section 8.03.B.3.
3. Payments by individual Wholesale Customers for installation relocation enlargement removal or modification of meters and service connections requested by and charged to a Wholesale Customer.
4. Payments applied to the amortization of the ending balance in the balancing account under the 1984 Agreement pursuant to Section 6.05.A.
5. Payments of the Water Management Charge which are delivered to BAWSCA pursuant to Section 3.06.
6. Payments directed to the Wholesale Revenue Coverage Reserve pursuant to Section 6.06.
7. Prepayments authorized by Sections 5.03.C and 5.03.F.

D. **Other**

1. The Wholesale Customers will receive a proportional benefit from funds received by the SFPUC from (a) governmental grants rebates reimbursements or other subventions (b) private-sector grants for Regional capital or operating purposes of the Water Enterprise and the Water-Only and Water-related portion of oint Hetch Hetchy Water Enterprise expenses or (c) a SFPUC use of taxable bonds.

2. The Wholesale Customers will receive a proportionate benefit from recovery of damages including li uidated damages by SFPUC from judgments against or settlements with contractors suppliers sureties etc. related to Regional Water System projects and the Water-Only and Water-Related portion of oint Hetch Hetchy Enterprise projects.

3. The SFPUC will continue to charge Wholesale Customers for assets acquired or constructed with proceeds of Indebtedness on which Wholesale Customers paid Debt Service during the Term of this Agreement on the cash basis (as opposed to the utility basis) after the expiration or earlier termination of this Agreement. The undertaking in this Section 5.10.D.3 will survive the expiration or earlier termination of this Agreement.

5.11. Classification of Existing System Assets.

Existing System Assets of the Regional Water System include the water storage transmission and treatment systems owned and operated by San Francisco in Tuolumne Stanislaus San Joaquin Alameda Santa Clara San Mateo and San Francisco Counties. These assets are managed by either the Water Enterprise or the Hetch Hetchy Enterprise and the assets have been classified for purposes of cost allocation.

A. **Water Enterprise Assets**. Water Enterprise assets are currently managed operated and maintained by the Water Enterprise and are generally located west of Alameda East Portal in addition to the treatment facilities located at Tesla and the Thomas Shaft Emergency Disinfection Facility. These assets are classified as Direct Retail Direct Wholesale or Regional.

B. **Hetch Hetchy Enterprise Assets**. Hetch Hetchy Enterprise assets are currently managed operated and maintained by the Hetch Hetchy Enterprise and are generally located east of the Alameda East Portal of the Coast Range Tunnel in Sunol Valley Alameda County. These assets are classified as Power-Only Water-Only or Joint in accordance with Sections 5.08 and 5.09. Through the Wholesale Revenue Requirement the Wholesale Customers pay Existing System Asset capital costs and operating expenses in accordance with Section 5.02.F and do not pay capital costs or operating expenses associated with assets classified as Direct Retail Power-Only and the Power-Related portion of Joint assets.

C. **Attachment R Documents Classifications**. To facilitate WSA administration Attachment R documents the classification of major Existing System Assets operated by the Hetch Hetchy Enterprise. Attachment R consists of three documents: R-1 Introduction R-2 Special Classification of Discrete Projects for 2018 Amendment Purposes and R-3 Major Hetch Hetchy Enterprise Existing System Assets. Attachment R may be modified as specified in Section 5.11.D and in the manner set forth in Section 2.03.C.

D. **Attachment R-3, Major Hetch Hetchy Enterprise Existing System Assets is Not Exhaustive**. Existing System Assets include but are not limited to land fixed infrastructure such as dams tunnels buildings water treatment plants and pipelines e uipment such as pumps and vehicles and related appurtenances. Major Hetch Hetchy Enterprise Existing System Assets and their classifications are listed in Attachment R-3. Attachment R-3 does not include all assets of the Regional Water System but represents the parties best efforts to document major Hetch Hetchy Enterprise Existing System Assets that would incur capital costs and operating expenses subject to cost allocation. The classification of assets listed on R-3 may not be changed during the Term any Extension Term and any renewal of the Agreement however Attachment R-3 may be modified by mutual agreement in accordance with Section 2.03.C to (1) add an asset that was inadvertently omitted (2) to add a new asset and (3) remove a destroyed or obsolete asset. In the event that the parties cannot agree on the classification of any omitted or new assets the dispute shall be subject to arbitration under Section 8.01.

E. **Attachment R-3, Major Hetch Hetchy Enterprise Existing System Assets Classifications are Fixed**. The classification of the major Hetch Hetchy Enterprise Existing System Assets is fixed and shall control the allocation of capital costs and operating expenses for the remainder of the Term any Extension Terms and any renewal of the Agreement. However changes may be proposed in accordance with subsection G below. Capital costs and operating expenses are meant to be inclusive of all costs related to assets including but not limited to any alterations additions improvements rehabilitation replacement of assets and e uipment that is appurtenant thereto. Since asset classifications are fixed in Attachment R-3 asset classifications may not be modified by mutual agreement in accordance with Section 2.03.C.

F. **Attachment R-2, Special Classification of Discrete Projects for 2018 Amendment Purposes**. Past ongoing and future capital projects involving five Hetch Hetchy Enterprise Existing System Assets defined in Attachment R-2 have classifications that differ from the underlying asset classifications. These project-related classification changes shown on Attachment R-2 are part of the 2018 amendments to the Agreement and are not precedential for any other asset-related capital cost or operating expense. With the exception of the defined projects related to the five assets listed on R-2 the capital projects for all assets follow the asset classifications. Capital projects listed on Attachment R-2 must be approved by the SFPUC following necessary CEQA review.

G. **Five Year Notice of Intent to Renegotiate Cost Allocation**. In the event San Francisco or the Wholesale Customers, which may be represented by BAWSCA, wish to propose and negotiate a change in Existing System Asset classifications, or a change in the Water-Related portion (45 percent) of Joint expenses, for the next Water Supply Agreement, such party must provide the other at least 5 years' written notice prior to the expiration of the Term or Extension Term, or the renewal of the Agreement. At a minimum, the noticing party must provide a comprehensive analysis of the financial and rate impacts of the proposed change at least two years prior to the expiration of the Term or Extension Term, or the renewal of the Agreement.

To meet this requirement, the parties may agree to jointly analyze, under a separate agreement, system capacity and usage and/or new assets, as well as other possible alternative cost allocation methodologies. Either party may also unilaterally initiate such studies by consultants of their choice and bear all their own costs.

Article 6. Integration of Wholesale Revenue Requirement with SFPUC Budget Development and Rate Adjustments

6.01. General

A. The purpose of the allocation bases set forth in Article 5 is to determine the Wholesale Revenue Requirement for each fiscal year. The Wholesale Revenue Requirement can only be estimated in advance based on projected costs and water deliveries. These projections are used to establish water rates applicable to the Wholesale Customers.

B. After the close of each fiscal year the procedures described in Article 7 will be used to determine the actual Wholesale Revenue Requirement for that year based on actual costs incurred allocated according to the provisions of Article 5 and using actual water delivery data. The amount properly allocated to the Wholesale Customers shall be compared to the amount billed to the Wholesale Customers for the fiscal year other than those identified in Section 5.10.C. The difference will be entered into a balancing account to be charged to or credited to the Wholesale Customers as appropriate.

C. The balancing account shall be managed as described in Section 6.05.

6.02. Budget Development

The SFPUC General Manager will send a copy of the proposed SFPUC budget to BAWSCA at the same time as it is sent to the Commission. In addition a copy of materials submitted to the Commission for consideration at meetings prior to the meeting at which the overall SFPUC budget is considered (including (a) operating budgets for the Water Enterprise and the Hetch Hetchy Enterprise (b) budgets for SFPUC Bureaus and (c) capital budgets for the Water Enterprise and the Hetch Hetchy Enterprise) will also be sent to BAWSCA concurrently with their submission to the Commission.

6.03. Rate Adjustments

A. **Budget Coordinated Rate Adjustments**. Adjustments to the rates applicable to the Wholesale Customers shall be coordinated with the budget development process described in this section except to the extent that Sections 6.03.B and 6.03.C authorize emergency rate increases and drought rate increases respectively.

If the SFPUC intends to increase wholesale water rates during the ensuing fiscal year it will comply with the following procedures:

1. Adjustments to the wholesale rates will be adopted by the Commission at a regularly scheduled meeting or at special meeting properly noticed called for the purpose of adjusting rates or for taking any other action under the jurisdiction of the Commission.

2. The SFPUC will send a written notice by mail or electronic means to each Wholesale Customer and to BAWSCA of the recommended adjustment at least thirty (30) days prior to the date of the meeting at which the Commission will consider the proposed adjustment. The notice will include the date time and place of the Commission meeting.

3. The SFPUC shall prepare and provide to each Wholesale Customer and to BAWSCA the following materials: (a) a table illustrating how the increase or decrease in the Wholesale Revenue Re uirement and wholesale rates were calculated substantially in the form of Attachment N-1 (b) a schedule showing the projected expenses included in the Wholesale Revenue Re uirement for the fiscal year for which the rates are being proposed and supporting materials substantially in the form of Attachment N-2 and (c) a schedule showing projected water sales Wholesale Revenue Re uirements and wholesale rates for the fiscal year for which rates are being set and the following four years substantially in the form of Attachment N-3. These materials will be included with the notification re uired by Section 6.03.A.2.

4. Rate adjustments will be effective no sooner than thirty (30) days after adoption of the wholesale rate by the Commission.

5. San Francisco will use its best efforts to provide the Wholesale Customers with the information described above. San Francisco s failure to comply with the re uirements set forth in this section shall not invalidate any action taken by the Commission (including but not limited to any rate increase or decrease adopted). In the event of such failure the Wholesale Customers may either invoke arbitration as set forth in Section 8.01 or seek injunctive relief to compel San Francisco to remedy the failure as soon as is reasonably practical and San Francisco shall be free to oppose the issuance of the re uested judicial or arbitral relief on any applicable legal or e uitable basis. The existence of this right to resort to arbitration shall not be deemed to preclude the right to seek injunctive relief.

6. Because delays in the budget process or other events may cause San Francisco to defer the effective date of Wholesale Customer rate adjustments until after the beginning of San Francisco s fiscal year nothing contained in this Agreement shall re uire San Francisco to make any changes in the water rates charged to Wholesale Customers effective at

the start of San Francisco's fiscal year or at any other specific date. Nothing in the preceding sentence shall excuse non-compliance with the provisions of Section 6.02 and this section.

B. **Emergency Rate Increases**. The Commission may adjust the Wholesale Customers' rates without complying with the requirements of Section 6.03.A in response to an Emergency that damages the Regional Water System and disrupts San Francisco's ability to maintain normal deliveries of water to Retail and Wholesale Customers. In such an Emergency, the Commission may adopt an emergency rate surcharge applicable to Wholesale Customers without following the procedures set forth in this section, provided that any such rate surcharge imposed by the Commission shall be applicable to both Retail and Wholesale Customers and incorporate the same percentage increase for all customers. Any emergency rate surcharge adopted by the Commission shall remain in effect only until the next-budget coordinated rate-setting cycle.

C. **Drought Rates**. If the Commission declares a water shortage emergency under Water Code Section 350, implements the Tier 1 Shortage Plan (Attachment H) described in Section 3.11.C, and imposes drought rates on Retail Customers, it may concurrently adjust wholesale rates independently of coordination with the annual budget process. Those adjustments may be designed to encourage water conservation and may constitute changes to the structure of the rates within the meaning of Section 6.04. The parties agree, however, that, in adopting changes in rates in response to a declaration of water shortage emergency, the Commission shall comply with Section 6.03.A.1 and 2 but need not comply with Section 6.04.B. Drought Rate payments and payments of excess use charges levied in accordance with the Tier 1 Shortage Plan described in Section 3.11.C constitute Wholesale Customer Revenue and count towards the Wholesale Revenue Requirement. The SFPUC may use these revenues to purchase additional water for the Wholesale Customers from the State Drought Water Bank or other willing seller.

6.04. Rate Structure

A. This Agreement is not intended and shall not be construed to limit the Commission's right (a) to adjust the structure of the rate schedule applicable to the Wholesale Customers (i.e., the relationship among the several charges set out therein) or (b) to add, delete, or change the various charges which make up the rate schedule, provided that neither such charges nor the structure of the rate schedule(s) applicable to the Wholesale Customers shall be arbitrary, unreasonable, or unjustly discriminatory as among said customers. The

SFPUC will give careful consideration to proposals for changes in the rate schedule made jointly by the Wholesale Customers but subject to the limitations set out above shall retain the sole and exclusive right to determine the structure of the rate schedule.

B. If the SFPUC intends to recommend that the Commission adopt one or more changes to the structure of wholesale rates (currently set forth in SFPUC Rate Schedule W-25) it shall prepare and distribute to the Wholesale Customers and BAWSCA a report describing the proposed change(s) the purpose(s) for which it/they are being considered and the estimated financial effect on individual Wholesale Customers or classes of customers. Wholesale Customers may submit comments on the report to the SFPUC for sixty (60) days after receiving the report. The SFPUC will consider these comments and if it determines to recommend that the Commission adopt the change(s) as described in the report or as modified in response to comments the SFPUC General Manager shall submit a report to the Commission recommending specific change(s) in the rate structure. Copies of the General Manager s report shall be sent to all Wholesale Customers and BAWSCA at least thirty (30) days prior to the Commission meeting at which the changes will be considered.

C. The SFPUC may recommend and the Commission may adopt changes in the structure of wholesale rates at any time. However the new rate schedule implementing these changes will become effective at the beginning of the following fiscal year.

6.05. Balancing Account

A. **Balancing Account Established Under 1984 Agreement**. The amount of credit in favor of San Francisco as of the expiration of the term of 1984 Agreement (une 30 2009) is not known with certainty as of preparation and execution of this Agreement. It will not be known with certainty until the Compliance Audit for F 2008-09 is completed and disputes if any that the Wholesale Customers or the SFPUC may have with the calculation of the Suburban Revenue Re uirement for that fiscal year and for previous fiscal years have been settled or decided by arbitration.

The parties anticipate that the amount of the credit in favor of San Francisco as of une 30 2009 may be within the range of 15 million to 20 million.

In order to reduce the credit balance due San Francisco under the 1984 Agreement in an orderly manner while avoiding unnecessary fluctuations in wholesale rates the parties agree to implement the following procedure.

1. In setting wholesale rates for F 2009-10 SFPUC will include a balancing account repayment of approximately 2 million.

2. In setting wholesale rates for F 2010-11 and following years SFPUC will include a balancing account repayment of not less than 2 million and not more than 5 million annually until the full amount of the balance due plus interest at the rate specified in Section 6.05.B is repaid.

3. The actual ending balance as of une 30 2009 will be determined by the parties agreement or arbitral ruling after the Compliance Audit report for F 2008-09 is delivered to BAWSCA. That amount once determined will establish the principal to be amortized through subse uent years repayments pursuant to this Section 6.05.A.

B. **Balancing Account Under This Agreement**

1. Operation. After the close of each fiscal year the SFPUC will compute the costs allocable to the Wholesale Customers for that fiscal year pursuant to Article 5 based on actual costs incurred by the SFPUC and actual amounts of water used by the Wholesale Customers and the Retail Customers. That amount will be compared to the amounts billed to the Wholesale Customers for that fiscal year (including any Excess Use Charges but excluding revenues described in Section 5.10.C). The difference will be posted to a balancing account as a credit to or charge against the Wholesale Customers. Interest shall also be posted to the balancing account calculated by multiplying the amount of the opening balance by the average net interest rate certified by the Controller as earned in the San Francisco Treasury for the previous fiscal year on the San Francisco County Pooled Investment Account. Interest when posted will carry the same mathematical sign (whether positive or negative) as carried by the opening balance. The amount posted to the balancing account in each year shall be added to or subtracted from the balance in the account from previous years. The calculation of the amount to be posted to the balancing account shall be included in the report prepared by the SFPUC pursuant to Section 7.02.

The opening balance for fiscal year 2009-10 shall be zero.

2. Integration of Balancing Account with Wholesale Rate Setting Process. If the amount in the balancing account is owed to the Wholesale Customers (a positive balance) the SFPUC shall take it into consideration in establishing wholesale rates. However the SFPUC need not apply the entire amount to reduce wholesale rates for the immediately ensuing

year. Instead the SFPUC may prorate a positive ending balance over a period of up to three successive years in order to avoid fluctuating decreases and increases in wholesale rates.

a. If a positive balance is maintained for three successive years and represents 10 percent or more of the Wholesale Revenue Requirement for the most recent fiscal year the SFPUC shall consult with BAWSCA as to the Wholesale Customers preferred application of the balance. The Wholesale Customers shall through BAWSCA direct that the positive balance be applied to one or more of the following purposes: (a) transfer to the Wholesale Revenue Coverage Reserve (b) amortization of any remaining negative balance from the ending balancing account under the 1984 Agreement (c) prepayment of the existing asset balance under Section 5.03 (d) water conservation or water supply projects administered by or through BAWSCA (e) immediate reduction of wholesale rates or (f) continued retention for future rate stabilization purposes. In the absence of a direction from BAWSCA the SFPUC shall continue to retain the balance for rate stabilization in subsequent years.

b. If the amount in the balancing account is owed to the SFPUC (a negative balance) the SFPUC shall not be obligated to apply all or any part of the negative balance in establishing wholesale rates for the immediately ensuring year. Instead the SFPUC may prorate the negative balance in whole or in part over multiple years in order to avoid fluctuating increases and decreases in wholesale rates.

6.06. <u>Wholesale Revenue Coverage Reserve</u>

A. The SFPUC may include in wholesale rates for any fiscal year an additional dollar amount ("Wholesale Revenue Coverage") which for any fiscal year shall equal the following:

1. The lesser of (i) 25 of the Wholesale Customers share of Net Annual Debt Service for that fiscal year determined as described in Section 5.04.A or (ii) the amount necessary to meet the Wholesale Customers proportionate share of Debt Service coverage required by then-current Indebtedness for that fiscal year minus

2. A credit for (i) the actual amounts previously deposited in the "Wholesale Revenue Coverage Reserve" (as defined in subsection B below) (ii) accrued interest on the amounts on deposit in the Wholesale Revenue Coverage Reserve and (iii) an amount equal to any additional interest that would have accrued on the actual amounts previously deposited in the Wholesale Revenue Coverage Reserve assuming no withdrawals had been made therefrom.

B. During each fiscal year the SFPUC will set aside and deposit that portion of revenue equal to Wholesale Revenue Coverage into a separate account that the SFPUC will establish and maintain to be known as the "Wholesale Revenue Coverage Reserve." Deposits into the Wholesale Revenue Coverage Reserve shall be made no less frequently than monthly. The Wholesale Revenue Coverage Reserve shall be credited with interest at the rate specified in Section 6.05.B. The SFPUC may use amounts in the Wholesale Revenue Coverage Reserve for any lawful purpose. Any balance in the Wholesale Revenue Coverage Reserve in excess of the Wholesale Revenue Coverage amount as of the end of any fiscal year (as calculated in subsection 6.06(A) above) shall be applied as a credit against wholesale rates in the immediately following fiscal year unless otherwise directed by BAWSCA.

C. Within 180 days following the later of expiration of the Term or final payment of Debt Service due on Indebtedness issued during the Term to which Wholesale Customers were contributing, SFPUC shall rebate to the Wholesale Customers an amount equal to the Wholesale Revenue Coverage amount in effect for the fiscal year during which the Term expires or the final payment of Debt Service on Indebtedness is made based on each Wholesale Customer's Proportional Annual Use in the fiscal year during which the Term expires or the final payment of debt service on Indebtedness is made.

D. SFPUC shall provide a schedule of debt issuance (with assumptions) and the Wholesale Customers' share of Net Annual Debt Service (actual and projected) expected to be included in wholesale rates starting in 2009-10 through the expected completion of the WSIP. The schedule is to be updated annually prior to rate setting. If estimated Debt Service is used in rate setting, the SFPUC must be able to demonstrate that the Water Enterprise revenues will be sufficient to meet the additional bonds test for the proposed bonds and rate covenants for the upcoming year.

E. Conditions in the municipal bond market may change from those prevailing in 2009. If, prior to expiration of the Term, the SFPUC determines that it would be in the best financial interest of both Retail Customers and Wholesale Customers of the Regional Water System for the Debt Service coverage requirement to be increased in one or more series of proposed new Indebtedness above 1.25 or for the coverage covenant to be strengthened in other ways, it will provide a written report to BAWSCA. The report will contain (1) a description of proposed covenant(s) in the bond indenture, (2) an explanation of how savings are expected to be achieved (e.g. increase in the SFPUC's credit rating over the then-current level, ability to

obtain credit enhancement□etc.)□(3) the estimated all-in true interest cost savings□(4) a comparison of the Wholesale Revenue Re□uirements using the Debt Service coverage limitation in subsection A and under the proposed methodology□and (5) a comparison of the respective monetary benefits expected to be received by both Retail and Wholesale Customers. The SFPUC and BAWSCA agree to meet and confer in good faith about the proposed changes.

F. Any increase in Debt Service coverage proposed by the SFPUC shall be commensurate with Proportional Water Use by Retail and Wholesale Customers. If the SFPUC demonstrates that an increase in Debt Service coverage will result in e□uivalent percentage reductions in total Wholesale and Retail Debt Service payments over the life of the proposed new Indebtedness□based on Proportional Water Use□BAWSCA may agree to a modification of the Wholesale Revenue Coverage re□uirement in subsection A. If BAWSCA does not agree to a proposed modification in coverage re□uirements in the covenants for new Indebtedness□ SFPUC may nevertheless proceed with the modification and the issuance of new Indebtedness. Any Wholesale Customer□or BAWSCA□may challenge an increase in the Wholesale Revenue Re□uirement resulting from the modification in Debt Service coverage through arbitration as provided in Section 8.01.A. If the arbitrator finds that the increase in Debt Service coverage (1) did not and will not result in e□uivalent percentage reductions in total Wholesale and Retail Debt Service payments over the life of the proposed new Indebtedness□based on Proportional Water Use□or (2) was not commensurate with Proportional Water Use□the arbitrator may order the Wholesale Revenue Re□uirement to be recalculated both retrospectively and prospectively to eliminate the differential impact to Wholesale or Retail Customers□subject to the limitation in Section 8.01.C.

6.07. <u>Working Capital Requirement</u>

A. The SFPUC maintains working capital in the form of unappropriated reserves for the purpose of bridging the gap between when the SFPUC incurs operating expenses re□uired to provide service and when it receives revenues from its Retail and Wholesale Customers. The Wholesale Customers shall fund their share of working capital as part of the annual Wholesale Revenue Re□uirement calculation. The amount of wholesale working capital for which the Wholesale Customers will be responsible will be determined using the 60-day standard formula approach.

B. Applying this approach□annual wholesale working capital e□uals one-sixth of the wholesale allocation of operation and maintenance□administrative and general□and property tax

expenses for the Water and Hetch Hetchy Enterprises. Wholesale working capital shall be calculated separately for the Water and Hetch Hetchy Enterprises.

C. Each month, the sum of the Water Enterprise and Hetch Hetchy Enterprise working capital components will be compared with the ending balance in the Wholesale Revenue Coverage Reserve to determine if the Wholesale Customers provided the minimum required working capital. If the Wholesale Revenue Coverage Reserve is greater than the total Water Enterprise and Hetch Hetchy Enterprise working capital requirement, the Wholesale Customers will have provided their share of working capital. If the Wholesale Revenue Coverage Reserve is less than the total Water Enterprise and Hetch Hetchy Enterprise working capital requirement, the Wholesale Customers will be charged interest on the difference, which will be included in the adjustment to the Balancing Account under Section 6.05.B for the subsequent fiscal year.

6.08. <u>Wholesale Capital Fund</u>

A. The SFPUC currently funds revenue-funded capital projects through annual budget appropriations that are included in rates established for that fiscal year and transferred to a capital project fund from which expenditures are made. Consistent with the San Francisco Charter and Administrative Code, the SFPUC appropriates funds in advance of construction in order to maintain a positive balance in the capital project fund. The capital project fund also accrues interest and any unspent appropriations in excess of total project costs. It is the SFPUC's practice to regularly monitor the capital project fund balance to determine whether a surplus has accumulated, which can be credited against the next fiscal year's capital project appropriation.

B. The SFPUC shall establish a comparable Wholesale Revenue-Funded Capital Fund (Wholesale Capital Fund) to enable the Wholesale Customers to fund the wholesale share of revenue-funded New Regional Assets. The Wholesale Capital Fund balance is zero as of July 1, 2009. The SFPUC may include in wholesale rates for any fiscal year an amount equal to the wholesale share of the SFPUC's appropriation for revenue funded New Regional Assets for that year, which sum will be credited to the Wholesale Capital Fund. The wholesale share of other sources of funding, where legally permitted and appropriately accounted for under GAAP, will also be credited to the Wholesale Capital Fund, together with interest earnings on the Wholesale Capital Fund balance.

C. The SFPUC will expend revenues appropriated and transferred to the Wholesale Capital Fund only on New Regional Assets. The annual capital appropriation included in each fiscal year's budget will be provided to BAWSCA in accordance with Section 6.02 and will take into account the current and projected balance in the Wholesale Capital Fund as well as current and projected unexpended and unencumbered surplus as shown on attachment M-1 which will be prepared by the SFPUC each year.

D. Commencing on November 30 2010 and thereafter in each fiscal year during the Term the SFPUC will also provide an annual report to BAWSCA on the status of individual revenue-funded New Regional Assets substantially in the form of Attachment M-2.

E. In order to prevent the accumulation of an excessive unexpended and unencumbered balance in the Wholesale Capital Fund the status of the fund balance will be reviewed through the annual Compliance Audit commencing in F 2018-19. The F 2018-19 Compliance Audit and the Wholesale Customer/BAWSCA review under Section 7.06 shall include Wholesale Capital Fund appropriations expenditures and interest earnings for F 2014-15 through 2017-18 for the purpose of determining whether a Balancing Account transfer is re uired. If the une 30 unencumbered balance of the Wholesale Capital Fund exceeds the lesser of the following: (i) the Target Balance (ii) the unencumbered remaining cumulative appropriations the amount of such excess shall be transferred to the credit of the Wholesale Customers to the Balancing Account described in Section 6.05.

In order to avoid funding delays for New Regional Asset capital projects resulting from prior year transfers of excess Wholesale Capital fund balances to the Wholesale Customers if the une 30 unencumbered balance of the Wholesale Capital Fund is below the lesser of the following: (i) the Target Balance (ii) the unencumbered remaining cumulative appropriation such deficiency shall be posted to the Balancing Account described in Section 6.05 as a charge to the Wholesale Customers. Notwithstanding the foregoing no such charge to the Wholesale Customers shall exceed 4 million annually.

Amended Attachment M-3 illustrates the process for determining the Wholesale Capital Fund balance as of une 30 2019.

F. Three years prior to the end of the Term the SFPUC and BAWSCA will discuss the disposition of the Wholesale Capital Fund balance at the end of the Term. Absent

agreement any balance remaining in the Wholesale Capital Fund at the end of the Term shall be transferred to the Balancing Account to the credit of the Wholesale Customers.

6.09. SFPUC Adoption of Regional Water System 10-Year Capital Improvement Program

A. **Established Level of Service Goals and Objectives**. In approving the WSIP the Commission adopted Level of Service Goals and Objectives that are in part used to develop capital programs related to water including the 10-ear Capital Improvement Program for the Regional Water System (10-ear CIP). BAWSCA and the Wholesale Customers shall have the opportunity to review and provide written or oral comments on any changes to the Level of Service Goals and Objectives that may be submitted to the Commission for approval.

B. **Submittal of an Asset Management Policy**. Prior to December 31 2020 the SFPUC shall develop and submit to the Commission for approval an Asset Management Policy applicable to the Regional Water System.

C. **Coordination of 10-Year CIP and SFPUC Budget Meetings**. The Commission annually reviews updates and adopts a 10-ear CIP pursuant to Section 8B.123 of the San Francisco Charter. At two-year intervals the Commission holds two budget meetings concerning the 10-ear CIP. Over the course of the two budget meetings the SFPUC reviews its budget priorities potential changes to projects in the previously adopted 10-ear CIP and the potential financial implications of such changes. In the event that Charter amendments are placed on the ballot that could alter or amend the City s budget preparation and adoption efforts BAWSCA shall be notified in advance of any proposed change that could result in a less robust CIP development effort and BAWSCA and the SFPUC shall meet to consider BAWSCA s comments on maintaining a robust CIP development effort.

D. **Mid-cycle Changes to the 10-Year CIP**. The SFPUC shall include within the Water Enterprise Capital Improvement Program Quarterly Projects Reports that it provides to the Commission (CIP Quarterly Projects Reports) discussion of any material changes proposed to projects that are included in the most recently adopted 10-ear CIP. The SFPUC defines a material change as a change that applies to a CIP project whose approved CIP budget is e ual to or greater than 5 000 000 that results in one or more of the following:

1. Increases the cost of the CIP project by more than 10 .
2. Increases the schedule of the CIP project by extending said schedule by 12 calendar months or greater.

3. Affects the SFPUC's ability to meet the Level of Service Goals and Objectives.

The SFPUC shall also include within the CIP Quarterly Projects Reports discussion of any new capital project that is not included in the most recently adopted 10-year CIP if the SFPUC has 1) begun spending on the project and 2) anticipates that it will require total funding in excess of $5,000,000. For such projects, the parties recognize that the work may be of an urgent nature and that details of those projects may be developing quickly to address a critical need. The SFPUC commits that for these projects, an expanded discussion will be provided in quarterly reports generated 6 months following the creation of the project in the City's finance and accounting system. At a minimum, the discussion will include: 1) a detailed scope of work; 2) schedule; 3) cost breakdown; and 4) proposed source of funding. This level of detail shall continue to be included in subsequent quarterly reports through either the completion of the work or until the work is included as part of an adopted 10-year CIP.

E. **BAWSCA and Wholesale Customer Notice and Review**. Beginning in 2020, at least 30 days before the first budget meeting, the SFPUC shall provide BAWSCA and the Wholesale Customers with written notice of the dates of the two budget meetings. At least 30 days before the first budget meeting, the SFPUC shall also provide BAWSCA and the Wholesale Customers with a draft of the 10-year CIP and meet with those same parties to review potential candidate projects that it is considering for inclusion in the 10-year CIP. Final materials for the first budget meeting will be made available to BAWSCA and the Wholesale Customers no less than 14 days prior to that budget meeting. Final materials for the second budget meeting will be made available to BAWSCA and the Wholesale Customers on the same date that they are made available to the Commission. Prior to the Commission's adoption of the 10-year CIP at the second budget meeting, San Francisco shall respond in writing to all written comments by BAWSCA and the Wholesale Customers on the 10-year CIP that were submitted prior to the date of the first budget meeting.

F. **Contents of Draft 10-Year CIP – Projects in Years One and Two of 10-Year Schedule**. The SFPUC's CIP projects generally fall into three categories: defined projects, placeholder concepts that could become projects, and programmatic spending for expenses likely to be made but for which there is no schedule. Projects in the near-term years of the 10-year CIP have more definition than those in the outer years, and as a result more detailed information is available for them. For each project listed that has significant expected

expenditures identified in the first two years of the 10-□ear CIP□the draft 10-□ear CIP made available to BAWSCA and the Wholesale Customers shall include the following elements:

1. Project name.
2. Project description and justification.
3. Description of the project□s relationship to the Level of Service Goals and Objectives.
4. Project asset classification for cost-allocation purposes□pursuant to Attachment R for Hetch Hetchy Enterprise assets□or as Regional or Retail for Water Enterprise assets.
5. Project schedule where applicable□broken down by phase□through to completion.
6. Total project budget estimate including a proposed inflation rate.

G. **Contents of Draft 10-Year CIP – Projects Listed After First Two Years of 10-Year Schedule**. For each project that is listed in years three through ten of the 10-□ear CIP□ the draft 10-□ear CIP made available to BAWSCA and the Wholesale Customers shall include the following elements:

1. Project name.
2. Project description and justification.
3. Description of the project□s relationship to the Level of Service Goals and Objectives.
4. Project asset classification for cost-allocation purposes□pursuant to Attachment R for Hetch Hetchy Enterprise assets□or as Regional or Retail for Water Enterprise assets.
5. Project schedule information that forms the basis for project planning if available.
6. Total project budget estimate.

H. **Additional Contents of Draft 10-Year CIP**. The draft 10-□ear CIP made available to BAWSCA and the Wholesale Customers shall also include the following:

1. A discussion of any changes to projects in the previously adopted 10-□ear CIP□the reasons for such changes□any impact of the proposed changes on the SFPUC□s ability to achieve the Level of Service Goals

and Objectives and the SFPUC's proposal for meeting the specific Level of Service Goals and Objectives in question.

2. A discussion of factors that have influenced the 10-year CIP budget or identified projects or have the potential to influence the overall budget or the number cost and scale of identified projects such as rate increase considerations local rate setting policies etc.
3. A discussion of how the CIP will be staffed.
4. A cash flow estimate for each project included as part of the first five years of the 10-year CIP that considers historical spending and changes in the amount of work to be done.
5. Project spreadsheets that separate new projects from existing projects.
6. A summary roll-up for Regional costs including all programmatic costs budgeted in the 10-year CIP.

I. **Quarterly Reporting and Meetings**.

1. CIP Quarterly Projects Reports. The SFPUC shall include within the CIP Quarterly Projects Reports a detailed status update of each Regional project in the 10-year CIP that has an estimated cost greater than $5 million and a summary of the work completed to date for such projects. The CIP Quarterly Projects Reports shall focus on the first two years projects in the 10-year CIP but shall also demonstrate a connection to the 10-year CIP asset classification and the Level of Service Goals and Objectives. The CIP Quarterly Projects Reports shall identify any Regional project in the 10-year CIP with an estimated cost greater than $5 million that is behind schedule and for each project so identified shall describe the SFPUC's plan and timeline for either making up the delay or adopting a revised project schedule. In each fourth quarter of the fiscal year CIP Quarterly Projects Report the SFPUC will also address the status of Regional projects in the 10-year CIP that have an estimated cost of less than $5 million noting any such projects that are behind schedule and describing the SFPUC's plan and timeline for either making up the delay or adopting a revised project schedule.

2. Quarterly Meetings. If requested by BAWSCA the SFPUC shall hold quarterly meetings with BAWSCA to review each CIP Quarterly Projects Report during which the SFPUC shall present information and detail about the individual projects and overall implementation of the 10-year CIP as well as the need for re-prioritization and/or the proposal

of new candidate projects for consideration as part of the next update of the 10-□ear CIP. As part of the meeting held in each fourth □uarter of the fiscal year□the SFPUC shall provide additional information and detail regarding the CIP development schedule and associated coordination proposed with BAWSCA.

Article 7. Accounting Procedures; Compliance Audit

7.01. SFPUC Accounting Principles, Practices

A. **Accounting Principles**. San Francisco will maintain the accounts of the SFPUC and the Water and Hetch Hetchy Enterprises in conformity with Generally Accepted Accounting Principles. San Francisco will apply all applicable pronouncements of the Governmental Accounting Standards Board (GASB) as well as statements and interpretations of the Financial Accounting Standards Board and Accounting Principles Board opinions issued on or before March 30 1989 unless those pronouncements or opinions conflict with GASB pronouncements.

B. **General Rule**. San Francisco will maintain the accounting records of the SFPUC and the Water and Hetch Hetchy Enterprises in a format and level of detail sufficient to allow it to determine the annual Wholesale Revenue Re uirement in compliance with this Agreement and to allow its determination of the Wholesale Revenue Re uirement to be audited as provided in Section 7.04.

C. **Water Enterprise**. San Francisco will maintain an account structure which allows utility plant and operating and maintenance expenses to be segregated by location (inside San Francisco and outside San Francisco) and by function (Direct Retail Regional and Direct Wholesale).

D. **Hetch Hetchy Enterprise**. San Francisco will maintain an account structure which allows utility plant and operating and maintenance expenses to be segregated into Water Only Power Only and oint categories.

E. **SFPUC**. San Francisco will maintain an account structure which allows any expenses of SFPUC bureaus that benefit only the Wastewater Enterprise the Power-Only operations of the Hetch Hetchy Enterprise or Retail Customers to be excluded from the Wholesale Revenue Re uirement.

F. **Utility Plant Ledgers**. San Francisco will maintain subsidiary plant ledgers for the Water and Hetch Hetchy Enterprises that contain uni ue identifying numbers for all assets included in the rate base and identify the original cost annual depreciation accumulated depreciation date placed in service useful life salvage value if any source of funding (e.g. bond series revenues grants) and classification for purposes of this Agreement.

G. **Debt.** San Francisco will maintain documentation identifying:

1. The portion of total bonded debt outstanding related to each series of each bond issue.

2. The portion of total interest expense related to each series of each bond issue.

3. The use of proceeds of each bond issue (including proceeds of commercial paper and/or other interim financial instruments redeemed or expected to be redeemed from bonds and earnings on the proceeds of financings) in sufficient detail to determine for each bond issue the proceeds and earnings of each (including proceeds and earnings of interim financing vehicles redeemed by a bond issue) and the total amounts expended on Direct Retail improvements and the total amounts expended on Regional improvements.

H. **Changes in Accounting**. Subject to subsections A thru G San Francisco may change the chart of accounts and accounting practices of the SFPUC and the Water and Hetch Hetchy Enterprises. However the allocation of any expense to the Wholesale Customers that is specified in the Agreement may not be changed merely because of a change in (1) the accounting system or chart of accounts used by SFPUC (2) the account to which an expense is posted or (3) a change in the organizational structure of the SFPUC or the Water or Hetch Hetchy Enterprises.

I. **Audit**. San Francisco will arrange for an audit of the financial statements of Water and Hetch Hetchy Enterprises to be conducted each year by an independent certified public accountant appointed by the Controller in accordance with Generally Accepted Auditing Standards.

7.02. Calculation of and Report on Wholesale Revenue Requirement

A. Within five months after the close of each fiscal year San Francisco will prepare a report showing its calculation of the Wholesale Revenue Re uirement for the preceding fiscal year and the change in the balancing account as of the end of that fiscal year. The first such report will be prepared by November 30 2010 and will cover fiscal year 2009-10 and the balancing account as of une 30 2010.

B. The report will consist of the following items:

1. Statement of changes in the balancing account for the fiscal year being reported on and for the immediately preceding fiscal year substantially in the form of Attachment O.

2. Detailed supporting schedules 8.1 through 8.2 substantially in the form of Attachment N-2.

3. Description and explanation of any changes in San Francisco's accounting practices from those previously in effect.

4. Explanation of any line item of expense (shown on Attachment N-2 schedules 1 and 4) for which the amount allocated to the Wholesale Customers increased by (a) ten percent or more from the preceding fiscal year or (b) more than $1,000,000.

5. Representation letter signed by the SFPUC General Manager and by other SFPUC financial staff shown on Attachment P as the General Manager may direct subject to change in position titles at the discretion of the SFPUC.

C. The report will be delivered to the BAWSCA General Manager by the date identified in Subsection A.

Once the report has been delivered to BAWSCA San Francisco will upon re uest:

1. Provide BAWSCA with access to and copies of all worksheets and supporting documents used or prepared by San Francisco during its calculation of the Wholesale Revenue Re uirement

2. Make available to BAWSCA all supporting documentation and calculations used by San Francisco in preparing the report and

3. Promptly provide answers to uestions from BAWSCA staff about the report.

7.03. Appointment of Compliance Auditor

A. **Purpose**. The purpose of this section is to provide for an annual Compliance Audit by an independent certified public accountant of the procedures followed and the underlying data used by San Francisco in calculating the Wholesale Revenue Re uirement for the preceding fiscal year. The annual Compliance Audit shall also determine whether the Wholesale Revenue Re uirement has been calculated in accordance with the terms of the Agreement and whether amounts paid by the Wholesale Customers in excess of or less than

the Wholesale Revenue Requirement have been posted to the balancing account together with interest as provided in Section 6.05.

B. **Method of Appointment**. The Controller shall select an independent certified public accountant ("Compliance Auditor") to conduct the Compliance Audit described below. The Compliance Auditor may be the same certified public accountant engaged by the Controller to audit the financial statements of the Water and Hetch Hetchy Enterprises. Subject to approval by the Controller and the General Manager of the SFPUC, the Compliance Auditor shall have the authority to engage such consultants as it deems necessary or appropriate to assist in the audit. The terms of this Article shall be incorporated into the contract between San Francisco and the Compliance Auditor, and the Wholesale Customers shall be deemed to be third-party beneficiaries of said contract.

7.04. Conduct of Compliance Audit

A. **Standards**. The Compliance Auditor shall perform the Compliance Audit in accordance with Generally Accepted Auditing Standards. In particular, its review shall be governed by the standards contained in Section AU 623 (Reports on Specified Elements, Accounts or Items of a Financial Statement) of the AICPA Professional Standards, as amended from time to time.

B. **Preliminary Meeting; Periodic Status Reports; Access to Data**. Prior to commencing the audit, the Compliance Auditor shall meet with San Francisco and BAWSCA to discuss the audit plan, the procedures to be employed and the schedule to be followed. During the course of the audit, the Compliance Auditor shall keep San Francisco and BAWSCA informed of any unforeseen problems or circumstances which could cause a delay in the audit or any material expansion of the audit's scope. The Compliance Auditor shall be given full access to all records of the SFPUC and the Water and Hetch Hetchy Enterprises that the Auditor deems necessary for the audit.

C. **Audit Procedures**. The Compliance Auditor shall review San Francisco's calculation of the Wholesale Revenue Requirement and the underlying data in order to carry out the purpose of the audit described in Section 7.03.A and to issue the report described in Section 7.05. At a minimum, the Compliance Auditor shall address the following:

1. Water Enterprise Operating and Maintenance Expenses. The Compliance Auditor shall review Water Enterprise cost ledgers to determine whether the

recorded operating and maintenance expenses fairly reflect the costs incurred□were recorded on a basis consistent with applicable Generally Accepted Accounting Principles□and were allocated to the Wholesale Customers as provided in this Agreement.

2. Water Enterprise Administrative and General Expenses. The Compliance Auditor shall review Water Enterprise cost ledgers and other appropriate financial records□ including those of the SFPUC□to determine whether the recorded administrative and general expenses fairly reflect the costs incurred by or allocated to the Water Enterprise□whether they were recorded on a basis consistent with applicable Generally Accepted Accounting Principles□ whether SFPUC charges were allocated to the Water Enterprise in accordance with this Agreement□and whether the amount of administrative and general expenses allocated to the Wholesale Customers was determined as provided by this Agreement.

3. Property Taxes. The Compliance Auditor shall review Water Enterprise cost ledgers to determine whether the amount of property taxes shown on the report fairly reflects the property tax expense incurred by San Francisco for Water Enterprise property outside of San Francisco and whether there has been deducted from the amount to be allocated (1) all taxes actually reimbursed to San Francisco by tenants of Water Enterprise property under leases that re□uire such reimbursement and (2) any refunds received from the taxing authority. The Compliance Auditor also shall determine whether the amount of property taxes allocated to the Wholesale Customers was determined as provided in this Agreement.

4. Debt Service. The Compliance Auditor shall review SFPUC records to determine whether debt service□and associated coverage re□uirements□were allocated to the Wholesale Customers as provided in this Agreement.

5. Amortization of Existing Assets in Service as of □une 30□2009. The Compliance Auditor shall review both Water and Hetch Hetchy Enterprise records to determine whether the payoff amount for Existing Assets allocated to the Wholesale Customers as shown on Attachment □-1 through □-4 was calculated as provided in Section 5.03 of this Agreement.

6. Revenue-Funded Capital Appropriations/Expenditures. The Compliance Auditor shall review San Francisco□s calculation of actual expenditures on the wholesale share of revenue-funded New Regional Assets and remaining unexpended and unencumbered project balances in the □Wholesale Capital Fund□described in Section 6.08□to determine whether the procedures contained in that section were followed.

7. Hetch Hetchy Expenses. The Compliance Auditor shall determine whether Hetch Hetchy Enterprise expenses were allocated to the Wholesale Customers as provided in this Agreement.

D. **Use of and Reliance on Audited Financial Statements and Water Use Data**

1. In performing the audit, the Compliance Auditor shall incorporate any adjustments to the cost ledgers recommended by the independent certified public accountant referred to in Section 7.01.I, which audited the financial statements of the Water and Hetch Hetchy Enterprises. The Compliance Auditor may rely upon the work performed by that independent certified public accountant if the Compliance Auditor reviews the work and is willing to take responsibility for it as part of the compliance audit.

2. In performing the Compliance Audit and issuing its report, the Compliance Auditor may rely on water use data furnished by the Water Enterprise, regardless of whether the Wholesale Customers contest the accuracy of such data. The Compliance Auditor shall have no obligation to independently verify the accuracy of the water use data provided by San Francisco, however, the Compliance Auditor shall disclose in its report any information which came to its attention suggesting that the water use data provided by San Francisco are inaccurate in any significant respect.

E. Exit Conference. Upon completion of the audit, the Compliance Auditor shall meet with San Francisco and BAWSCA to discuss audit findings, including (1) any material weakness in internal controls and (2) adjustments proposed by the Compliance Auditor and San Francisco's response (i.e., booked or waived).

7.05. Issuance of Compliance Auditor's Report

A. San Francisco will require the Compliance Auditor to issue its report no later than nine months after the fiscal year under audit (i.e., March 31 of the following calendar year). The Compliance Auditor's report shall be addressed and delivered to San Francisco and BAWSCA. The report shall contain:

1. A statement that the Auditor has audited the report on the calculation of the Wholesale Revenue Requirement and changes in the balancing account and supporting documents prepared by San Francisco as required by Section 7.02.

2. A statement that the audit was conducted in accordance with auditing standards generally accepted in the United States of America and that the audit provides a reasonable basis for its opinion.

3. A statement that in the Compliance Auditor's opinion the Wholesale Revenue Requirement was calculated by San Francisco in accordance with this Agreement and that the change in the balancing account shown in San Francisco's report was calculated as required by this Agreement and presents fairly in all material respects changes in and the balance due to (or from) the Wholesale Customers as of the end of the fiscal year under audit.

7.06. Wholesale Customer Review

A. One or more Wholesale Customers or BAWSCA may engage an independent certified public accountant (CPA) to conduct a review (at its or their expense) of San Francisco's calculation of the annual Wholesale Revenue Requirement and a review of changes in the balancing account.

B. If a Wholesale Customer or BAWSCA wishes such a review to be conducted it will provide written notice to SFPUC within 30 days of the date the Compliance Auditor's report is issued. The notice will identify the CPA or accounting/auditing firm that will conduct the review and the specific aspects of the Compliance Auditor's report that are the subject of the review. If more than one notice of review is received by the SFPUC the requesting Wholesale Customers shall combine and coordinate their reviews and select a lead auditor to act on their behalf for the purposes of requesting documents and conducting on-site investigations.

C. San Francisco will cooperate with the CPA appointed by a Wholesale Customer or BAWSCA. This cooperation includes making requested records promptly available making knowledgeable SFPUC personnel available to timely and truthfully answer the CPA's questions and directing the Compliance Auditor to cooperate with the CPA.

D. The Wholesale Customer's review shall be completed within 60 days after the date the Compliance Auditor's report is issued. At the conclusion of the review representatives of San Francisco and BAWSCA shall meet to discuss any differences between them concerning San Francisco's compliance with Articles 5 or 6 of this Agreement during the preceding fiscal year or San Francisco's calculation of the Wholesale Revenue Requirement for the preceding fiscal year. If such differences cannot be resolved the dispute shall be submitted to arbitration in accordance with Section 8.01.

Article 8. Other Agreements of the Parties

8.01. Arbitration and Judicial Review

A. **General Principles re Scope of Arbitration**. All questions or disputes arising under the following subject areas shall be subject to mandatory binding arbitration and shall not be subject to judicial determination:

1. the determination of the Wholesale Revenue Requirement which shall include both the calculations used in the determination and the variables used in those calculations;

2. the SFPUC's adherence to accounting practices and conduct of the Compliance Audit; and

3. the SFPUC's classification of new or omitted assets for purposes of determining the Wholesale Revenue Requirement.

All other questions or disputes arising under this Agreement shall be subject to judicial determination. Disputes about the scope of arbitrability shall be resolved by the courts.

B. **Demand for Arbitration**. If any arbitrable question or dispute should arise, any Wholesale Customer or the SFPUC may commence arbitration proceedings hereunder by service of a written Demand for Arbitration. Demands for arbitration shall set forth all of the issues to be arbitrated, the general contentions relating to those issues, and the relief sought by the party serving the Demand. Within 45 days after service of a Demand upon it, any Wholesale Customer or the SFPUC may serve a Notice of Election to become a party to the arbitration and a Response to the issues set forth in the Demand. The Response shall include the party's general contentions and defenses with respect to the claims made in the Demand; and may include any otherwise arbitrable claims, contentions and demands that concern the fiscal year covered by the Demand. If a timely Notice of Election and Response is not filed by any such entity, it shall not be a party to the arbitration but shall nonetheless be bound by the award of the arbitrator. If no party to this Agreement serves a timely Notice of Election and Response, the party seeking arbitration shall be entitled to the relief sought in its Demand for Arbitration without the necessity of further proceedings. Any claims not made in a Demand or Response shall be deemed waived.

If a Demand or Notice of Election is made by the SFPUC, it shall be served by personal delivery or certified mail to each Wholesale Customer at the address of such customer as set forth in the billing records of the SFPUC. If a Demand or Notice of Election is made by a Wholesale Customer, service shall be by certified mail or personal delivery to the General Manager, SFPUC, 525 Golden Gate Avenue, 13th Floor, San Francisco, California 94102, and to each of the other Wholesale Customers. If arbitration is commenced, the Wholesale Customers shall use their best efforts to formulate a single, joint position with respect thereto. In any event, with respect to the appointment of arbitrators, as hereinafter provided, all Wholesale Customers that take the same position as to the issues to be arbitrated shall jointly and collectively be deemed to be a single party.

C. **Limitations Period**. All Demands For Arbitration shall be served within twelve months of receipt by BAWSCA of the Wholesale Revenue Requirement Compliance Auditor's Report for that year. If a party fails to file a Demand within the time period specified in this subsection, that party waives all present and future claims with respect to the fiscal year in question. If no such Demand is served within the twelve month period specified above, the SFPUC's determination of the Wholesale Revenue Requirement for that year shall be final and conclusive. Whether any particular claim is barred by the twelve month limitations period provided for herein shall be for the arbitrator to determine. Prior to the expiration of the twelve month limitations period, the parties to the dispute may agree by written stipulation to extend the period by up to six additional months.

The Arbitrator may order the alteration or recalculation of underlying Water Enterprise and/or Hetch Hetchy Enterprise accounts or asset classifications. Such changes shall be used to calculate the Wholesale Revenue Requirement for the fiscal year in dispute and shall also be used to determine future Wholesale Revenue Requirements, if otherwise applicable, even though the existing entries in such accounts or the asset classifications, in whole or in part, predate the twelve month period described above, so long as a timely arbitration Demand has been filed in accordance with this subsection.

D. **Number and Appointment of Arbitrators**. All arbitration proceedings under this section shall be conducted by a single arbitrator, selected by the SFPUC and a designated representative of the Wholesale Customers or each group of Wholesale Customers that take the same position with respect to the arbitration, within 75 days after service of the Demand. If the parties to the arbitration cannot agree on an arbitrator within 75 days, any party may petition

the Marin County Superior Court for the appointment of an arbitrator pursuant to Code of Civil Procedure Section 1281.6 (or any successor provision).

E. **Guidelines for Qualifications of Arbitrators**. The Wholesale Customers and the SFPUC acknowledge that the qualifications of the arbitrator will vary with the nature of the matter arbitrated, but, in general, agree that such qualifications may include service as a judge or expertise in one or more of the following fields: public utility law, water utility rate setting, water system and hydraulic engineering, utility accounting methods and practices, and water system operation and management. The parties to the arbitration shall use their best efforts to agree in advance upon the qualifications of any arbitrator to be appointed by the Superior Court.

F. **Powers of Arbitrator; Conduct of Proceedings**

1. Except as provided in this section, arbitrations under this section shall be conducted under and be governed by the provisions of California Code of Civil Procedure Sections 1282.2 through 1284.2 (hereinafter, collectively, "Code sections"), and arbitrators appointed hereunder shall have the powers and duties specified by the Code sections.

2. Within the meaning of the Code sections, the term "neutral arbitrator" shall mean the single arbitrator selected by the parties to the arbitration.

3. Unless waived in writing by the parties to the arbitration, the notice of hearing served by the arbitrator shall not be less than 90 days.

4. The lists of witnesses (including expert witnesses), and the lists of documents (including the reports of expert witnesses) referred to in Code of Civil Procedure Section 1282.2 shall be mutually exchanged, without necessity of demand therefore, no later than 60 days prior to the date of the hearing, unless otherwise agreed in writing by the parties to the arbitration. Upon application of any party, or on his or her own motion, the arbitrator may schedule one or more prehearing conferences for the purposes of narrowing and/or expediting resolution of the issues in dispute. Strict conformity to the rules of evidence is not required, except that the arbitrator shall apply applicable law relating to privileges and work product. The arbitrator shall consider evidence that he or she finds relevant and material to the dispute, giving the evidence such weight as is appropriate. The arbitrator may limit testimony to exclude evidence that would be immaterial or unduly repetitive, provided that all parties are afforded the opportunity to present material and relevant evidence.

5. Within thirty days after the close of the arbitration hearing or such other time as the arbitrator shall determine the parties will submit proposed findings and a proposed remedy to the arbitrator. The parties may file objections to their adversary's proposed findings and remedy within a time limit to be specified by the arbitrator. The arbitrator shall not base his or her award on information not obtained at the hearing.

6. The arbitrator shall render a written award no later than twelve months after the arbitrator is appointed either by the parties or by the court provided that such time may be waived or extended as provided in Code of Civil Procedure Section 1283.8.

7. The provisions for discovery set forth in Code of Civil Procedure Section 1283.05 are incorporated into and made part of this Agreement except that: (a) leave of the arbitrator need not be obtained for the taking of depositions including the depositions of expert witnesses (b) the provisions of Code of Civil Procedure Section 2034.010 et seq. relating to discovery of expert witnesses shall automatically be applicable to arbitration proceedings arising under this Agreement without the necessity for a formal demand pursuant to Section 2034.210 and the date for the exchange of expert discovery provided by Sections 2034.260 and 2034.270 shall be not later than 60 days prior to the date for the hearing and (c) all reports documents and other materials prepared or reviewed by any expert designated to testify at the arbitration shall be discoverable. In appropriate circumstances the arbitrator may order any party to this Agreement that is not a party to the arbitration to comply with any discovery request.

8. For the purposes of allocation of expenses and fees as provided in Code of Civil Procedure Section 1284.2 if any two or more Wholesale Customers join together in a single joint position in the arbitration those Wholesale Customers shall be deemed to be a single party. If any Wholesale Customer or customers join together with the SFPUC in a single joint position in the arbitration those Wholesale Customers and the SFPUC together shall be deemed to be a single party.

9. Subject to any other limitations imposed by the Agreement the arbitrator shall have power to issue orders mandating compliance with the terms of the Agreement or enjoining violations of the Agreement. With respect to any arbitration brought to redress a claimed wholesale overpayment to the SFPUC the arbitrator's power to award monetary relief shall be limited to entering an order requiring that an adjustment be made in the amount posted to the balancing account for the fiscal year covered by the Demand.

10. All awards of the arbitrator shall be binding on the SFPUC and the Wholesale Customers regardless of the participation or lack thereof by any Wholesale Customer or the SFPUC as a party to the arbitration proceeding. The parties to an arbitration shall have the power to modify or amend any arbitration award by mutual consent. The arbitrator shall apply California law.

8.02. Attorneys' Fees

A. **Arbitration or Litigation Between San Francisco and Wholesale Customers Arising under the Agreement or Individual Water Sales Contracts**. Each party will bear its own costs including attorneys fees incurred in any arbitration or litigation arising under this Agreement or the Individual Water Sales Contracts between San Francisco and the Wholesale Customers. Notwithstanding the foregoing and subject to the limitations contained herein the SFPUC may allocate to the Wholesale Customers as an allowable expense utilizing the composite rate used for allocating other Water Enterprise administrative and general expenses any attorneys fees and costs incurred by the SFPUC in connection with arbitration and/or litigation arising under this Agreement and/or the Individual Water Sales Contracts. Attorneys fees incurred by the SFPUC for attorneys employed in the San Francisco City Attorney s office shall be billed at the hourly rates charged for the attorneys in uestion by the San Francisco City Attorney s Office to the SFPUC. Attorneys fees incurred by the SFPUC for attorneys other than those employed in the San Francisco City Attorney s Office shall be limited to the hourly rates charged to the SFPUC for attorneys and paralegals with comparable experience employed in the San Francisco City Attorney s office and in no event shall exceed the highest hourly rate charged by any attorney or paralegal employed in the City Attorney s Office to the SFPUC.

B. **Arbitration or Litigation Outside of Agreement Concerning the SFPUC Water System or Reserved Issues**

1. The attorneys fees and costs incurred by the SFPUC in litigation between San Francisco and one or more of the Wholesale Customers arising from matters outside of the Agreement including without limitation litigation and/or arbitration concerning the issues specifically reserved in the Agreement shall be allocated between the Retail Customers and the Wholesale Customers utilizing the composite rate used for allocating other Water Enterprise administrative and general expenses.

2. If in any litigation described in subsection B.1 above attorneys fees and costs are awarded to one or more of the Wholesale Customers as prevailing parties the

SFPUC's payment of the Wholesale Customers' attorneys' fees and costs shall not be an allowable expense pursuant to subsection A.

3. If, in any litigation described in subsection B.1, the SFPUC obtains an award of attorneys' fees and costs as a prevailing party against one or more of the Wholesale Customers, any such award shall be reduced to offset the amount of the SFPUC's fees and costs, if any, that have already been paid by the Wholesale Customers in the current or any prior fiscal years pursuant to subsection B.1 and the provisions of Articles 5 and 6 of the Agreement.

4. Nothing contained in this Agreement, including this subsection, shall authorize a court to award attorneys' fees and costs to a prevailing party as a matter of contract and/or the provisions of Civil Code Section 1717, in litigation between San Francisco and one or more of the Wholesale Customers arising from matters outside of the Agreement, including, without limitation, litigation and/or arbitration concerning the issues specifically reserved in the Agreement.

C. **Attorneys Fees and Costs Incurred by the SFPUC in Connection with the Operation and Maintenance of the SFPUC Water Supply System**. All attorneys' fees and costs incurred by the SFPUC in connection with the operation and maintenance of the SFPUC's water supply system shall be allocated between Retail Customers and the Wholesale Customers utilizing the composite rate used for allocating other Water Enterprise administrative and general expenses.

8.03. Annual Meeting and Report

A. The parties wish to ensure that the Wholesale Customers may, in an orderly way, be informed of matters affecting the Regional Water System, including matters affecting the continuity and adequacy of their water supply from San Francisco.

For this purpose, the General Manager of the SFPUC shall meet annually with the Wholesale Customers and BAWSCA during the month of February, commencing February 2010. At these annual meetings, the SFPUC shall provide the Wholesale Customers a report on the following topics:

1. Capital additions under construction or being planned for the Regional Water System, including the status of planning studies, financing plans, environmental reviews, permit applications, etc.

2. Water use trends and projections for Retail Customers and Wholesale Customers.

3. Water supply conditions and projections.

4. The status of any administrative proceedings or litigation affecting San Francisco's water rights or the SFPUC's ability to deliver water from the watersheds which currently supply the Regional Water System.

5. Existing or anticipated problems with the maintenance and repair of the Regional Water System or with water quality.

6. Projections of Wholesale Revenue Requirements for the next five years.

7. Any other topic which the SFPUC General Manager places on the agenda for the meeting.

8. Any topic which the Wholesale Customers, through BAWSCA, request be placed on the agenda, provided that the SFPUC is notified of the request at least 10 days before the meeting.

B. The General Manager of the SFPUC, the Assistant General Manager of the Water Enterprise, and the Assistant General Manager of Business Services-CFO will use their best efforts to attend the annual meetings. If one or more of these officers are unable to attend, they will designate an appropriately informed assistant to attend in their place.

8.04. 8.04 Administrative Matters Delegated to BAWSCA

A. The Wholesale Customers hereby delegate the authority and responsibility for performing the following administrative functions contemplated in this Agreement to BAWSCA:

1. Approval of calculations of Proportional Annual Water Use required by Section 3.14 and Attachment [illegible] "Water Use Measurement and Tabulation"[illegible]

2. Approval of amendments to Attachments A and A-3 and A-4 "25-Year Payoff Schedules for Existing Rate Base"[illegible]

3. Agreement that the Water Meter and Calibration Procedures Manual to be prepared by the SFPUC may supersede some or all of the requirements in Attachment [illegible] as described in Section 3.14.

4. Conduct of Wholesale Customer review of SFPUC's calculation of annual Wholesale Revenue Requirement/Change in Balancing Account described in Section 7.06.

5. Approval of an adjustment to Wholesale Revenue Coverage as described in Section 6.06.

B. A majority of the Wholesale Customers may, without amending this Agreement, delegate additional administrative functions to BAWSCA. To be effective, such expanded delegation must be evidenced by resolutions adopted by the governing bodies of a majority of the Wholesale Customers. In 2014, all twenty-six Wholesale Customers adopted resolutions delegating authority to BAWSCA to initiate, defend and settle arbitration for the matters that, pursuant to Section 8.01 of this Agreement, are subject to mandatory, binding arbitration.

C. Unless otherwise explicitly stated, the administrative authority delegated to BAWSCA may be exercised by the General Manager/CEO of BAWSCA, rather than requiring action by the BAWSCA Board of Directors. In addition, the Wholesale Customers may, with the consent of BAWSCA, delegate to BAWSCA the initiation, defense, and settlement of arbitration proceedings provided for in Section 8.01.

8.05. Preservation of Water Rights; Notice of Water Rights Proceedings

A. It is the intention of San Francisco to preserve all of its water rights, irrespective of whether the water held under such water rights is allocated under this Agreement. Nothing in this Agreement shall be construed as an abandonment, or evidence of an intent to abandon, any of the water rights that San Francisco presently possesses.

B. San Francisco shall use its best efforts to give prompt notice to BAWSCA of any litigation or administrative proceedings to which San Francisco is a party involving water rights to the Regional Water System. The failure of San Francisco to provide notice as required by this section, for whatever reason, shall not give rise to any monetary liability.

8.06. SFPUC Rules and Regulations

The sale and delivery of all water under this Agreement shall be subject to such of the "Rules and Regulations Governing Water Service to Customers" of the Water Enterprise adopted by the Commission, as those rules and regulations may be amended from time to time, as are (1) applicable to the sale and delivery of water to the Wholesale Customers, (2) reasonable, and (3) not inconsistent with either this Agreement or with an Individual Water

Sales Contract. The SFPUC will give the Wholesale Customers notice of any proposal to amend the Rules and Regulations in a manner that would affect the Wholesale Customers. The notice will be delivered at least thirty days in advance of the date on which the proposal is to be considered by the Commission and will be accompanied by the text of the proposed amendment.

8.07. Reservations of, and Limitations on, Claims

A. **General Reservation of Raker Act Contentions**. The 1984 Agreement resolved a civil action brought against San Francisco by certain of the Wholesale Customers. Plaintiffs in that action contended that they and other Wholesale Customers that are municipalities or special districts were co-grantees within the meaning of Section 8 of the Act and were entitled to certain rights benefits and privileges by virtue of that status. San Francisco disputed those claims.

Nothing in this Agreement or in the Individual Water Sales Contracts shall be construed or interpreted in any way to affect the ultimate resolution of the controversy between the parties concerning whether any of the Wholesale Customers are co-grantees under the Act and if so what rights benefits and privileges accrue to them by reason of that claimed status.

B. **Claims Reserved but not Assertable During Term or Portions Thereof**. The following claims which San Francisco disputes are reserved but may not be asserted during the Term (or portions thereof as indicated):

1. The Wholesale Customers claim that the Act entitles them to water at cost.

2. The Wholesale Customers claim that San Francisco is obligated under the Act or state law to supply them with additional water in excess of the Supply Assurance. This claim may not be asserted unless and until San Francisco decides not to meet projected water demands of Wholesale Customers in excess of the Supply Assurance pursuant to Section 4.06.

3. The claim by San ose and Santa Clara that they are entitled under the Act or any other federal or state law to permanent non-interruptible status and to be charged rates identical to those charged other Wholesale Customers. This claim may not be asserted unless and until San Francisco notifies San ose or Santa Clara that it intends to interrupt or terminate water deliveries pursuant to Section 4.05.

4. he Wholesale Customers claim that the SFPUC is not entitled to impose a surcharge for lost power generation revenues attributable to furnishing water in excess of the Supply Assurance. This claim may not be asserted unless and until SFPUC furnishes water in excess of the Supply Assurance during the Term and also includes such a surcharge in the price of such water.

5. Claims by Wholesale Customers (other than San ose and Santa Clara whose service areas are fixed) that SFPUC is obligated under the Act or state law to furnish water within their Individual Supply Guarantee for delivery to customers outside their existing service area and that Wholesale Customers are entitled to enlarge their service areas to supply those customers. Such claims may be asserted only after compliance with the procedure set forth in Section 3.03 followed by SFPUC s denial of or failure for six months to act on a written re uest by a Wholesale Customer to expand its service area.

C. **Waived Activities**. The Wholesale Customers (and the SFPUC where specified) will refrain from the following activities during the Term (or portions thereof as specified):

1. The Wholesale Customers and the SFPUC will not contend before any court administrative agency or legislative body or committee that the methodology for determining the Wholesale Revenue Re uirement (or the re uirements for (a) amortization of the ending balance under the 1984 Agreement or (b) contribution to the Wholesale Revenue Coverage) determined in accordance with this Agreement violates the Act or any other provision of federal law state law or San Francisco s City Charter or is unfair unreasonable or unlawful.

2. The Wholesale Customers will not challenge the transfer of funds by the SFPUC to any other San Francisco City department or fund provided such transfer complies with the San Francisco City Charter. The transfer of its funds whether or not permitted by the City Charter will not excuse the SFPUC from its failure to perform any obligation imposed by this Agreement.

3. The Wholesale Customers and the SFPUC will not assert monetary claims against one another based on the 1984 Agreement other than otherwise arbitrable claims arising from the three fiscal years immediately preceding the start of the Term (i.e. F s 2006-07 2007-08 and 2008-09). Such claims if any shall be governed by the dispute resolution provisions of this Agreement except that the time within which arbitration must be commenced shall be 18 months from delivery of the Compliance Auditor s report.

D. **Other**

1. This Agreement shall determine the respective monetary rights and obligations of the parties with respect to water sold by the SFPUC to the Wholesale Customers during the Term. Such rights and obligations shall not be affected by any judgments or orders issued by any court in litigation, whether or not between parties hereto, and whether or not related to the controversy over co-grantee status, except for arbitration and/or litigation expressly permitted in this Agreement. No judicial or other resolution of issues reserved by this section will affect the Wholesale Revenue Requirement which, during the Term, will be determined exclusively as provided in Articles 5, 6 and 7 of this Agreement.

2. Because delays in the budget process or other events may cause the SFPUC to defer the effective date of changes in wholesale rates until after the beginning of the fiscal year, this Agreement does not require the SFPUC to make changes in wholesale rates effective at the start of the fiscal year or at any other specific date.

3. he Wholesale Customers do not, by executing this Agreement, concede the legality of the SFPUC's establishing Interim Supply Allocations, as provided in Article 4 or imposing Environmental Enhancement Surcharges on water use in excess of such allocations. Any Wholesale Customer may challenge such allocation when imposed and/or such surcharges if and when levied, in any court of competent jurisdiction.

4. The furnishing of water in excess of the Supply Assurance by San Francisco to the Wholesale Customers shall not be deemed or construed to be a waiver by San Francisco of its claim that it has no obligation under any provision of law to supply such water to the Wholesale Customers, nor shall it constitute a dedication by San Francisco to the Wholesale Customers of such water.

8.08. Prohibition of Assignment

A. This Agreement shall be binding on, and shall inure to the benefit of, the parties and their respective successors and permitted assigns. Each Wholesale Customer agrees that it will not transfer or assign any rights or privileges under this Agreement, either in whole or in part, or make any transfer of all or any part of its water system or allow the use thereof in any manner whereby any provision of this Agreement will not continue to be binding on it, its assignee or transferee, or such user of the system. Any assignment or transfer in violation of this covenant, and any assignment or transfer that would result in the supply of water in violation of the Act, shall be void.

B. Nothing in this section shall prevent any Wholesale Customer (except the California Water Service Company and Stanford) from entering into a joint powers agreement or a municipal or multi-party water district with any other Wholesale Customer (except the two listed above) to exercise the rights and obligations granted to and imposed upon the Wholesale Customers hereunder nor shall this section prevent any Wholesale Customer (except the two listed above) from succeeding to the rights and obligations of another Wholesale Customer hereunder as long as the Wholesale Service Area served by the Wholesale Customers involved in the succession is not thereby enlarged.

8.09. Notices

A. All notices and other documents that San Francisco is required or permitted to send to the Wholesale Customers under this Agreement shall be sent to each and all of the Wholesale Customers by United States mail first class postage prepaid addressed to each Wholesale Customer at the address to which monthly water bills are mailed by the Water Enterprise.

B. All notices or other documents which the Wholesale Customers are required or permitted to send to San Francisco under this Agreement shall be sent by United States mail first class postage prepaid addressed as follows:

General Manager
San Francisco Public Utilities Commission
525 Golden Gate Avenue 13th Floor
San Francisco CA 94123

C. Each Wholesale Customer is a member of BAWSCA. San Francisco shall send a copy of each notice or other document which it is required to send to all Wholesale Customers to BAWSCA addressed as follows:

General Manager/CEO
Bay Area Water Supply and Conservation Agency
155 Bovet Road Suite 650
San Mateo CA 94402

The failure of San Francisco to send a copy of such notices or documents to BAWSCA shall not invalidate any rate set or other action taken by San Francisco.

D. Any party (or BAWSCA) may change the address to which notice is to be sent to it under this Agreement by notice to San Francisco (in the case of a change desired by a Wholesale Customer or BAWSCA) and to the Wholesale Customer and BAWSCA (in the case of a change desired by San Francisco).

The requirements for notice set forth in Section 8.01 concerning arbitration shall prevail over this section when they are applicable.

8.10. Incorporation of Attachments

Attachments A through R referred to herein are incorporated in and made a part of this Agreement.

8.11. Interpretation

In interpreting this Agreement or any provision thereof it shall be deemed to have been drafted by all signatories and no presumption pursuant to Civil Code Section 1654 may be invoked to determine the Agreement's meaning. The marginal headings and titles to the sections and paragraphs of this Agreement are not a part of this Agreement and shall have no effect upon the construction or interpretation of any part hereof.

8.12. Actions and Approvals by San Francisco

Whenever action or approval by San Francisco is required or contemplated by this Agreement authority to act or approve shall be exercised by the Commission except if such action is required by law to be taken or approval required to be given by the San Francisco Board of Supervisors. The Commission may delegate authority to the General Manager in accordance with the San Francisco City Charter and Administrative Code except for actions that this Agreement requires to be taken by the Commission.

8.13. Counterparts

Execution of this Agreement may be accomplished by execution of separate counterparts by each signatory. San Francisco shall deliver its executed counterpart to BAWSCA and the counterpart which each Wholesale Customer executes shall be delivered to San Francisco. The separate executed counterparts taken together shall constitute a single agreement.

8.14. Limitations on Damages

A. Unless otherwise prohibited by this Agreement general or direct damages may be recovered for a breach of a party s obligations under this Agreement. No party is liable for or may recover from any other party special indirect or conse uential damages or incidental damages including but not limited to lost profits or revenue. No damages may be awarded for a breach of Section 8.17.

B. The limitations in subsection A apply only to claims for damages for an alleged breach of this Agreement. These limitations do not apply to claims for damages for an alleged breach of a legal duty that arises independently of this Agreement established by constitution or statute.

C. If damages would be an inade uate remedy for a breach of this Agreement e uitable relief may be awarded by a court in a case in which it is otherwise proper.

D. This section does not apply to any claim of breach for which arbitration is the exclusive remedy pursuant to Section 8.01.A.

8.15. Force Majeure

A. **Excuse from Performance**. No party shall be liable in damages to any other party for delay in performance of or failure to perform its obligations under this Agreement including the obligations set forth in Sections 3.09 and 4.06 if such delay or failure is caused by a Force Majeure Event.

B. **Notice**. The party claiming excuse shall deliver to the other parties a written notice of intent to claim excuse from performance under this Agreement by reason of a Force Majeure Event. Notice re uired by this section shall be given promptly in light of the circumstances and in the case of events described in (c) (d) or (e) of the definition of Force Majeure Event only not later than ten (10) days after the occurrence of the Force Majeure Event. Such notice shall describe the Force Majeure Event the services impacted by the claimed event the length of time that the party expects to be prevented from performing and the steps which the party intends to take to restore its ability to perform.

C. **Obligation to Restore Ability to Perform**. Any suspension of performance by a party pursuant to this section shall be only to the extent and for a period of no longer duration

than □re□uired by the nature of the Force Majeure Event□and the party claiming excuse shall use its best efforts to remedy its inability to perform as □uickly as possible.

8.16. No Third-Party Beneficiaries

This Agreement is exclusively for the benefit of the parties and not for the benefit of any other Person. There are no third-party beneficiaries of this Agreement and no person not a party shall have any rights under or interests in this Agreement.

No party may assert a claim for damages on behalf of a person other than itself□ including a person that is not a party.

8.17. Good Faith and Fair Dealing

San Francisco and the Wholesale Customers each acknowledge their obligation under California law to act in good faith toward□and deal fairly with□each other with respect to this Agreement.

Article 9. Implementation and Special Provisions Affecting Certain Wholesale Customers

9.01. 9.01 General; Individual Water Sales Contracts

A. As described in Section 1.03, San Francisco previously entered into Individual Water Sales Contracts with each of the Wholesale Customers. The term of the majority of Individual Water Sales Contracts will expire on June 30, 2009, concurrently with the expiration of the 1984 Agreement. Except as provided below in this Article, each of the Wholesale Customers will execute a new Individual Water Sales Contract with San Francisco concurrently with its approval of the Agreement.

B. The Individual Water Sales Contracts will describe the service area of each Wholesale Customer, identify the location and size of connections between the Regional Water System and the Wholesale Customer's distribution system, provide for periodic rendering and payment of bills for water usage, and in some instances contain additional specialized provisions unique to the particular Wholesale Customer and not of general concern or applicability. A sample Individual Water Sales Contract is provided at Attachment F. The Individual Water Sales Contracts between San Francisco and the Wholesale Customers will not contain any provision inconsistent with Articles 1 through 8 of this Agreement except (1) as provided below in this Article or (2) to the extent that such provisions are not in derogation of the Fundamental Rights of other Wholesale Customers under this Agreement. Any provisions in an Individual Water Sales Contract which are in violation of this section shall be void.

9.02. California Water Service Company

A. The parties recognize that the California Water Service Company is an investor-owned utility company and, as such, has no claim to co-grantee status under the Act, which specifically bars private parties from receiving for resale any water produced by the Hetch Hetchy portion of the Regional Water System. Accordingly, the following provisions shall apply to the California Water Service Company, notwithstanding anything to the contrary elsewhere in this Agreement.

B. The total quantity of water delivered by San Francisco to the California Water Service Company shall not in any calendar year exceed 47,400 acre feet, which is the estimated average annual production of Local System Water. If San Francisco develops additional Local System Water after the Effective Date, it may (1) increase the maximum

delivery amount stated herein and (2) increase the Supply Assurance but not necessarily both. San Francisco has no obligation to deliver water to California Water Service Company in excess of the maximum stated herein except as such maximum may be increased by San Francisco pursuant to this subsection. The maximum annual quantity of Local System Water set forth in this subsection is intended to be a limitation on the total quantity of water that may be allocated to California Water Service Company and is not an Individual Supply Guarantee for purposes of Section 3.02. The maximum quantity of Local System Water set forth in this subsection is subject to reduction in response to (1) changes in long-term hydrology or (2) environmental water requirements that may be imposed by or negotiated with state and federal resource agencies in order to comply with state or federal law or to secure applicable permits for construction of Regional Water System facilities. San Francisco shall notify California Water Service Company of any anticipated reduction of the quantity of Local System Water set forth in this subsection along with an explanation of the basis for the reduction.

C. Notwithstanding anything in Section 8.08 to the contrary California Water Service Company shall have the right to assign to a public agency having the power of eminent domain all or a portion of the rights of California Water Service Company under any contract between it and San Francisco applicable to any individual district of California Water Service Company in connection with the acquisition by such public agency of all or a portion of the water system of California Water Service Company in such district. In the event of any such assignment of all the rights privileges and obligations of California Water Service Company under such contract California Water Service Company shall be relieved of all further obligations under such contract provided that the assignee public agency expressly assumes the obligations of California Water Service Company thereunder. In the event of such an assignment of a portion of the rights privileges and obligations of California Water Service Company under such contract California Water Service Company shall be relieved of such portion of such obligations so assigned thereunder provided that the assignee public agency shall expressly assume such obligations so assigned to it.

D. Should California Water Service Company seek to take over or otherwise acquire in whole or in part the service obligations of another Wholesale Customer under Section 3.03.E it will so inform San Francisco at least six months prior to the effective date of the sale and provide information concerning the total additional demand proposed to be served in order that San Francisco may compare the proposed additional demand to the then-current estimate of Local System Water. In this regard California Water Service Company has notified

the SFPUC that it has reached an agreement to acquire the assets of Skyline County Water District ("Skyline") and assume the responsibility for providing water service to customers in the Skyline service area. California Water Service Company has advised the SFPUC that on September 18, 2008, the California Public Utilities Commission approved California Water Service Company's acquisition of Skyline. The SFPUC anticipates approving the transfer of Skyline's Supply Guarantee as shown on Attachment C to California Water Service Company and the expansion of California Water Service Company's service area to include the current Skyline service area before the Effective Date of this Agreement. All parties to this Agreement authorize corresponding modifications of Attachment C, as well as any of the Agreement's other provisions, to reflect the foregoing transaction without the necessity of amending this Agreement.

E. Nothing in this Agreement shall preclude San Francisco from selling water to any county, city, town, district, political subdivision, or other public agency for resale to customers within the service area of the California Water Service Company. Nothing in this Agreement shall require or contemplate any delivery of water to California Water Service Company in violation of the Act.

F. Nothing in this Agreement shall alter, amend or modify the Findings of Fact and Conclusions of Law and the Judgment dated May 25, 1961, in that certain action entitled City and County of San Francisco v. California Water Service Company in the Superior Court of the State of California in and for the County of Marin, No. 23286, as modified by the Quitclaim Deed from California Water Service Company to San Francisco dated August 22, 1961. The rights and obligations of San Francisco and California Water Service Company under these documents shall continue as therein set forth.

9.03. <u>City of Hayward</u>

A. San Francisco and the City of Hayward ("Hayward") entered into a water supply contract on February 9, 1962 ("the 1962 contract") which provides, inter alia, that San Francisco will supply Hayward with all water supplemental to sources and supplies of water owned or controlled by Hayward as of that date, in sufficient quantity to supply the total water needs of the service area described on an exhibit to the 1962 contract, on a permanent basis. The service area map attached as Exhibit C to the 1962 contract was amended in 1974 to remove an area of land in the Hayward hills and in 2008 to make minor boundary adjustments identified in SFPUC Resolution No. 08-0035.

B. The intention of the parties is to continue the 1962 contract as amended in effect as the Individual Water Sales Contract between San Francisco and Hayward. Accordingly it shall not be necessary for San Francisco and Hayward to enter into a new Individual Water Sales Contract pursuant to this Article and approval of this Agreement by Hayward shall constitute approval of both this Agreement and an Individual Water Sales Contract for purposes of Section 1.03. The 1962 contract as amended will continue to describe the service area of Hayward while rates for water delivered to Hayward during the Term shall be governed by Article 5 hereof. The 1962 contract as amended will continue in force after the expiration of the Term.

9.04. Estero Municipal Improvement District

A. San Francisco and the Estero Municipal Improvement District ("Estero") entered into a water supply contract on August 24 1961 the term of which continues until August 24 2011 ("the 1961 Contract"). The 1961 Contract provides inter alia that San Francisco will supply Estero with all water supplemental to sources and supplies of water owned or controlled by Estero as of that date in sufficient quantity to supply the total water needs of the service area described on an exhibit to the 1961 Contract.

B. The intention of the parties is to terminate the 1961 Contract and replace it with a new Individual Water Sales Contract which will become effective on July 1 2009. The new Individual Water Sales Contract will describe the current service area of Estero. The Individual Supply Guarantee applicable to Estero shall be 5.9 MGD rather than being determined as provided in the 1961 Contract.

9.05. Stanford University

A. The parties recognize that The Board of Trustees of The Leland Stanford unior University ("Stanford") operates a non-profit university and purchases water from San Francisco for redistribution to the academic and related facilities and activities of the university and to residents of Stanford the majority of whom are either employed by or students of Stanford. Stanford agrees that all water furnished by San Francisco shall be used by Stanford only for domestic purposes and those directly connected with the academic and related facilities and activities of Stanford and no water furnished by San Francisco shall be used in any area now or hereafter leased or otherwise used for industrial purposes or for commercial purposes

other than those campus support facilities that provide direct services to Stanford faculty, students or staff such as the U.S. Post Office, the bookstore and Student Union.

Nothing in this Agreement shall preclude San Francisco from selling water to any county, city, town, political subdivision or other public agency for resale to Stanford or to customers within the service area of Stanford.

B. Notwithstanding anything in Section 8.08 to the contrary, Stanford shall have the right to assign to a public agency having the power of eminent domain all or a portion of the rights of Stanford under this Agreement or the Individual Water Sales Contract between it and San Francisco in connection with the acquisition by such public agency of all or a portion of Stanford's water system. In the event of any such assignment of all the rights, privileges, and obligations of Stanford under such contract, Stanford shall be relieved of all further obligations under such contract, provided that the assignee public agency expressly assumes Stanford's obligations thereunder. In the event of such an assignment of a portion of the rights, privileges, and obligations of Stanford under such contract, Stanford shall be relieved of such obligations so assigned thereunder, provided that the assignee public agency shall expressly assume such obligations so assigned to it.

Nothing in this Agreement shall require or contemplate any delivery of water to Stanford in violation of the Act.

9.06. City of San Jose and City of Santa Clara

A. **Continued Supply on Temporary, Interruptible Basis**. During the term of the 1984 Agreement, San Francisco provided water to the City of San Jose ("San Jose") and the City of Santa Clara ("Santa Clara") on a temporary, interruptible basis pursuant to SFPUC Resolution No. 85-0256. Subject to termination or reduction of supply as provided in Section 4.05 of this Agreement, San Francisco will continue to supply water to San Jose and Santa Clara on a temporary, interruptible basis pending a decision by the Commission, pursuant to Section 4.05.H, as to whether to make San Jose and Santa Clara permanent customers of the Regional Water System. San Francisco will furnish water to San Jose and Santa Clara at the same rates as those applicable to other Wholesale Customers pursuant to this Agreement. Water delivered to San Jose and Santa Clara after July 1, 2009 may be limited by the SFPUC's ability to meet the full needs of all its other Retail and Wholesale Customers. The service areas of San Jose and Santa Clara set forth in their Individual Water Sales Contracts may not be

expanded using the procedure set forth in Section 3.03. The combined annual average water usage of San □ose and Santa Clara shall not exceed 9 MGD. The allocation of that total amount between San □ose and Santa Clara shall be as set forth in their Individual Water Sales Contracts.

B. **Reservation of Rights**. In signing this Agreement□neither San □ose nor Santa Clara waives any of its rights to contend□in the event that San Francisco (1) elects to terminate or interrupt water deliveries to either or both of the two cities prior to 2028 using the process set forth in Section 4.05□or (2) does not elect to take either city on as a permanent customer in 2028□that it is entitled to permanent customer status□pursuant to the Act or any other federal or state law. Santa Clara□s reservation of rights is limited to its existing Service Area A□as shown on Attachment Q-2. Service Area B□south of Highway 101□was added in 2018 solely for the operational convenience of Santa Clara. Santa Clara waives its right to make claims described in this Section 9.06.B and Section 8.07.B.3 with respect to Service Area B. In signing this Agreement□San Francisco does not waive its right to deny any or all such contentions.

9.07. City of Brisbane, Guadalupe Valley Municipal Improvement District, Town of Hillsborough

A. The parties acknowledge that San Francisco has heretofore provided certain □uantities of water to the City of Brisbane (□Brisbane□)□Guadalupe Valley Municipal Improvement District (□Guadalupe□) and the Town of Hillsborough (□Hillsborough□) at specified rates or without charge pursuant to obligations arising out of agreements between the predecessors of San Francisco and these parties□which agreements are referred to in judicial orders□resolutions of the SFPUC and/or the 1960 contracts between San Francisco and Brisbane□Guadalupe and Hillsborough. The parties intend to continue those arrangements and accordingly agree as follows:

1. Nothing in this Agreement is intended to alter□amend or modify the terms of SFPUC Resolution No. 74-0653 or the indenture of □uly 18□1908 between the Guadalupe Development Company and the Spring Valley Water Company.

2. Nothing in this Agreement is intended to alter□amend or modify the Findings of Fact and Conclusions of Law and □udgment dated May 25□1961 in that certain action entitled City and County of San Francisco v. Town of Hillsborough in the Superior Court of the State of California in and for the County of Marin□No. 23282□as modified by the Satisfaction of □udgment filed October 23□1961 and the Compromise and Release between

Hillsborough and San Francisco dated August 22□1961. The rights and obligations of Hillsborough under these documents shall continue as therein set forth.

3. Nothing in this Agreement is intended to affect or prejudice any claims□ rights or remedies of Guadalupe or of Crocker Estate Company□a corporation□or of Crocker Land Company□a corporation□or of San Francisco□or of their successors and assigns□ respectively□with respect to or arising out of that certain deed dated May 22□1884□from Charles Crocker to Spring Valley Water Works□a corporation□recorded on May 24□1884□in Book 37 of Deeds at page 356□Records of San Mateo County□California□as amended by that certain Deed of Exchange of Easements in Real Property and Agreement for Trade in Connection Therewith□dated □uly 29□1954□recorded on August 4□1954□in Book 2628□at page 298□Official Records of said San Mateo County□or with respect to or arising out of that certain action involving the validity or enforceability of certain provisions of said deed entitled City and County of San Francisco v. Crocker Estate Company□in the Superior Court of the State of California in and for the County of Marin□No. 23281.

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AGREEMENT

FOR GROUNDWATER STORAGE AND RECOVERY FROM

THE SOUTHERN PORTION OF THE WESTSIDE BASIN

BY AND AMONG

THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION,

THE CITY OF DALY CITY,

THE CITY OF SAN BRUNO

AND

CALIFORNIA WATER SERVICE COMPANY

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AGREEMENT
FOR GROUNDWATER STORAGE AND RECOVERY FROM THE SOUTHERN PORTION OF THE WESTSIDE BASIN

This Agreement for Groundwater Storage and Recovery from the Southern Portion of the Westside Basin ("Agreement") is entered into by and among the San Francisco Public Utilities Commission ("SFPUC"), a department of the City and County of San Francisco ("San Francisco"), a California charter city, the City of Daly City ("Daly City"), a municipal corporation of the State of California, the City of San Bruno ("San Bruno"), a municipal corporation of the State of California, and California Water Service Company ("Cal Water"), a California investor-owned utility providing water service to the City of South San Francisco. Daly City, San Bruno and Cal Water are collectively referred to as "Participating Pumpers." The SFPUC and the Participating Pumpers are collectively referred to as "Parties" and individually as a "Party".

RECITALS

A. The SFPUC provides water ("SFPUC System Water") to San Francisco retail customers and 26 Bay Area wholesale customers, including the Participating Pumpers, through the operation of an integrated local Bay Area surface water supply system and a Tuolumne River surface water supply system. Deliveries to suburban wholesale customers are pursuant to the Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda, San Mateo and Santa Clara Counties dated July 1, 2009 ("WSA"). The SFPUC's wholesale customers extend from Daly City south through the Peninsula to Santa Clara County, and up the southeast side of San Francisco Bay through Alameda County to Hayward. Some wholesale customers, such as the Participating Pumpers, have also developed other water supplies, including local surface water and groundwater, and some import surface water from the State Water Project.

B. The SFPUC has adopted a Water System Improvement Program (WSIP) to increase the reliability of the SFPUC water system through 2030 and to provide water to meet retail and wholesale water demands through the year 2018. The WSIP included the groundwater storage and recovery project ("Project") that is the subject of this Agreement, proposed by the SFPUC to benefit all customers purchasing SFPUC System Water. The environmental effects of WSIP implementation were analyzed in a Program environmental impact report (PEIR) certified by the San Francisco Planning Commission in Motion No. 17734 dated October 30, 2008, and approved by the SFPUC in Res. No. 08-200 dated October 30, 2008.

C. On August 7, 2014, the San Francisco Planning Commission certified the completion of the Final Environmental Impact Report for the Project in its Motion No. M-19209, and the SFPUC approved the Project on August 12, 2014 in resolution no. 14-0127, including the adoption of a mitigation, monitoring and reporting program. SFPUC resolution no. 14-0127 authorized the SFPUC

General Manager to negotiate and execute this Agreement following approval by the Participating Pumpers.

D. The Participating Pumpers supply water to retail customers within their respective service areas in San Mateo County through a combination of purchased water from the SFPUC ("Wholesale Water"); their own groundwater wells in the Basin; and recycled water. The Participating Pumpers purchase Wholesale Water pursuant to the terms of the WSA and Individual Water Supply Contracts. The southern portion of the Westside Groundwater Basin, shown on the map attached hereto as **Attachment A**, (hereinafter "Basin") has been a source of municipal and irrigation water supply for northern San Mateo County water users, including the Participating Pumpers. Groundwater from the Basin has also been a portion of the historical water supply for irrigation at golf courses in San Mateo County and around Lake Merced in San Francisco, and at cemeteries in Colma and San Bruno.

E. Groundwater pumping from the Basin over the past half-century has from time to time lowered water levels within the Basin, resulting in vacant storage capacity in the Basin. The purpose of the Project described in this Agreement is to enhance the use of the Basin as an underground reservoir to store water during periods when surface water supply can be made available to offset pumping by the Participating Pumpers, leading to an accumulation of stored groundwater in the Basin. The SFPUC would augment recharge in the Basin by delivering surface water to the Participating Pumpers to be used in lieu of groundwater pumping, thus allowing groundwater to accumulate in the Basin. Stored water would be recaptured by pumping during periods of insufficient surface water supplies, thereby increasing the overall supply of potable water from the Basin.

F. A Conjunctive Use Pilot Program conducted by the Parties demonstrated that water can be stored in the Basin through the SFPUC's delivery of In Lieu Water to replace groundwater that the Participating Pumpers refrain from pumping. The Project objective is to develop enough additional groundwater pumping capacity in order to produce up to an additional 8,100 acre feet per year (pumped at an annual average rate of 7.2 million gallons per day, or "mgd") for an anticipated total extraction of 61,000 acre feet of stored water under the Project to meet SFPUC System demands during a possible 8.5 year drought cycle.

G. In addition to being available during shortages caused by drought, Project Facilities would be available for use during shortages caused by natural disasters, SFPUC System rehabilitation, scheduled maintenance, or malfunction of the SFPUC System as provided for in the WSA, as well as for certain non-Project purposes by Participating Pumpers, as described in this Agreement.

H. The SFPUC, through its consulting engineering firm MWH, has completed the "*South Westside Basin Conjunctive Use Program Alternatives Analysis Report*" dated October 2007 ("AAR"), and the "South Westside Basin Conjunctive Use Program Conceptual Engineering Report dated November 2008 ("CER"). The

AAR evaluated well sites and distribution connection alternatives for Project Well sites, taking into account the availability of disinfection and treatment facilities, water quality blending options, and costs. The CER recommended 16 Project Well sites, and included preliminary site layouts and a schedule for subsequent phases of project design and potential implementation (i.e., pre-design site investigations, environmental review, design, and construction). The configuration of Project Facilities and Project Wells reflects the technical and engineering analyses contained in the CER and DEIR, and is as shown on the map attached hereto as **Attachment C**.

I. The CER updated the AAR well siting plan based upon well interference analyses conducted by the firm of Luhdorff & Scalmanini in a report entitled "*Conceptual Estimate of Static Water Level Response to Planned Conjunctive Use Operations South Westside Basin*" dated April 18, 2008. Based on this work, the Participating Pumpers and the SFPUC have improved their understanding of the possible effects associated with the operation of Project Wells.

J. A Groundwater Management Plan ("Management Plan") has been developed for the South Westside Basin with participation by San Bruno, Daly City, and Cal Water, and in collaboration with the SFPUC, under California Water Code section 10750 et. seq. The Management Plan has been adopted by San Bruno and Daly City, accepted by Cal Water, and has been received by the SFPUC.

K. It is the intent of the Parties that this Agreement be interpreted to apply only to the Groundwater Storage and Recovery Project contemplated herein and that this Agreement will have no effect whatsoever on the land use planning or land use permitting authority or decision-making of Daly City, San Bruno, South San Francisco or the City and County of San Francisco.

L. It is the intent of the Parties that this Agreement, unless expressly stated otherwise, shall not create, alter or impact the rights of the Parties to pump or utilize water from the Basin or the rights of the Participating Pumpers or Nonparticipating Pumpers as overlying owners, pumpers, appropriators, prescriptors or otherwise.

NOW, THEREFORE, in consideration of the foregoing Recitals, the Parties hereby agree as follows:

ARTICLE 1

DEFINITIONS

As used in this Agreement, each of the following capitalized terms shall have the respective meaning given to it in this section unless expressly stated to the contrary where such term is used.

1.1. **"Aggregate Designated Quantity"** is the groundwater production allocation set forth in **Section 4.5** that the Participating Pumpers can pump from their Existing Facilities and any New Wells during the Term of this Agreement.

1.2. **"Agreement"** shall refer to this Agreement for Groundwater Storage and Recovery from the Southern Portion of the Westside Basin.

1.3. **"Basin"** shall refer solely to the 31 square mile southern portion of the Westside Groundwater Basin, as delineated on the map attached hereto as **Attachment A.**

1.4. **"Basin Management Objectives"** refers to the groundwater quality and quantity objectives set forth in the Management Plan.

1.5. **"Conjunctive Use Pilot Program"** is the program reflected in the First and Second Amendments to Individual Water Supply Contract between the City and County of San Francisco and the City of Daly City for Purposes of Conducting an Aquifer Recharge Study, along with any subsequent letter agreements between the SFPUC and the Participating Pumpers prior to the Effective Date of this Agreement, that authorized the continued delivery of In Lieu Water for study purposes. San Bruno and Cal Water also participated in the Conjunctive Use Pilot Program under respective amendments to their Individual Water Supply Contracts dated December 11, 2002 and December 20, 2002.

1.6. **"Consumer Price Index"** refers to the United States Department of Labor's Bureau of Labor Statistics Consumer Price Index for All Urban Consumers, San Francisco-Oakland-San Jose, California, excluding the shelter component of said index. If the aforesaid Consumer Price Index ceases to be published, any similar index published by any other branch or department of the U.S. government shall be used as the index in this Agreement, and if none is published, another index generally recognized as authoritative shall be substituted therefore by the Parties.

1.7. **"Designated Quantity"** refers to each Participating Pumper's initial production allocation of the Aggregate Designated Quantity identified in **Section 4.5**, subject to adjustment by agreement of the Participating Pumpers as provided in **Section 4.5.**

1.8. **"Emergency"** means a sudden, non-drought event, such as an earthquake or other catastrophic event that results in an insufficient supply of water available to all or part of a Party's service area, or to the combined SFPUC System

wholesale and retail service area, for basic human consumption, firefighting, sanitation, and fire protection.

1.9. **"Existing Facilities"** means those wells and associated infrastructure owned by the Participating Pumpers and in existence as of the Effective Date of this Agreement shown on **Attachment B**, and any replacements of Existing Facilities irrespective of location that may be required to pump the share of the Aggregate Designated Quantity allocated to each Participating Pumper during the Term of this Agreement.

1.10. **"Force Majeure Event"** means an event, conditions or circumstances not the fault of, and beyond the reasonable control of, the Party claiming excuse which makes it impossible or impracticable for such Party to operate Project Facilities, Shared Facilities or Existing Facilities for Project purposes, by virtue of its effect on (1) Project Facilities, Shared Facilities or Existing Facilities and their continued operation; (2) employees essential to such performance; or (3) the financial viability of a Party's continued operation of Project Facilities, Shared Facilities or Existing Facilities for Project purposes. Force Majeure Events include (a) an "act of God" such as an earthquake, flood, earth movement, or similar catastrophic event, (b) an act of the public enemy, terrorism, sabotage, civil disturbance or similar event, (c) a strike, work stoppage, picketing or similar concerted labor action, (d) delays in construction caused by unanticipated negligence or breach of contract by a third party or inability to obtain essential materials after diligent and timely efforts; or (e) adopted legislation or a decision, order or regulation issued by a federal or state court or regulatory agency during the Term of this Agreement.

1.11. **"Hold Periods"** refers to all time periods during the Term of this Agreement that are not declared to be Storage Periods by the SFPUC under **Section 4.2** or deemed to be Recovery Periods under the circumstances described in **Section 5.1**.

1.12. **"In Lieu Water"** is SFPUC System Water, subject to the limitations set forth in WSA section 9.02 for water delivered to Cal Water, that the SFPUC delivers at no charge on an interruptible basis to the Participating Pumpers, up to a maximum rate of delivery of 5.52 mgd, to replace groundwater that the Participating Pumpers refrain from pumping using their Existing Facilities during Storage Periods. In Lieu Water is referred to in the Conjunctive Use Pilot Program agreements as "Supplemental Water".

1.13. **"Individual Water Supply Guarantee"** is the amount of the 184 mgd Supply Assurance guaranteed to an individual wholesale customer under §3.02 of the WSA, as shown for the Participating Pumpers on **Attachments D-1 through D-3**.

1.14. **"Management Plan"** refers to the South Westside Basin Groundwater Management Plan prepared by WRIME, Inc. on behalf of San Bruno, Daly City,

Cal Water, and adopted by San Bruno and Daly City, accepted by Cal Water and received by the SFPUC.

1.15. **"Minimum Groundwater Requirements"** means either (1) the minimum quantity of groundwater pumping that cannot be replaced by delivery of In Lieu Water due to constraints in a Participating Pumper's distribution system that a Participating Pumper must continue to pump from its Existing Facilities combined with pumping from any New Wells during Storage Periods; or (2) the minimum quantity of groundwater pumping needed for Existing Facility or New Well maintenance in accordance with prudent operating parameters, as set forth on **Attachments D-1 through D-3.**

1.16. **"Minimum Surface Water Requirements"** means the minimum quantity of SFPUC System Water that must continue to be supplied to each Participating Pumper during Recovery Periods for purposes of (1) blending with groundwater as may be required to meet drinking water standards promulgated by the California State Water Resources Control Board; or (2) meeting demands in an individual Participating Pumper's service area whose distribution system may not be configured to permit delivery of groundwater to all of its customers, as set forth in **Attachments D-1 through D-3**.

1.17. **"New Well"** means a new groundwater production well in the Basin proposed by a Party that is not intended to replace an existing well, subject to any necessary environmental review under CEQA as set forth in **Section 7.5.**

1.18. **"Nonparticipating Pumpers"** are groundwater users pumping water from the Basin that are not participating in this Agreement.

1.19. **"Operating Committee"** is the committee of SFPUC and Participating Pumper representatives formed pursuant to **Article 10** of this Agreement.

1.20. **"Over Production"** refers to the combined average pumping rate of the Participating Pumpers using their Existing Facilities, including pumping from any proposed New Wells, that exceeds the Aggregate Designated Quantity over the course of a five year period, as explained in **Section 4.5.**

1.21. **"Participating Pumpers"** are the groundwater pumpers in the Basin that are participating in this Agreement: Daly City, San Bruno and Cal Water.

1.22. **"Preexisting Conditions"** refers to conditions in Existing Facilities that, if not properly managed by a Participating Pumper, have the potential to reduce the extraction of Designated Quantities from its Existing Facilities, irrespective of the intermittent operation of Project Wells.

1.23. **"Project"** refers to the proposed Groundwater Storage and Recovery Project described in this Agreement.

1.24. **"Project Capital Costs"** means costs incurred for the construction and acquisition of Project Facilities along with all Project-related planning costs, such as engineering costs, engineering services, costs to obtain Project-related regulatory permits, fees for environmental consultants, legal fees, and other costs that are required to construct and acquire Project Facilities.

1.25. **"Project Facilities"** includes all Project assets, such as Project Wells and all related fixed assets (e.g., real property, water treatment, connecting pipelines) that are acquired or constructed by the SFPUC pursuant to this Agreement and operated as Regional Water Enterprise assets for the allocation of capital costs and operation and maintenance expenses under the WSA, as shown on the map attached as **Attachment C** and listed on **Attachment E.**

1.26. **"Project Operation and Maintenance Expenses"** means the cost of operating and maintaining Project Facilities and Shared Facilities in good working order or repairing those Facilities when necessary, including all Project-related expenses, such as labor, materials and supplies, water treatment, permitting, energy, water quality monitoring and other expenses directly attributable to operation of Project Facilities for Project purposes. Project Operation and Maintenance Expenses may also include expenses incurred by the Participating Pumpers in operating Existing Facilities and new wells provided that such expenses are recommended in advance by the Operating Committee under **Section 9.2.**

1.27. **"Project Wells"** are the wells proposed to be installed for Project purposes, as shown on the map attached as **Attachment C.**

1.28. **"Recovery Notice"** is the written notice issued by the SFPUC declaring a forecasted shortage of water in the SFPUC Water System due to drought, scheduled maintenance, or an Emergency, triggering Recovery of water stored in the SFPUC Storage Account by the Parties to this Agreement at such time as the SFPUC may direct.

1.29. **"Recovery" or "Recovery Periods"** refers to the act of pumping or to periods of pumping of water from the SFPUC Storage Account for Project purposes using Project Facilities as may be directed by the SFPUC or recommended by the Operating Committee under **Section 5.1**. Recovery does not include the pumping of Project Wells for non-Project purposes as described in **Section 8.8**, the pumping of Project Wells for non-Project Emergency purposes under **Section 8.9**, or any volume of Over Production by a Participating Pumper.

1.30. **"Replacement Water"** means the quantity of SFPUC System Water made available by the SFPUC, in accordance with **Section 4.7,** to some or all of the Participating Pumpers based on a determination by the Operating Committee that the Aggregate Designated Quantity in **Section 4.5** should be reduced based on the criterion set forth in **Section 4.7.**

1.31. **"SFPUC System"** is the surface water importation system operated by the SFPUC that diverts, delivers, and accounts for SFPUC System Water to wholesale and retail customers in the SFPUC service area.

1.32. **"SFPUC System Water"** is the water the SFPUC diverts from local Bay Area watersheds and the Tuolumne River for use within the SFPUC service area, and includes any positive balance in the SFPUC Storage Account that is available for pumping using Project Wells connected to SFPUC System transmission mains or to the Participating Pumpers' water distribution systems.

1.33. **"SFPUC Storage Account"** means the book account maintained by the SFPUC showing the amount of water stored in the Basin during Storage Periods under this Agreement, and the amounts described in **Section 6.3** that were previously stored as a result of participation in the Conjunctive Use Pilot Project, less the amount of water pumped by the Participating Pumpers and the SFPUC from Project Wells during Recovery Periods and less losses from the Basin, as determined by the Operating Committee as provided in **Section 6.5**.

1.34. **"Shared Facilities"** refers to an Existing Facility that is owned by a Participating Pumper, as upgraded though the expenditure of Regional capital costs under section 5.04 of the WSA and operated in part as a Project Facility.

1.35. **"Shortage"** means a reduction in SFPUC System Water available to the SFPUC System or portions thereof caused by drought, Emergencies, scheduled maintenance activities, or malfunction of the SFPUC System.

1.36. **"Shortage Allocation"** refers to each Participating Pumper's allocation of SFPUC System Water during periods of mandatory rationing as determined by the wholesale customers in Tier 2 of the Shortage Allocation Plan or any successor plan that may be agreed to by the SFPUC and its wholesale customers during the Term of this Agreement.

1.37. **"Shortage Allocation Plan"** is the Water Shortage Allocation Plan attached as Attachment H to the WSA that describes a method for allocating water between the SFPUC retail and wholesale customer classes during system-wide water shortages that require an average system-wide reduction in water use of up to twenty percent.

1.38. **"Storage" or "Storage Periods"** refers to the act of storing water, or to periods of time when such storage occurs, through the provision of In Lieu Water to the Participating Pumpers, as may be directed by the SFPUC in accordance with **Section 4.3**.

1.39. **"Supply Assurance"** is the total amount (184 mgd) that the SFPUC guarantees it will make available to its wholesale customers on an annual average basis under §3.01 of the WSA.

1.40. **"Supply Year"** refers to the period from July 1 to June 30.

1.41. **"Undesirable Effects"** means a substantial adverse physical change to the Basin caused by Project operation that would result in (1) seawater intrusion, land subsidence, or water quality degradation; (2) material reductions in well yield at, or the inability to pump from, without experiencing excessive pump lifts, one or more wells owned and operated by a Participating Pumper; (3) lowering of groundwater levels such that there would be a substantial (greater than 5%) reduction in the amount of water available in the SFPUC Storage Account; (4) a substantial lowering of groundwater levels such that the impacts identified in subparts (1), (2) or (3) above would result, or any other material adverse physical change on the water supply or operations of a participating pumper. For purposes of this Agreement, "Undesirable Effects" also includes material increases in the cost of operation of Existing or Project Facilities.

1.42. **"Wholesale Water"** is SFPUC System Water that the SFPUC delivers to a Participating Pumper pursuant to the WSA within a Participating Pumper's Individual Water Supply Guarantee, and does not include supplies of In Lieu Water delivered to the Participating Pumpers on an interruptible basis.

1.43. **"WSA"** refers to the Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda, San Mateo and Santa Clara Counties dated July 1, 2009.

ARTICLE 2

EFFECTIVE DATE, TERM AND AMENDMENT

2.1. Effective Date

This Agreement shall be effective as of December 16, 2014, the date that the General Manager of the SFPUC signed this Agreement following approval by the Participating Pumpers (the "Effective Date").

2.2. Term

The term ("Term") of this Agreement shall be co extant with the term of the WSA, subject to the limitations and terms and conditions set forth herein. The Term shall begin on the Effective Date, and shall end on the expiration of the WSA, June 30, 2034. If the term of the WSA is extended as provided in section 2.02 thereof through the addition of any Extension Term(s), the term of this Agreement shall be automatically extended for an identical Extension Term.

2.3. Amendment

The Parties may agree to amend this Agreement in writing from time to time following duly authorized approval of their governing bodies. The matters to be determined by the Operating Committee under **Section 10.2**, and amendments to **Attachments A through G**, do not require the approval of the Parties' governing bodies.

2.4. Conditions Precedent in Article 3; Termination

In the event of the failure or non-waiver of any of the conditions precedent in **Article 3**, the Parties shall meet and confer on the feasibility of satisfying or waiving the conditions. If, after reasonable efforts by the Parties, the conditions precedent in **Article 3** cannot be satisfied or waived, this Agreement shall terminate automatically.

2.5. Consequences of Non-Extension or Termination

If the term of the WSA is not extended pursuant to **Section 2.2**, or if this Agreement terminates pursuant to **Sections 11.1 or 12.14**, the SFPUC shall continue to own and have access to all Project Facilities, and shall have the right to direct the Participating Pumpers to extract and use any remaining water reflected as a credit balance in the SFPUC Storage Account as provided in **Article 5** of this Agreement, until there is no remaining water in the SFPUC Storage Account. Alternatively, the SFPUC may in its sole discretion pump any remaining stored water reflected as a credit balance in the SFPUC Storage Account, subject only to the limitations contained in this Agreement until there is no remaining water in the SFPUC Storage Account. The SFPUC shall allocate the water supply benefit that accrues as a result of such pumping in accordance with Section 3.17 of the WSA. Upon the expiration of this Agreement, the SFPUC shall otherwise have no right, claim or interest in the Basin, or to water in the Basin, pursuant to this Agreement.

ARTICLE 3

CONDITIONS PRECEDENT TO IMPLEMENTATION OF PROJECT

The construction of Project Facilities, the Parties' obligations to operate Project Facilities, Existing Facilities and Shared Facilities in accordance with this Agreement, and the taking of any discretionary actions by any Party in accordance with this Agreement, are subject to the following conditions precedent:

3.1. Permits and Approvals

Compliance with CEQA (California Public Resources Code Section 21000 et seq.) and any other authorizations, consents, licenses, permits and approvals from any governmental authority or person required by applicable law to construct and operate the Project shall have been obtained.

In considering any proposed future discretionary actions that may be proposed in this Agreement, the Parties retain absolute discretion to: (1) make such modifications to any of the proposed discretionary actions as may be necessary to mitigate significant environmental impacts; (2) select feasible alternatives to the proposed discretionary actions that avoid significant adverse impacts; (3) require the implementation of specific measures to mitigate the significant adverse environmental impacts as part of the decision to approve the discretionary actions; (4) balance the benefits of the proposed discretionary actions against any significant environmental impacts before taking final actions to approve the proposed discretionary actions if such significant impacts cannot otherwise be avoided; or (5) determine not to proceed with the proposed discretionary actions.

3.2. No Force Majeure Event

No Force Majeure Event (as defined in **Section 1.10**) shall have occurred and be continuing.

ARTICLE 4

GROUNDWATER STORAGE PERIODS

4.1. SFPUC Storage Through In Lieu Water Deliveries

During Storage Periods the SFPUC may require the Participating Pumpers to store In Lieu Water in the Basin up to a maximum rate of 5.52 mgd. All quantities of In Lieu Water stored in the Basin shall be added to the SFPUC Storage Account, up to a total maximum storage of 61,000 acre feet. All quantities of In Lieu Water delivered to Cal Water shall be in accordance with the terms of the Raker Act and the requirements of WSA section 9.02.

4.2. Notice of In Lieu Deliveries; Duty to Take Delivery of In Lieu Water

The amount of In Lieu Water available for delivery to the Participating Pumpers shall be at the sole discretion of the SFPUC, taking into account hydrologic, operational and other conditions of concern to the SFPUC as the operator of the SFPUC System. If the SFPUC elects to declare a Storage Period and deliver In Lieu Water, the Participating Pumpers shall accept In Lieu Water delivered by the SFPUC in accordance with the terms and conditions of this Agreement.

In accordance with the schedule set forth in the Shortage Allocation Plan, the SFPUC informs its wholesale customers, including the Participating Pumpers, of its final estimate of available SFPUC System Water by April 15th (or sooner if adequate snow survey measurement data is available) to form a robust estimate of the water supply available to the retail and wholesale customer classes for the coming Supply Year. As a part of that annual determination, the SFPUC will give written notice to the Participating Pumpers and the Operating Committee on or before April 15th of the availability, anticipated quantities, and timing of SFPUC In Lieu Water deliveries.

4.3. Reduction in Pumping from Existing Facilities; Minimum Groundwater Requirements

If the SFPUC's notice of available SFPUC System Water states that In Lieu Water is available for delivery to the Participating Pumpers at the maximum total rate of 5.52 mgd, the Participating Pumpers shall each respond to the SFPUC in writing by May 15th regarding whether and to what extent they can accept delivery of In Lieu Water over the course of the coming Supply Year by reducing pumping of their Designated Quantities from their Existing Facilities to the amounts of their respective Minimum Groundwater Requirements shown in **Attachments D-1, D-2 and D-3**.

The Participating Pumpers' may indicate in their responses that they elect to pump groundwater from their Existing Facilities at rates higher than their individual Minimum Groundwater Requirements, up to a cumulative total exceedance of 1.9 mgd, as may be allocated based on mutual agreement of the Participating Pumpers. The Participating Pumpers shall take delivery of a minimum of 5 mgd of In Lieu Water during Storage Periods, or of any smaller quantity of In Lieu Water that is made available by the SFPUC in the notice issued on or before April 15th.

The Participating Pumpers shall decrease pumping from their Existing Facilities on such date as the Parties may agree but no later than July 1, at which time the SFPUC will commence delivery of In Lieu Water up to the amount made available by the SFPUC, and as requested by the Participating Pumpers. All quantities of In Lieu Water delivered by the SFPUC up to a rate of 5.52 mgd will be accounted for as credits in the SFPUC Storage Account.

The Participating Pumpers may operate their Existing Facilities to pump less than their individual Minimum Groundwater Requirements during Storage Periods. Deliveries of SFPUC System Water to offset pumping reductions below a Participating Pumper's Minimum Groundwater Requirement shall not be considered In Lieu Water and are subject to the provisions of **Section 6.4.** Increases in Minimum Groundwater Requirements may be made only with the approval of the Operating Committee under **Section 10.2.5**.

4.4. Location of Delivery of In Lieu Water to Participating Pumpers

The SFPUC shall deliver In Lieu Water to the Participating Pumpers at the existing service connections detailed in each Participating Pumper's Individual Water Supply contract with the SFPUC. To the extent that delivery of In Lieu Water under the Project requires additional service connections to the SFPUC System, such connections shall be considered Project Facilities for cost allocation purposes under **Article 9** of this Agreement.

4.5. Aggregate Designated Quantity; Initial Designated Quantities Assigned to Participating Pumpers

The Participating Pumpers agree to restrict the pumping of groundwater from the Basin utilizing their Existing Facilities, combined with any pumping from proposed New Wells, to the Aggregate Designated Quantity of 7,724 acre feet per year, extracted at an annual cumulative rate of 6.9 mgd. Subject to the limitation on Over Production expressed in **Section 4.8**, the Participating Pumpers may in their sole discretion exceed the 6.9 mgd annual cumulative pumping rate provided that the five-year moving average cumulative pumping rate, computed solely with reference to the previous five years of Recovery and Hold periods, shall not exceed 6.9 mgd. The initial Designated Quantities assigned to each of the Participating Pumpers over the first Supply Year during the Term of this Agreement are as follows:

4.5.1. Daly City: 3,842 acre feet per year, extracted at an annual average rate of 3.43 mgd.

4.5.2. Cal Water: 1,534 acre feet per year, extracted at an annual average rate of 1.37 mgd.

4.5.3. San Bruno: 2,350 acre feet per year, extracted at an annual average rate of 2.1 mgd.

The Designated Quantities set forth in this section may be freely altered, transferred, adjusted or allocated by agreement (collectively, "adjustments") of the Participating Pumpers in each Supply Year during the Term of this Agreement, provided that (1) the Aggregate Designated Quantity is not increased above 6.9 mgd using the five-year moving average described in this section; (2) the adjustments in Designated Quantities are reflected, to the extent possible, in the annual operating plans developed by the Operating Committee under **Section 8.6**; and (3) such adjustments do not exceed 10%, of each Participating Pumper's agreed upon Designated Quantity, plus or minus, for that Supply Year. The Operating Committee may consider an increase to the 10% limitation on adjustments to Designated Quantities expressed in this section in accordance with the criteria set forth in **Sections 4.6.1** and **4.6.2.**

4.6. Increase of Aggregate Designated Quantity

The future operation of the Basin for Project purposes, and continued water level monitoring by the Parties in accordance with the Management Plan, may result in mutual agreement that the Aggregate Designated Quantity set forth in **Section 4.5** may be below the yield of the Basin. Requests by the Participating Pumpers to extract groundwater above the Aggregate Designated Quantity may be approved by the Operating Committee as set forth in **Section 10.2.12**. As of the Effective Date of this Agreement, the Participating Pumpers are not planning to extract groundwater above the Aggregate Designated Quantity, but are incorporating a process for adjusting the Aggregate Designated Quantity should the Operating Committee decide to exercise its discretion to do so in the future, following compliance with CEQA to the extent required. Potential increases in the Aggregate Designated Quantity may be considered by the Operating Committee under any of the following circumstances:

4.6.1. Based on actual water level data and operational experience, or changed conditions, following the completion and acceptance of Project Facilities as reflected in a resolution of the SFPUC.

4.6.2. At any time following the permanent replacement of groundwater pumped by a Nonparticipating Pumper with water from another source, e.g. recycled water.

4.7. Reduction in Aggregate Designated Quantity; Provision of Replacement Water by the SFPUC

The Operating Committee may determine under **Section 10.2.12** that it is necessary to reduce the Aggregate Designated Quantity set forth in **Section 4.5**. Any decision of the Operating Committee to reduce the Aggregate Designated Quantity shall be based solely on a determination that continued pumping of the Aggregate Designated Quantity will result in the long term decline of Basin water levels absent Project operations in a manner that substantially interferes with the ability to extract water from the SFPUC Storage Account during Recovery Periods.

The determination of each Participating Pumper's share of any reduction in the Aggregate Designated Quantity shall be by agreement of the Participating Pumpers. In the event the Participating Pumpers are unable to reach agreement, Section 12.1 shall apply. Following such agreement, the SFPUC agrees that it will provide a total of up to 500 acre feet of Replacement Water per year to the Participating Pumpers at a cost of $226.53 per acre foot within 60 days of receipt of written notification by the affected Participating Pumper(s). The price of Replacement Water may be adjusted annually by the SFPUC based on the Consumer Price Index.

The supply of Replacement Water by the SFPUC shall not increase a Participating Pumper's Individual Water Supply Guarantee under the WSA and shall be consistent with section 9.02 of the WSA. In the event that the SFPUC offers to increase the Supply Assurance under section 4.06 of the WSA, and one or more Participating Pumpers receiving Replacement Water requests and receives an increase in its Individual Water Supply Guarantee, then the SFPUC's obligation to provide Replacement Water shall cease to the extent of the increase in the Participating Pumper's Individual Water Supply Guarantee that is offered by the SFPUC, and the corresponding amount of Replacement Water formerly supplied by the SFPUC shall be priced at the then-current SFPUC wholesale water rate. Alternatively, the SFPUC's obligation to provide a Replacement Water supply to one or more Participating Pumpers may be retired in whole or part if the SFPUC pays a mutually agreed upon one-time capital cost contribution towards a permanent replacement of groundwater pumped by a Nonparticipating Pumper with water from

another source in the Basin as provided in **Section 4.6.2.** Prior to making any decision to retire a Replacement Water obligation by making a capital cost contribution towards a permanent replacement of groundwater pumped from the Basin, the SFPUC agrees that it will solicit input and recommendations from the Bay Area Water Supply and Conservation Agency and the wholesale customers under WSA section 3.15.B. The provision of Replacement Water described in this section shall not be construed as precedent for the allocation of surface water by the SFPUC in any future water transfer or SFPUC System capital project involving other wholesale water customers of the SFPUC.

The notice(s) from the affected Participating Pumper(s) requesting delivery of Replacement Water shall, on an annual basis, select one of the following options:

4.7.1. An annual transfer of storage credits in the SFPUC Storage Account.

4.7.2. Provision of interruptible supplies of surface water from the SFPUC System, provided that the SFPUC determines, in its sole discretion, that such supplies are available.

4.8. Over Production of Water in Excess of Aggregate Designated Quantity

At the close of each Supply Year, beginning in the fifth year of Project operations, the Operating Committee will determine whether the Participating Pumpers engaged in Over Production, and if so, identify which Participating Pumper(s) were responsible for the Over Production by pumping more than its agreed upon Designated Quantity during the previous five year averaging period. Over Production shall never exceed an amount that is 10% over the Aggregate Designated Quantity (7.6 mgd) in any Supply Year or the five-year moving average amount of 6.9 mgd calculated as provided in **Section 4.5** above. No volume of Over Production shall result in any deduction of water from the SFPUC Storage Account. Any Participating Pumper determined by the Operating Committee to be responsible for Over Production shall take one of the following corrective actions:

4.8.1. reduce pumping below its Designated Quantity, not including Storage Periods, by a commensurate amount to restore water to the Basin in the amount of the Over Production which will result in the five year moving average basis of 6.9 mgd being achieved;

4.8.2. replace the quantity of water pumped in excess of the Designated Quantity with water from another source or supply, resulting in an equivalent amount of water being stored in the Basin, subject to the approval of the Operating Committee under **Section 10.2.12**; or

4.8.3. other appropriate measures proposed by the Parties, subject to the approval of the Operating Committee under **Section 10.2.12.**

A Participating Pumper that engages in Over Production shall propose its preferred method for remedying the Over Production by August 1st of the succeeding Supply Year and shall so inform the other members of the Operating Committee. If the proposed remedy for Over Production requires a decision of the Operating Committee under **Section 10.2.12,** the Operating Committee shall convene within 30 days of receipt of the proposal. The corrective measures set forth in **Sections 4.8.1 through 4.8.3** shall not be applicable to Over Production required solely due to an Emergency or for Project Management purposes as directed by the Operating Committee under **Section 5.2.3.**

ARTICLE 5

RECOVERY OF SFPUC STORAGE ACCOUNT WATER FROM PROJECT WELLS

5.1. Circumstances Triggering Recovery of SFPUC Storage Account Water by Participating Pumpers

Pursuant to **Section 5.2**, the SFPUC will determine the quantity of groundwater to be pumped from the SFPUC Storage Account using Project Wells in any of the following circumstances:

5.1.1. During Shortages caused by drought using the process set forth in the Shortage Allocation Plan, and as set forth in Section 5.2.1; or

5.1.2. During Shortages caused by an Emergency, SFPUC System rehabilitation, scheduled maintenance, or malfunction of the SFPUC System, any of which permit the SFPUC to temporarily reduce deliveries of Wholesale Water to all or some of its wholesale customers as set forth in WSA §3.11; or

5.1.3. Upon recommendation of the Operating Committee, including for purposes of managing the SFPUC Storage Account.

5.2. Timing of Recovery of Water from SFPUC Storage Account

5.2.1. Drought Recovery

The SFPUC may issue a Recovery Notice during droughts when the SFPUC determines that available water supplies from the SFPUC System are insufficient to meet customer purchase projections using the process set forth in the Shortage Allocation Plan. During Shortages caused by drought, the SFPUC may choose to exercise its dry year water supply options, including but not limited to Recovery of water from the SFPUC Storage Account; requesting voluntary reductions in water use or imposition of mandatory rationing; or any combination of these measures. Upon issuance of a Recovery Notice by the SFPUC, the Parties and the Operating Committee shall make plans and preparations for the possible Recovery of SFPUC Storage Account water commencing on July 1 or such later date as the Recovery Notice shall direct, pursuant to **Section 5.3** below. In successive dry years, the SFPUC's initial determination of water availability under the Shortage Allocation Plan shall include the remaining volume of water in the SFPUC Storage Account, and the SFPUC may direct the Participating Pumpers to continue Recovery from Project Wells under their operational control in each successive dry year until the total volume in the SFPUC Storage Account is exhausted.

5.2.2. Non-Drought Shortages

During Shortages that would be caused by SFPUC System rehabilitation or scheduled maintenance, the SFPUC's Recovery Notice shall provide not less than 60 days' advance notice to the Participating Pumpers and the Operating Committee that water must be pumped from the SFPUC Storage Account using Project Wells. During Emergencies or malfunctioning of the SFPUC System that

prevent the SFPUC from meeting water demands in its combined retail and wholesale service areas at established level of service goals for the delivery of SFPUC System Water, the SFPUC may issue a written Recovery Notice that requires Recovery by the Participating Pumpers as soon as is reasonably practicable.

5.2.3. Management of SFPUC Storage Account

For purposes of managing the SFPUC Storage Account, the Operating Committee may authorize pumping outside of Recovery Periods and shall develop a schedule of pumping pursuant to **Section 10.2.2** that provides adequate notice to the Parties of the need to pump water from the SFPUC Storage Account.

5.3. Issuance of Recovery Notice by the SFPUC

Based on the circumstances and timing set forth in **Sections 5.2.1 and 5.2.2**, the SFPUC may, in order to manage the limited supply of SFPUC System Water during Shortage, issue a Recovery Notice directing that groundwater be pumped by Participating Pumpers from Project Wells in the Basin, up to the cumulative total amount available in the SFPUC Storage Account and in accordance with the Operating Committee's (1) operating schedule developed pursuant to **Section 10.2.2** and (2) rules for accounting for storage losses from the Basin pursuant to **Sections 6.5** and **10.2.10**.

5.4. Quantities of Water Available to Participating Pumpers from Project Facilities and SFPUC System Connections During Shortages Caused by Drought

During Shortages caused by drought that require mandatory rationing, the quantity of groundwater pumped by each Participating Pumper from the SFPUC Storage Account using Project Facilities, plus each Participating Pumper's Minimum Surface Water Requirement, shall not exceed the volume of the Wholesale Water allocation that would have been available to that Participating Pumper under the methodology adopted by all of the wholesale customers under section 2.2 of the Shortage Allocation Plan. During Shortages caused by drought that require mandatory rationing, the Participating Pumpers may not take delivery of SFPUC Surface Water in excess of the volumes that would have been available to them under section 2.2 of the Shortage Allocation Plan as a substitute for reduced pumping from their Existing Facilities or from Project Wells under their operational control.

5.5. Minimum SFPUC System Water Deliveries to Participating Pumpers during Recovery Periods

During Recovery Periods, the SFPUC shall continue to supply each Participating Pumper with its Minimum Surface Water Requirements, as set forth in **Attachment D**. Changes in Minimum Surface Water Requirements may be made only with the approval of the SFPUC, which shall not be unreasonably withheld.

5.6. Recovery of Stored Water by the SFPUC

Project Facilities include Project Wells located on SFPUC System transmission line rights of way which may, in addition to Project Wells operated by the Participating Pumpers, be operated by the SFPUC for the Recovery of SFPUC Storage Account water pursuant to **Section 5.1**. These Project Wells are shown on **Attachment C**.

5.7. Limitations on Recovery

The Parties agree that Recovery will never exceed the cumulative amount of water available in the SFPUC Storage Account (taking into consideration Basin losses measured in accordance with the methodology adopted by the Operating Committee in accordance with **Section 6.5**), and that Recovery will never exceed 8,100 acre-feet per Supply Year withdrawn at an average rate of 7.2 mgd. The SFPUC further agrees that it will not pump or recover any water from the Basin unless there is a positive balance in the SFPUC Storage Account. If the SFPUC pumps or recovers any water from the Basin in excess of the balance available in the SFPUC Storage Account, the SFPUC must transfer a corresponding amount of SFPUC System Water to the Basin over the course of the succeeding Supply Year at no cost to the Participating Pumpers.

ARTICLE 6

PROJECT WATER ACCOUNTING

6.1. Accounting for Storage and Recovery

Accounting for Storage and Recovery of groundwater in the SFPUC Storage Account is to be performed on the following basis:

6.1.1. Storage Period Accounting. All quantities of In Lieu Water delivered to the Participating Pumpers will result in a corresponding credit to the SFPUC Storage Account. The SFPUC's calculation of Storage Account credits will be based on the volume of In Lieu Water delivered to each Participating Pumper through its service connections to the SFPUC System. The total volume of In Lieu Water delivered during Storage Periods will be measured based on the delta between the combined metered reductions in each Participating Pumper's annual Designated Quantity and its respective Minimum Groundwater Requirement. The Participating Pumpers will provide metered volumes of groundwater produced from their Existing Facilities to the SFPUC on a monthly basis. Quantities of In Lieu Water delivered to each Participating Pumper by the SFPUC will be reflected in the next SFPUC monthly billing to each Participating Pumper for Wholesale Water, along with the cumulative total of prior In Lieu Water deliveries during Storage Periods.

6.1.2. Recovery Period Accounting. All quantities of groundwater pumped from Project Wells by the Parties for Project purposes will result in a corresponding debit to the SFPUC Storage Account. Pumping for Project purposes includes pumping of up to 265 acre feet per year from Project Wells for purposes of maintaining well capacity when idle during Storage Periods and Hold Periods. The SFPUC's calculation of Storage Account debits will be based upon Project Well meter readings made by or provided to the SFPUC. During Recovery Periods, the SFPUC's monthly billings to each Participating Pumper for Wholesale Water will include the total metered extractions of SFPUC Storage Account Water from Project Wells by the Parties, along with the balance remaining in the SFPUC Storage Account.

6.1.3. Water Accounting for Use of Project Facilities for Non-Project Purposes or During Emergencies. The Participating Pumpers' use of Project Facilities for non-Project purposes under **Section 8.8** shall not result in a corresponding debit to the volume of water stored in the SFPUC Storage Account. A Participating Pumper's use of Project Facilities during a local Emergency under **Section 8.9** shall not result in a corresponding debit to the volume of water stored in the SFPUC Storage Account, unless the SFPUC determines, in its sole discretion, that such pumping is required under **Section 5.2.2** in order to maintain water deliveries from the SFPUC System to its combined wholesale and retail service area at the SFPUC's established level of service goals.

6.2. Accounting for Wholesale Water

Wholesale Water deliveries shall continue to be paid for by the Participating Pumpers pursuant to the WSA and shall not increase the credit balance in the SFPUC Storage Account. The SFPUC's delivery of Replacement Water, and interruptible supplies of In Lieu Water to a Participating Pumper in excess of its Individual Water Supply Guarantee, shall not be construed to create any liability, dedication to public use, or obligation on the part of the SFPUC to provide a greater volume of water to that Participating Pumper than its Individual Water Supply Guarantee, as set forth in Attachment C to the WSA.

Apart from changes in the timing of SFPUC System Water delivery and payment therefore in accordance with conjunctive operation of the Basin, and as is set forth in **Section 12.18** of this Agreement, nothing in this Agreement is intended to affect the Participating Pumpers' rights to, and payment for, Wholesale Water, including each Participating Pumper's share of payment for SFPUC System Regional asset capital costs and associated operating expense categories under the WSA.

6.3. Accounting for In Lieu Water Delivered during Conjunctive Use Pilot Program

During the Conjunctive Use Pilot Program, the SFPUC delivered In Lieu Water to the Participating Pumpers. The following quantities of water have been added to the SFPUC Storage Account as a result of the Conjunctive Use Pilot Program:

6.3.1. **Daly City** - During the Conjunctive Use Pilot Program, up until April 1, 2006, the SFPUC delivered 9,573 acre feet of In Lieu Water to Daly City, which paid for that water at the $0.35 per unit rate established under the Conjunctive Use Pilot Program. That water, which is included as a credit balance to the SFPUC Storage Account, shall be pumped first at no charge to Daly City upon the future initiation of Recovery.

From April 1, 2006 through March 31, 2011, the SFPUC continued to periodically deliver In Lieu Water to Daly City at no charge, resulting in an additional credit of 7,864 acre feet in the SFPUC Storage Account. Those deliveries shall be credited to the SFPUC Storage Account, and, when Recovery is initiated, and after Daly City has received, at no charge, 9,573 acre feet stored under the Conjunctive Use Pilot Program, Daly City shall pay for groundwater

pumped from the SFPUC Storage Account as provided in **Section 6.4** of this Agreement.

6.3.2. **Cal Water** - During the first phase of the Conjunctive Use Pilot Program, between February 1, 2003 and November 30, 2003, the SFPUC delivered 802 acre feet of In Lieu Water to Cal Water, which paid for that water at the $0.35 per unit rate established under the Conjunctive Use Pilot Program.

When the Conjunctive Use Pilot Program restarted on April 1, 2004, Cal Water did not participate and did not resume pumping any part of its Designated Quantity, but continued to rely on Wholesale Water for all of its water needs in its South San Francisco service area. This resulted in an increase in Basin water levels as if Cal Water had continued to participate in the Conjunctive Use Pilot Program, and a corresponding increase in the SFPUC Storage Account of 938 acre feet between April 1, 2004 and March 1, 2005. The SFPUC will reduce Cal Water's FY 2014-15 Wholesale Water billings by $315,323 (three hundred fifteen thousand three hundred twenty three dollars), representing the difference between the rate charged for 938 acre feet of water delivered under the Conjunctive Use Pilot Program and the established FY 2003-04 and FY 2004-05 SFPUC Wholesale Water rates paid by Cal Water, as if Cal Water had continued to participate in the Conjunctive Use Pilot Program between April 1, 2004 and March 1, 2005. The SFPUC will make the credit adjustment to Cal Water's FY 2014-15 Wholesale Water account by no later than June 30, 2015. Following the SFPUC's adjustment of Cal Water's Wholesale Water payment balance to reflect the previous storage of 938 acre feet in the SFPUC Storage Account, the total quantity of water delivered to Cal Water between February 1, 2003 - November 30, 2003 and April 1, 2004 – March 1, 2005 (1,740 acre feet) shall be pumped first at no charge to Cal Water upon the future initiation of Recovery. The SFPUC shall reimburse Cal Water an amount not to exceed $80,000 (eighty thousand dollars), based on invoices submitted and approved by the SFPUC, for design costs previously incurred by Cal Water as Project Capital Costs to evaluate the feasibility of co-locating Shared Facilities for Project Well no. 13 at Cal Water's existing South San Francisco water treatment facilities. Should Cal Water ultimately approve construction of these Shared Facilities, the SFPUC will contribute an additional amount not to exceed $500,000 (five hundred thousand dollars) towards the total costs of Cal Water's Shared Facilities as a Project Capital Cost, and shall reimburse Cal Water for design and construction costs as a lump sum payment prior to construction, for a total potential not to exceed amount of $580,000 (five hundred eighty thousand dollars). Operation and maintenance expenses incurred by Cal Water as a result of operating Shared Facilities for Project purposes as a Project Facility shall be reimbursed by the SFPUC as Project Operations and Maintenance Expenses in accordance with **Section 9.2.**

When Recovery is initiated, and after Cal Water has received, at no charge, 1,740 acre feet stored between February 1, 2003 and March 1, 2005, Cal Water shall

pay for groundwater pumped from the SFPUC Storage Account as provided in **Section 6.4** of this Agreement.

6.3.3. **San Bruno** - During the Conjunctive Use Pilot Program, up until March 1, 2005, the SFPUC delivered 3,915 acre feet of In Lieu Water to San Bruno, which paid for that water at the $0.35 per unit rate established under the Conjunctive Use Pilot Program. That water, which is included as a credit balance to the SFPUC Storage Account, shall be pumped first at no charge to San Bruno upon the future initiation of Recovery.

When Recovery is initiated, after San Bruno has received, at no charge, 3,915 acre feet stored under the Conjunctive Use Pilot Program, San Bruno shall pay for groundwater pumped from the SFPUC Storage Account as provided in **Section 6.4** of this Agreement.

San Bruno and SFPUC agree to execute a memorandum of understanding that reflects the SFPUC's intent to provide for, or to construct at the SFPUC's expense, facilities for the emergency storage of one million gallons of water in pressure zone 1/4, or equivalent, during Storage Periods since San Bruno's Existing Facilities would not be immediately available to supply water during an emergency.

6.4. Deferred Payment for Stored In Lieu Water Supplies

Except as expressly provided in **Section 6.3** of this Agreement, a Participating Pumper will not pay for In Lieu Water at the time of delivery. Rather, payment will be deferred until Recovery by pumping. The SFPUC will bill, and the Participating Pumper will pay, for groundwater pumped by the Participating Pumper from the SFPUC Storage Account using Project Facilities at the then-applicable Wholesale Water rate established by the SFPUC. During Storage Periods, each Participating Pumper shall pay the established SFPUC Wholesale Water rate for all quantities of Wholesale Water that are delivered to it as a result of pumping from Existing Facilities at a rate less than its Minimum Groundwater Requirement.

6.5. Accounting for Losses

Groundwater modeling performed by the Parties as well as the Management Plan have determined that the Basin is not a closed basin. Therefore, the Operating Committee shall develop and adopt, and periodically revise, if necessary, a proposal for accounting for losses from the Basin under **Section 10.2.10**, including, if necessary, a reduction in the Aggregate Designated Quantity under **Section 4.7** or to the volume of water in the SFPUC Storage Account, which shall be consistent with generally accepted principles of groundwater accounting and management.

ARTICLE 7

OWNERSHIP, OPERATION, MAINTENANCE AND REPLACEMENT OF EXISTING FACILITIES

7.1. Ownership, Operation, Maintenance and Replacement of Existing Facilities

Each Participating Pumper will continue to own, operate, maintain and replace, if necessary, its Existing Facilities during the Term of this Agreement. This Agreement does not authorize nor prohibit the replacement of Existing Facilities, which shall be based solely on the discretion of each Participating Pumper following environmental review under CEQA, if necessary. Each Participating Pumper further agrees that it is solely responsible for all costs associated with the operation, maintenance, repair and replacement of its Existing Facilities, except to the extent authorized in **Section 9.2**.

7.2. Operation and Maintenance of Existing Facilities

Each Participating Pumper agrees, to the extent practicable and economically feasible, to operate, maintain, repair and replace its Existing Facilities (1) in accordance with this Agreement and applicable laws, rules, regulations, guidelines, well encrustation studies and prudent utility operator standards, including management of any Preexisting Conditions to avoid interference with Recovery of water from the SFPUC Storage Account; (2) in accordance with its agreed upon share of the Aggregate Designated Quantity set forth in **Section 4.5;** and (3) in a manner that will not cause Undesirable Effects on Project Wells or the wells of other Participating Pumpers. The Participating Pumpers agree to use best efforts to maintain their Existing Facilities in good repair so as to be fully capable of producing the Aggregate Designated Quantity set forth in **Section 4.5** during Recovery Periods.

7.2.1. During the period following the SFPUC's issuance of a Recovery Notice for a potential drought pursuant to **Section 5.2.1**, each Participating Pumper shall conduct such testing and perform all maintenance or rehabilitation work on its Existing Facilities that may be required to produce its agreed upon Designated Quantity by the date specified in the Recovery Notice and over successive years if the drought continues. Within 30 days of receipt of the initial Recovery Notice under **Section 5.2.1**, and during each successive drought year, each Participating Pumper shall submit a written report to the Operating Committee signed by its licensed system operator that describes (1) the condition of its Existing Facilities; (2) whether its Existing Facilities are capable of producing its Designated Quantity by the date specified in the Recovery Notice; and (3) what steps must be undertaken by the Participating Pumper to improve its Existing Facilities in the event that it cannot produce its Designated Quantity by the date specified in the Recovery Notice.

7.2.2. In the event that the initial or subsequent reports reveal that a Participating Pumper's Existing Facilities are not capable of producing its share of the Aggregate Designated Quantity, the Participating Pumper shall provide additional reports on a quarterly basis to the Operating Committee until it has resolved the problem, as certified by its licensed system operator.

7.2.3. In the event of the temporary outage of Existing Facilities, the Participating Pumper owning the Existing Facility shall notify the Operating Committee of the

nature and extent of the outage. To the extent the Participating Pumper is able to obtain permission for the use of alternative facilities owned by Nonparticipating Pumpers (such as cemetery or golf course wells) for the production of its Designated Quantity, the Participating Pumper may utilize such alternative facilities after notification to and review by the Operating Committee.

7.3. Failure to Maintain, Repair, or Replace Existing Facilities

In the event that a Participating Pumper cannot provide certification by its licensed system operator that it has undertaken and completed the work identified in the initial report to the Operating Committee under **Section 7.2** by the date specified in the SFPUC's Recovery Notice under **Section 5.2.1**, the SFPUC shall have no obligation to increase the quantity of Wholesale Water available to the Participating Pumper under the Shortage Allocation Plan to make up any shortfall in the production of that Participating Pumper's Designated Quantity caused by the unavailability of its Existing Facilities.

7.4. Measurement of Water Pumped Using Existing Facilities

All Parties shall install, maintain and use adequate measuring devices on all water pumped from Existing Facilities, New Wells, and Project Wells, and shall report accurate measurements of all water pumped from Existing Facilities, New Wells and Project Wells to any Party and the Operating Committee upon request. All meters shall be maintained to be accurate within plus or minus 2%.

7.5. Drilling and Operation of New Wells by Parties

The SFPUC agrees not to construct or operate New Wells in the Basin other than (1) pursuant to this Agreement; (2) the certified Project final environmental impact report, and any addenda or supplements thereto; and (3) with the approval and agreement of the Participating Pumpers following amendment of this Agreement as provided in **Section 2.3**. Prior to drilling a test hole that may result in construction of a New Well, each Party proposing to construct and operate a New Well shall (i) provide written notice to the Operating Committee and the other Parties of its intent to do so; (ii) conduct environmental review to the extent required under CEQA of the impacts associated with construction and operation of the proposed New Well; (iii) if necessary, provide the Operating Committee with an analysis of mutual pumping interference effects between the proposed New Well and potentially affected Project Facilities and Existing Facilities operated by other Parties; and (iv) obtain a well construction permit from San Mateo County or the public entity with jurisdiction over well construction permits for the proposed New Well, if necessary. The Parties shall be given written notice and opportunity to comment on any environmental documentation prepared for a New Well within the time frame allowed for public comment under CEQA, and shall also be copied on any CEQA notices of exemption or notices of determination filed by a Party in connection with carrying out the approval of a New Well. All New Wells proposed by the Parties shall be located, constructed and operated in a manner that will not cause Undesirable Effects. Once operational, New Wells installed by the Participating Pumpers shall be considered to be Existing Facilities.

ARTICLE 8

OWNERSHIP, INSTALLATION, OPERATION, AND MAINTENANCE OF PROJECT FACILITIES

8.1. Project Facilities

Project Facilities, shown on the map attached as **Attachment C** and listed on **Attachment E**, are required to make use of 61,000 acre feet per year of the available storage capacity in the Basin by facilitating the simultaneous extraction of the Aggregate Designated Quantity by the Participating Pumpers from their Existing Facilities and stored SFPUC System Water by the Parties from Project Wells during Recovery Periods.

8.2. Real Property Interests Required for Project Implementation

Project Facilities may be located on lands within the service areas of the Participating Pumpers and/or on lands owned or acquired by the SFPUC. The SFPUC will acquire all real property interests that are necessary for the installation of, and access to, Project Facilities. The SFPUC agrees to grant suitable licenses to each Participating Pumper to the extent required for access to Project Facilities connected to a Participating Pumper's water distribution system. Each Participating Pumper agrees to grant the SFPUC suitable licenses for all Project Facilities on or across land owned by that Participating Pumper. All licenses exchanged by the Parties will follow the format used in **Attachment G**, subject to modification as necessary to address site specific needs and conditions. Each Participating Pumper further agrees to use reasonable best efforts to assist the SFPUC in securing fee title or easements for Project Facilities that may be located on property owned by other governmental entities within the service areas of the Participating Pumpers.

8.3. Ownership of Project Facilities

All Project Facilities will be owned by the SFPUC, subject to the limitations and restrictions within this Agreement.

8.4. Installation of Project Facilities

The SFPUC shall be solely responsible for the permitting, licensing, design, construction, and installation of Project Facilities under this Agreement. Each Participating Pumper shall have the right to approve the location of Project Facilities on land owned by such Participating Pumper, along with the design and the construction schedule for installation of any Project Facilities in its service area, which approvals shall not be unreasonably delayed or withheld. At the 10, 35, 65, 95 and 100% stages of design, the SFPUC will provide each Participating Pumper with the plans and specifications of work to be performed on the Participating Pumper's property or within its service area. Pending completion of design, the proposed location of Project Facilities is generally shown on the map attached as **Attachment C** and described in **Attachment E**. As set forth in **Section 12.3** of this Agreement, the SFPUC will require in all construction contracts for Project Facilities that the Participating Pumpers, and their respective officers, agents and employees, be named (1) as additional insureds on all required insurance policies, and (2) as additional indemnitees in any contractual indemnity provisions. Project Facilities constructed on land owned or acquired by the SFPUC shall be immune from San Bruno and Daly City planning,

zoning and building permit requirements pursuant to the doctrine of intergovernmental immunity set forth in the case law interpreting California Government Code §§53090 et seq.

8.5. Provision of As-Built Drawings; Modifications to Project Facilities Following Completion

Within three (3) months of completion and acceptance of Project Facilities (as reflected in a Resolution adopted by the SFPUC), the SFPUC shall deliver to each Participating Pumper a complete set of as-built drawings and specifications for all Project Facilities located within its service area. Should improvements and/or modifications be made to Project Facilities, the SFPUC will provide each Participating Pumper with revised as-built drawings and specifications within three (3) months of completing the improvements and/or modifications to Project Facilities.

8.6. Operation and Maintenance of Project Facilities; Potential Undesirable Effects Associated with Operation of Project Facilities as Designed

The Operating Committee will develop annual operation, maintenance and monitoring plans under the Project pursuant to Section 10.2.1. The Operating Committee will also develop annual operating schedules for each Supply Year during Recovery Periods, including projected groundwater storage and/or Recovery from Project Wells of any water available in the SFPUC Storage Account and pursuant to Section 10.2.2. Each Participating Pumper agrees to operate, maintain, and repair Project Facilities (except those Project Facilities connected to the SFPUC System transmission mains) that are connected to its distribution system as necessary to comply with the terms of this Agreement and to further the aims of the Project in accordance with applicable laws, rules, regulations, guidelines, and prudent utility operator and asset management standards, and in accordance with the annual operation, maintenance and monitoring plans approved by the Operating Committee under **Sections 10.2.1** and **10.2.2**. The SFPUC will operate, maintain and repair all Project Facilities connected to SFPUC System transmission mains. When the Project Facilities reach the end of their useful service lives, the SFPUC shall reasonably determine whether to replace or abandon all or any portion of Project Facilities.

8.6.1. The estimated pumping level drawdown effects upon Existing Facilities resulting from the future operation of Project Wells over a hypothetical seven and one-half year drought are set forth in **Attachments D-1, D-2 and D-3**. The Participating Pumpers agree that the estimated pumping water levels shown in **Attachments D-1, D-2 and D-3** are acceptable and will not cause any Undesirable Effects to their Existing Facilities.

8.6.2. Should actual operating experience of Project Wells cause greater pumping level drawdown effects than estimated in **Attachments D-1, D-2 or D-3**, that are determined by the Operating Committee to be Undesirable Effects, the Operating Committee shall have the authority to require the measures outlined in **Section 10.2.8** in order to eliminate or reduce the Undesirable Effect(s) to a less than significant level.

8.7. Modifications to Participating Pumpers' Water Supply Permits Issued by the California State Water Resources Control Board

Installation and operation of Project Facilities may require amendments to the Parties' drinking water supply permits issued by the Division of Drinking Water and Environmental Management

(DDWEM). The Parties will be solely responsible for obtaining any DDWEM permit modifications and for permit compliance related to the operation of Project Facilities connected to their water transmission and distribution systems. The SFPUC will assist in preparing exhibits required for the Participating Pumpers' permit amendment packages submitted to DDWEM. All costs incurred by the Parties in obtaining such permit modifications shall be considered Project Capital Costs. Each Party that operates Project Wells, and the downstream facilities that receive water from those Project Wells, shall be named as the Operator of Record in the modified water supply permits issued by DDWEM.

8.8. Use of Project Facilities by Participating Pumpers for Non-Project Purposes

The Participating Pumpers may use Project Facilities for non-Project purposes upon satisfaction of all of the following conditions precedent:

(a) the SFPUC has not issued a Recovery Notice directing the Participating Pumpers to pump water from the SFPUC Storage Account under **Section 5.3** of this Agreement;

(b) use of Project Facilities for non-Project purposes does not interfere with future Recovery under the Project, as determined by the Operating Committee;

(c) the quantity of water pumped using Project Facilities for non-Project purposes does not, when combined with pumping from Existing Facilities, exceed the Participating Pumper's Designated Quantity; and

(d) the Operating Committee has approved the proposed use of Project Facilities for non-Project purposes.

The Operating Committee will consider all requests for use of Project Facilities for non-Project purposes within 30 days. As of the Effective Date of this Agreement, the Parties do not contemplate any specific use of Project Facilities for non-Project purposes, but the Parties desire to incorporate a process for allowing such use should they decide to exercise their discretion to do so in the future following compliance with CEQA to the extent required. Except as approved by the Operating Committee, use of Project Facilities for non-Project purposes pursuant to this section shall not exceed thirty (30) days' duration. The approved use of Project Facilities for non-Project purposes is not subject to the limitation on Recovery set forth in **Section 5.7**, and groundwater pumped pursuant to this section will not be debited against the SFPUC Storage Account as provided in **Section 6.1.3**.

8.9. Use of Project Facilities During an Emergency

The Parties may use Project Facilities within their service areas without the advance approval of the Operating Committee for non-Project purposes during a local Emergency that does not result in the SFPUC issuing Recovery Notice under **Section 5.3**, provided that the Project Facilities are capable of operation during an Emergency. Such pumping may continue only for the duration of the Emergency. Within 48 hours of such Emergency, the Party or Parties shall notify and explain to the Operating Committee the basis of the Emergency. The Party will, at intervals established by the Operating Committee, report on its efforts to resolve the Emergency.

ARTICLE 9

PROJECT COST RECOVERY

9.1. Project Capital Costs

The SFPUC will provide all funding required for payment of Project Capital Costs. To the extent that the Participating Pumpers directly provide in-kind services, real property, equipment assets in furtherance of the construction of Project Facilities, and Shared Facilities for Project purposes, the value of these contributions shall be included within Project Capital Costs. All Project Facilities listed on **Attachment E** will be classified as Regional SFPUC System assets for purposes of cost recovery under the WSA, unless indicated otherwise. The capital costs and operation expenses of Shared Facilities that are used and useful to a Participating Pumper irrespective of Project operations shall be allocated between the SFPUC and that Participating Pumper on the basis of mutual agreement or as otherwise specified in this Agreement. On an annual basis during construction of Project Facilities and Shared Facilities, the SFPUC will include information detailing estimated and actual Project Capital Costs in accordance with the requirements of WSA sections 5.04 and 6.08.

9.2. Project Operation and Maintenance Expenses

The SFPUC shall annually reimburse each Participating Pumper for all Project Operation and Maintenance Expenses actually incurred in the operation and maintenance of Project Facilities and Shared Facilities for Project purposes. The SFPUC's reimbursement obligation does not extend to Project Operation and Maintenance Expenses incurred by the Participating Pumpers for the operation of Project Facilities for non-Project purposes permitted in **Sections 8.8** and **8.9**. By November First of each year during the Term, each Participating Pumper shall provide an estimated Project Operations and Maintenance Expenses budget to the Operating Committee for the coming Supply Year as referenced in **Section 10.2.1**. The Operating Committee, on a case-by-case basis, may also recommend that the SFPUC reimburse the Participating Pumpers for operations and maintenance expenses incurred in the operation of Existing Facilities that are attributable to Undesirable Effects caused by Project operations. A Participating Pumper requesting reimbursement of expenses for the operation and maintenance of Existing Facilities shall certify that it has been operating and maintaining its Existing Facilities in a reasonable and prudent manner, including but not limited to management of the effects of Preexisting Conditions. All Project Operation and Maintenance Expenses, including expenses incurred by the SFPUC for the operation and maintenance of Project Wells connected to SFPUC System transmission mains, shall be considered Regional operation and maintenance expenses under WSA section 5.05, as further detailed in **Attachment F**. Project Operation and Maintenance Expenses incurred by a Participating Pumper in the operation of Shared Facilities shall be allocated based on the proportionate use of Shared Facilities for Project purposes. After the close of each Supply Year on June 30, each Participating Pumper shall submit an accounting, including invoices and other documentation, supporting its actual Project Operation and Maintenance Expenses over the preceding Supply Year to the SFPUC. Accounting detail submitted by a Participating Pumper for reimbursement of annual Project Operation and Maintenance Expenses shall be of sufficient detail to permit the SFPUC to properly allocate these expenses between (1) the SFPUC's retail and wholesale water customers under the WSA and (2) Project Facilities, Shared Facilities, and the Participating Pumper's Existing Facilities. The SFPUC shall reimburse each Participating Pumper for incurred Project Operation and Maintenance Expenses within sixty (60) days of receipt of the annual accounting. In the alternative, the SFPUC may, with the agreement of the Participating Pumper, reimburse the Participating Pumper for the previous fiscal year's Project Operation and Maintenance Expenses as one or more credits on monthly invoices for Wholesale Water over the course of the following

Fiscal Year. Disputes between the SFPUC and one or more Participating Pumpers concerning the reimbursement or accuracy of accounting of annual Project Operation and Maintenance Expenses will be resolved by the Operating Committee, or pursuant to **Section 12.1.**

9.3. Use of Project Facilities by Participating Pumpers for Non-Project Purposes

If the temporary use of Project Facilities by a Participating Pumper for non-Project purposes is approved by the Operating Committee under **Section 8.8** of this Agreement, or is approved by the SFPUC during a local Emergency under **Section 8.9**, the Participating Pumper shall deduct a proportionate share of operation and maintenance expenses reflecting such operation from the annual total of Project Operations and Maintenance Expenses submitted to the SFPUC for reimbursement under **Section 9.2.**

9.4. Metering of Project Facilities Operated During Recovery Periods by the SFPUC

The metered volume of water pumped from Project Wells connected to SFPUC transmission mains pursuant to **Section 5.6** shall be used to account for pumping of water for Project purposes as provided in **Section 6.1.2.** Meters that measure the flow of water pumped during Recovery Periods that is added to SFPUC transmission lines shall be considered new "System Input Meters" in accordance with Section 3.14 and Attachment J of the WSA.

ARTICLE 10

OPERATING COMMITTEE

10.1. Composition of Operating Committee

Upon the Effective Date of this Agreement, the Parties shall form a four member Operating Committee comprised of one representative each from the Participating Pumpers and the SFPUC. For decisions requiring a majority vote, the Operating Committee shall select a neutral fifth member not currently employed by or serving as a consultant to any of the Parties to serve as a tie-breaker as necessary in the event of a deadlock between the other members of the Operating Committee. The neutral fifth member may be employed by, or a consultant to, the Bay Area Water Supply and Conservation Agency. If a majority of members of the Operating Committee cannot agree to the identity of the neutral fifth member, the name shall be selected at random from the list of names proposed by members of the Operating Committee. The fifth member of the Operating Committee shall have no voting authority apart from serving as a tie-breaker. All 5 members of the Operating Committee shall have experience and technical expertise in water supply, groundwater wells and pump operations.

10.2. Duties and Powers of Operating Committee

The Management Plan contains Basin Management Objectives that are consistent with the sustainable management of the Basin. The Operating Committee will consider, but not be bound by, (1) the Basin Management Objectives and (2) the Mitigation, Monitoring and Reporting Program adopted by the SFPUC as a binding commitment in Resolution No. 14-0127 in making the decisions authorized in Article 10 of this Agreement. The duties and powers of the Operating Committee are limited to the following.

10.2.1. Development of annual Project operation, maintenance and monitoring plans, and estimated budgets for these activities, as set forth in **Section 8.6** and **Section 9.2,** to ensure proper management of the Project, including protocols for reporting collected data back to the Operating Committee by the Parties, review of operation, maintenance and monitoring plans submitted by the Parties, and recovery of Project Operations and Maintenance Expenses. The annual plans required by this section shall be completed by December 1 of each year.

10.2.2. Development of Project Well operating schedules during Recovery Periods by May 1st of each drought year that projects Recovery, including where such pumping shall occur, in what quantities, and any redirection or reduction in pumping to avoid Undesirable Effects or well interference impacts identified in the Project Mitigation, Monitoring and Reporting Program, subject to the sole discretion of the SFPUC to determine the volumes of In Lieu Water available for Storage and subsequent Recovery of any water available in the SFPUC Storage Account under **Articles 4** and **5** of this Agreement. Project Well operating schedules for non-drought Shortages under **Sections 5.2.2** and **5.2.3** shall be developed and approved by the Operating Committee on an as-needed basis.

10.2.3. Review of (1) annual reports submitted by the Participating Pumpers' licensed operators certifying that the Existing Facilities within their respective service areas are capable of operation during droughts in compliance with the standards set forth in **Section 7.2** of this Agreement; and (2) a Participating Pumper's proposed use of facilities owned by Nonparticipating Pumpers as required to pump Designated Quantities due to the unavailability of the Participating Pumper's Existing Facilities referenced in **Section 7.2** of this Agreement.

10.2.4. Review and approval of a request by a Participating Pumper to use Project Facilities for non-Project purposes, under the conditions set forth in **Section 8.8**.

10.2.5. Review and approval of a Participating Pumper's request for an increase in its Minimum Groundwater Requirement, pursuant to **Section 4.3**.

10.2.6. Monitoring pumping from all Existing and Project Facilities within the Basin to evaluate water quality trends and whether increases in the volume of water produced are occurring, including any Over Production in pumping from Existing Facilities resulting from higher Basin operating levels attributable to Storage under the Project. In response to changed conditions within the Basin, the Operating Committee may make recommendations to the Parties as to whether any action or changes in Project water accounting rules set forth in **Section 6.1** may be necessary to protect the Recovery of SFPUC Storage Account Water and Designated Quantities or to ensure the recovery of Project costs in accordance with Article 9 of this Agreement.

10.2.7. Approval of pumping Project Wells outside of Recovery Periods for Project management pursuant to **Section 5.2.3.**

10.2.8. Determining whether the operation of Project Wells caused Undesirable Effects on Existing Facilities under **Section 8.6** and identifying measures that the SFPUC must take to reduce or eliminate such Undesirable Effects and otherwise avoid harm to the Participating Pumpers and ensure long-term viability of the Basin as a drinking water supply. To the extent that the Operating Committee determines that the pumping of any Project Well caused Undesirable Effects, the Operating Committee may require one or more of the following actions, subject to necessary CEQA compliance: (1) redirect pumping to other Project Facilities; (2) reduce pumping at particular Project Well(s) while preserving the cumulative ability of the SFPUC to order the extraction of up to 8,100 acre feet annually from the SFPUC Storage Account; (3) modification of Existing Facilities as a Project Capital Cost (e.g., resetting pumps, installing water treatment facilities, vacuum pumps etc.); (4) reimbursement of additional cost as a Project Operation and Maintenance Expense under **Section 9.2**; or (5) such other remedy as may be appropriate.

10.2.9. Request and approval of studies and such technical support as is necessary to assist in Project management, conduct required monitoring, to refine Project goals and operations, to use the Basin more effectively, and to identify and address potential problems. Technical support may be provided by employees of the Parties or by third-party contractors. The costs of all technical support authorized by the Operating Committee shall be deemed a Project Operations and Maintenance Expense.

10.2.10. Determine the appropriate methodology of accounting for losses from the Basin under **Section 6.5.**

10.2.11. Review of information provided by the Parties required under **Section 7.5** concerning proposed New Wells.

10.2.12. Increases in the limitation on adjustments to Designated Quantities expressed in **Section 4.5** and the Aggregate Designated Quantity, using the criteria set forth in **Section 4.6**; reductions in the Aggregate Designated Quantity as provided in **Section 4.7**, and the approval of actions to remedy Over Production that is delegated to the Operating Committee under **Section 4.8.3**.

10.3. Operating Committee Decision-Making

The development of Project Well operating schedules under **Section 10.2.2** during Recovery Periods, and the decisions delegated to the Operating Committee in **Sections 10.2.5, 10.2.7, 10.2.10,** and **10.2.12**, shall require unanimous approval of the Operating Committee. All other decisions of the Operating Committee shall be by majority vote of the members of the Operating Committee, utilizing the fifth tie-breaker vote as necessary. For all matters, each member of the Operating Committee shall: (a) act in good faith; (b) utilize the best available scientific evidence relevant to the matter including but not limited to data and analysis generated by numeric models that meet prevailing industry standards for accuracy and reliability; and (c) ensure that the Storage and Recovery of water under the Project avoids Undesirable Effects to the Basin as well as ensure the long-term viability of the Basin as a drinking water supply. A minority of Operating Committee members may request voluntary mediation of certain disputes as described in **Section 12.1** of this Agreement.

10.4. Schedule for Meetings of Operating Committee

The Operating Committee shall meet within thirty days after the Effective Date of this Agreement, and thereafter as often as necessary to implement operations and take other action under this Agreement, but shall meet at least twice a year.

10.5. Minutes of Operating Committee Meetings

Minutes of all Operating Committee Meetings shall be kept and shall reflect a summary of all proceedings, actions and recommendations taken by the Operating Committee. Copies thereof shall be furnished to all Parties.

10.6. Duty of Each Party to Monitor Conjunctive Use Project Performance

Each Party has an independent obligation to review all monitoring information reported to the Operating Committee. If any Party believes that the Storage and Recovery of water under the Project is causing Undesirable Effects to its Existing Facilities, that Party shall promptly advise the Operating Committee.

ARTICLE 11

DEFAULTS AND REMEDIES

11.1. Remedies upon Termination

Notwithstanding anything to the contrary herein, if one or more of the Participating Pumpers breaches any provision of this Agreement, or invokes the existence of a Force Majeure Event under **Section 12.14**, the SFPUC may terminate this Agreement with respect to the Party or Parties by written notice to the Participating Pumpers.

11.1.1. If the SFPUC terminates this Agreement due to the occurrence of a Force Majeure Event or breach by one or more of the Participating Pumpers, any credit balance in the SFPUC Storage Account shall remain the property of the SFPUC, along with the ownership of all Project Facilities within such Party or Party's service area(s). Upon such termination, the SFPUC may in its sole discretion extract any stored water reflected as a credit balance in the SFPUC Storage Account using the Project Wells referenced in **Section 5.6** of this Agreement until there is no remaining water in the SFPUC Storage Account. Alternatively, in its sole discretion, the SFPUC may require the breaching Party or Parties, or Party(ies) subject to a Force Majeure Event, to purchase from the SFPUC the remaining balance of any water in the SFPUC Storage Account that is attributable to Storage of In Lieu Water by that Party, based on the applicable wholesale water rate for that water as provided in **Section 6.4** of this Agreement.

11.1.2. In the event that this Agreement is terminated under this section 11.1 or Section 12.14, the provisions of WSA Section 3.17, as it may be amended by the SFPUC and its wholesale customers, shall govern (1) the disposition of the balance of water in the SFPUC Stored Water Account; (2) the allocation of outstanding eligible Project Operations and Maintenance Expenses; and (3) the disposition of investments in Project Capital Costs by the SFPUC should the Project Facilities no longer be used to benefit wholesale or retail customers of the

SFPUC System. Upon the termination of this Agreement the SFPUC shall otherwise have no right, claim or interest in the Basin, credit or storage balances in the Basin, or water in the Basin, pursuant to this Agreement.

11.2. Remedies are Cumulative

The rights and remedies or the Parties are cumulative, and the exercise by any Party of one or more of such rights or remedies shall not preclude the exercise by it, at the same or different times, of any other rights or remedies for the same breach or any other breach by the other Party.

ARTICLE 12

MISCELLANEOUS PROVISIONS

12.1. Dispute Resolution

If (1) any dispute arises between or among the Parties regarding interpretation or implementation of this Agreement that does not concern a decision of the Operating Committee; or (2) one or more Parties file a written appeal with the Operating Committee within 14 days of an Operating Committee decision or action subject to majority vote; or (3) the members of the Operating Committee cannot achieve unanimity as described in **Section 10.3**; or (4) one or more Parties decline to follow a decision or action of the Operating Committee; or (5) one or more Parties asserts that the Operating Committee is acting beyond the scope of its authority as specified in this Agreement, the Parties will, in the first instance, attempt in good faith to resolve the dispute through their chief executive officers or their designees. If the chief executive officers cannot forge a consensus on the disputed issue, the matter shall be referred for non-binding mediation to a single mediator who will have technical expertise in groundwater management and/or public utility accounting practices. The mediator will be selected by unanimous consent of the Parties, but if unanimous consent of the Parties cannot be obtained the mediator will be selected by a majority vote of the Parties from a list of mediators maintained by the Operating Committee based on the qualifications set forth in this **Section 12.1.** Any Party may commence mediation by providing to the other Parties a written request for mediation, setting forth the subject of the dispute and the relief requested. The non-binding mediation will be governed by the American Arbitration Association's Commercial Mediation Procedures. If the dispute is not resolved by mediation, each Party will be free to pursue whatever legal or equitable remedies may be available. The fees and expenses incurred as a result of any dispute resolution activities, including attorney's fees, mediator fees and costs, expert costs, and other expenses, shall be borne solely by the Parties involved in the dispute. The Parties involved in the dispute will share the mediator's expenses on an equal basis.

12.2. Mutual Indemnity

Each Party agrees to indemnify, defend, and hold the other Parties and their respective officers, employees and agents free and harmless from and against any and all loss, liability, expense, claims, costs, suits and damages, including attorney's fees, arising out that Party's willful misconduct or negligent acts, errors, or omissions in its operation and maintenance of Existing Facilities, Shared Facilities or Project Facilities under **Articles 7** and **8** of this Agreement.

12.3. Insurance and Indemnity Provisions Applicable to Construction of Project Facilities

The SFPUC and the Participating Pumpers agree to the following provisions concerning insurance coverage and indemnity during the construction of Project Facilities.

12.3.1. Commencing from the date of Project approval by the SFPUC, every contract issued by the SFPUC for construction of Project Facilities (including associated professional services, environmental consultants, and other contracts required for construction of Project Facilities) shall require the contractor to maintain in force during the course of the contract all customary insurance required by the SFPUC, and shall include coverage for worker's compensation, commercial general liability insurance, automobile liability insurance and professional liability insurance. Each contractor's general, automobile, and professional liability insurance policies shall name as additional insured each Participating Pumper, and its officers, agents and employees.

12.3.2. Commencing from the date of Project approval by the SFPUC, every contract issued by the SFPUC for construction of Project Facilities (including associated professional services, environmental consultants, and other contracts required for construction of the Project) shall contain language requiring the contractor to indemnify, defend and hold harmless the SFPUC and each Participating Pumper for any and all claims for bodily injury or property damage arising out of the contractor's performance of work in constructing or installing Project Facilities or providing support services required for Project implementation.

12.4. Workers' Compensation Insurance for Project Operation

Each Party will provide to the other Parties evidence of Workers' Compensation insurance prior to entering into this Agreement. With respect to employees of a particular Party who are employed as operators of Project Facilities, the other Parties shall not be considered joint employers of any such employees, who shall be solely managed and controlled by each individual Party. Each Party agrees to maintain in force, during the term of this Agreement, Workers' Compensation insurance, in statutory amounts, with Employers' Liability Limits of not less than $1,000,000 each accident.

The cost of Workers' Compensation insurance applicable to the Parties' operation of Project Facilities shall be considered a Project Operations and Maintenance Expense. Approval of Workers' Compensation insurance by the SFPUC shall not relieve or decrease the liability of each Participating Pumper hereunder. In the event that any employee of a Party files a Workers' Compensation claim against another Party, the Party whose employee filed the claim agrees to indemnify, defend and hold harmless the other Parties for any such claims as provided in **Section 12.2** of this Agreement.

12.5. Right to Adjudicate; Limited Waiver of Prescriptive Rights Claims; No Intent to Abandon

12.5.1. Each Party reserves all rights to initiate or participate in a general adjudication of Basin groundwater rights. Nothing in this Agreement shall limit in any way any rights or interests that the Parties may assert related to the use or management of the Basin in the event of a general adjudication of Basin

groundwater rights, apart from the waiver of prescriptive rights claims set forth in section 12.5.2.

12.5.2. In the event of a general adjudication of Basin groundwater rights, including adjudication of issues pertaining to Basin use or management, (i) unless directed otherwise by a court or regulatory agency, the Participating Pumpers agree that the SFPUC will retain the right to any credit balance in the Storage Account, and the right to continue Storage and Recovery of up to 61,000 acre feet of water in the Basin using Project Facilities; (ii) the SFPUC expressly waives the right to store additional water in the Basin without the express written consent of all Parties effective through written amendment of this Agreement in accordance with **Section 2.2**; and (iii) each Party to this Agreement expressly waives any and all claims to prescriptive groundwater rights against the other Parties based on the production or use of groundwater pursuant to this Agreement; provided, however, that the Participating Pumpers reserve and retain all other claims to prescriptive groundwater rights which they may possess as of the Effective Date.

12.5.3. The failure of any Participating Pumper to use all of its Designated Quantity for any amount of time during periods of In Lieu Water delivery shall not be deemed to be or constitute an abandonment of such Participating Pumper's Designated Quantity.

12.5.4. The Parties agree that each Participating Pumper may file notices of reduction of groundwater use as a result of the use of an alternative supply of water from a nontributary source, pursuant to California Water Code Section 1005.1.

12.5.5. The SFPUC recognizes that it cannot and will not assert any claim to water in the Basin, including, but not limited to, as an overlying owner, pumper, or appropriator, except as expressly authorized under this Agreement or to the extent any such right exists as a result of the SFPUC's rights to the North Westside Basin.

12.6. Nonparticipating Pumpers

A Nonparticipating Pumper may become a Party to this Agreement if agreed to by all Parties in a written modification to this Agreement, as provided for in **Section 2.3**, subject to any additional terms or conditions agreed to by the Parties.

12.7. More Favorable Terms

If, at any time during the term of this Agreement, the SFPUC enters into an agreement with another party who is not signatory to this Agreement with respect to use of the Basin for a conjunctive use Project, and such agreement contains price, quantity, or other material terms that are more favorable than the terms extended to a Participating Pumper under this Agreement, the Parties will immediately modify this Agreement to extend the more favorable terms to Participating Pumpers.

12.8. Assignment

No Party shall transfer this Agreement, in whole or in part, or any of its interests, to any other person or entity without the prior written consent of the other Parties. Any attempt to transfer or

assign this Agreement, or any privilege hereunder, without such written consent shall be void and confer no right on any person or entity not a Party to this Agreement.

12.9. Successors

This Agreement shall bind and inure to the benefit of the Parties and their respective successors and permitted assigns.

12.10. Entire Agreement

This Agreement constitutes the entire agreement between the Parties pertaining to the matters provided for herein and, except as herein provided, supersedes all prior and/or contemporaneous agreements and understandings, whether written or oral, between the Parties related to the matters provided for herein.

12.11. Severability

Should any provision of this Agreement prove to be invalid or illegal, such invalidity or illegality shall in no way affect, impair or invalidate any other provisions hereof, and such remaining provisions shall remain in full force and effect; provided, however, if the illegality or invalidity of any provision undermines the intent of the Parties, then the Parties shall attempt in good faith to amend the Agreement in order to fulfill the intent of the Parties. If the Parties are unable to so amend the Agreement, then the Agreement shall terminate and be of no further force or effect.

12.12. Counterparts

This Agreement, and any document or instrument entered into, given or made pursuant to this Agreement or authorized hereby, and any amendment or supplement thereto, may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same agreement.

12.13. Notice

Formal written notices, demands, correspondence and communications between the Parties authorized by this Agreement shall be sufficiently given if personally delivered or dispatched by registered or certified mail, first-class, postage prepaid, return receipt requested, to the Parties as follows:

To the SFPUC:

Steve Ritchie
Assistant General Manager, Water Enterprise
San Francisco Public Utilities Commission
525 Golden Gate Avenue, 13th Floor
San Francisco, CA 94102
email: sritchie@sfwater.org

With a copy to:
San Francisco City Attorney's Office
Attn.: Utilities General Counsel
Room 234 City Hall
1 Carlton B. Goodlett Place
San Francisco, CA 94102

To Daly City:

Patrick Sweetland
Director of Water and Wastewater Resources
City of Daly City
153 Lake Merced Blvd.
Daly City, CA 94015
email: psweetland@dalycity.org

With a copy to:
Rose Zimmerman
City Attorney
City of Daly City
233 90th Street
Daly City, CA 94015
email: rzimmerman@dalycity.org

To San Bruno:

Constance C. Jackson
City Manager
567 El Camino Real
San Bruno, CA 94066

With a copy to:
Marc Zafferano
City Attorney
567 El Camino Real
San Bruno, CA 94066

To Cal Water:

Anthony Carrasco, District Manager
California Water Service Company
Bayshore District
341 North Delaware Avenue
San Mateo, CA 94401-1727
email: acarrasco@calwater.com

With a copy to:
Lynne McGhee, Corporate Secretary and Associate
Corporate Counsel
1720 North First Street
San Jose, CA 95112-4508

email: lmcghee@calwater.com

12.14. Force Majeure

12.14.1. Excuse from Performance. No Party shall be liable in damages to any other Party for delay in performance of, or failure to perform, its obligations under this Agreement, if such delay or failure is caused by a Force Majeure Event.

12.14.2. Notice. The Party claiming excuse shall deliver to the other Parties a written notice of intent to claim excuse from performance under this Agreement by reason of a Force Majeure Event. Notice required by this section shall be

given as promptly and as reasonably possible in light of the circumstances. Such notice shall describe the Force Majeure Event, the services impacted by the claimed event, the length of time that the Party expects to be prevented from performing, and any steps which the Party intends to take to attempt to restore its ability to perform.

12.14.3. Ability to Perform. Any suspension of performance by a Party pursuant to this section shall be only to the extent, and for a period of no longer duration than, required by the nature of the Force Majeure Event, and the Party claiming excuse shall use its best efforts to remedy its inability to perform as quickly as possible.

12.14.4. If the Party claiming a Force Majeure Event is not able to restore its ability to perform its obligations within one year after giving notice pursuant to Section 12.14.2, it may elect to terminate its participation in the Project. The Party claiming excuse will thereafter give an additional 60 days written notice of said termination to the Parties and the Operating Committee.

12.14.5. In the event that a Party terminates participation in this Agreement under section 12.14.4, the provisions of WSA Section 3.17 and section 11.1 of this Agreement shall govern the disposition of investments in Project Capital Costs, allocation of outstanding eligible Project Operations and Maintenance Expenses, and the balance of water in the SFPUC Storage Account.

12.15. Maintenance and Inspection of Books, Records and Reports

The Participating Pumpers shall maintain careful, accurate and complete records of all receipts and disbursements made for (1) reimbursable Project Operations and Maintenance Expenses authorized under **Section 9.2** and detailed in **Attachment F**; and (2) expenses related to use of Project Facilities for non-Project purposes authorized under **Section 9.3.** During regular office hours, and upon reasonable notice, the Parties shall have the right to inspect and make copies of any books, records, and reports pertaining to this Agreement or related matters in the possession of the other Parties at the inspecting Party's cost. The SFPUC and its agents may conduct audits of the Participating Pumpers during the term of this Agreement for the purpose of ensuring that Project Operations and Maintenance Expenses incurred by the Participating Pumpers are eligible for reimbursement in accordance with **Attachment F**, and to ensure that any expenses incurred by the SFPUC due to the Participating Pumpers' operation of Project Wells for non-Project purposes are repaid to the SFPUC. The Participating Pumpers agree to cooperate with the SFPUC in connection with any such audit. All costs incurred by the Participating Pumpers that are associated with responding to an audit by the SFPUC shall be considered Project Operation and Maintenance Expenses.

12.16. Governing Law; Venue

The laws of the State of California shall govern the interpretation and enforcement of this Agreement. The Parties agree that Santa Clara County is an appropriate neutral county in the event one Party seeks to change venue under Code of Civil Procedure section 394.

12.17. Effect of Agreement on WSA

The provisions of this Agreement do not affect, change or modify any section, term or condition of the WSA. In the event of any conflict between this Agreement and the terms of the WSA, the terms of the WSA shall control.

12.18. Compliance with Raker Act

Nothing in this Agreement shall be construed to authorize or result in delivery of SFPUC System Water to the California Water Service Company in violation of section 6 of the Raker Act (38 Stat. 242).

12.19. Cooperation in Implementation of Project Mitigation Measures

The Participating Pumpers acknowledge the mitigation measures set forth in the Project final environmental impact report and Mitigation, Monitoring and Reporting Program adopted by the SFPUC as part of Project approval, and agree to cooperate with the SFPUC in complying with such measures to the extent that they are under the control of, or are the responsibility of, one or more of the Participating Pumpers. Any costs or expenses associated with such compliance and cooperation shall be the responsibility of the SFPUC, and the SFPUC must reimburse the Participating Pumpers for such costs and expenses as a component of Project Capital Costs.

[This space left intentionally blank; signature pages follow]

SAN FRANCISCO PUBLIC UTILITIES COMMISSION

By: _____
Harlan L. Kelly, Jr.
General Manager

Authorized by SFPUC Res. No. 14-0127 Dated August 12, 2014

Approved as to form:

DENNIS J. HERRERA
City Attorney

By: _____
Joshua D. Milstein
Deputy City Attorney

CITY OF DALY CITY

By: _____
Patricia Martel
City Manager

Authorized by City Council Res. No. 14-153 Dated: September 8, 2014

Approved as to form:

_____
Rose Zimmerman
City Attorney

CITY OF SAN BRUNO

By: _____
Constance Jackson
City Manager

Authorized by City Council Res. No. 2014-103 Dated: September 23, 2014

Approved as to form:

_____
Marc Zafferano
City Attorney

CALIFORNIA WATER SERVICE COMPANY

By: _____

Martin Kropelnicki, President and Chief Executive Officer

Dated: 12-16-14

Approved as to form:

_____

Lynne McGhee, Vice President and General Counsel

Appendix C

SFPUC Memorandum Re: Regional Water System Supply Reliability and UWMP 2020

San Francisco
Water Power Sewer
Services of the San Francisco Public Utilities Commission

525 Golden Gate Avenue, 13th Floor
San Francisco, CA 94102
T 415.554.3155
F 415.554.3161
TTY 415.554.3488

TO: SFPUC Wholesale Customers

FROM: Steven R. Ritchie, Assistant General Manager, Water

DATE: June 2, 2021

RE: Regional Water System Supply Reliability and UWMP 2020

This memo is in response to various comments from Wholesale Customers we have received regarding the reliability of the Regional Water System supply and San Francisco's 2020 Urban Water Management Plan (UWMP).

As you are all aware, the UWMP makes clear the potential effect of the amendments to the Bay-Delta Water Quality Control Plan adopted by the State Water Resources Control Board on December 12, 2018 should it be implemented. Regional Water System-wide water supply shortages of 40-50% could occur until alternative water supplies are developed to replace those shortfalls. Those shortages could increase dramatically if the State Water Board's proposed Water Quality Certification of the Don Pedro Federal Energy Regulatory Commission (FERC) relicensing were implemented.

We are pursuing several courses of action to remedy this situation as detailed below.

Pursuing a Tuolumne River Voluntary Agreement

The State Water Board included in its action of December 12, 2018 a provision allowing for the development of Voluntary Agreements as an alternative to the adopted Plan. Together with the Modesto and Turlock Irrigation Districts, we have been actively pursuing a Tuolumne River Voluntary Agreement (TRVA) since January 2017. We believe the TRVA is a superior approach to producing benefits for fish with a much more modest effect on our water supply. Unfortunately, it has been a challenge to work with the State on this, but we continue to persist, and of course we are still interested in early implementation of the TRVA.

Evaluating our Drought Planning Scenario in light of climate change

Ever since the drought of 1987-92, we have been using a Drought Planning Scenario with a duration of 8.5 years as a stress test of our Regional Water System supplies. Some stakeholders have criticized this methodology as being too conservative. This fall we anticipate our Commission convening a workshop

London N. Breed
Mayor

Sophie Maxwell
President

Anson Moran
Vice President

Tim Paulson
Commissioner

Ed Harrington
Commissioner

Newsha Ajami
Commissioner

Michael Carlin
Acting
General Manager

regarding our use of the 8.5-year Drought Planning Scenario, particularly in light of climate change resilience assessment work that we have funded through the Water Research Foundation. We look forward to a valuable discussion with our various stakeholders and the Commission.

Pursuing Alternative Water Supplies

The SFPUC continues to aggressively pursue Alternative Water Supplies to address whatever shortfall may ultimately occur pending the outcome of negotiation and/or litigation. The most extreme degree of Regional Water System supply shortfall is modeled to be 93 million gallons per day under implementation of the Bay-Delta Plan amendments. We are actively pursuing more than a dozen projects, including recycled water for irrigation, purified water for potable use, increased reservoir storage and conveyance, brackish water desalination, and partnerships with other agencies, particularly the Turlock and Modesto Irrigation Districts. Our goal is to have a suite of alternative water supply projects ready for CEQA review by July 1, 2023.

In litigation with the State over the Bay-Delta Plan Amendments

On January 10, 2019, we joined in litigation against the State over the adoption of the Bay-Delta Water Quality Control Plan Amendments on substantive and procedural grounds. The lawsuit was necessary because there is a statute of limitations on CEQA cases of 30 days, and we needed to preserve our legal options in the event that we are unsuccessful in reaching a voluntary agreement for the Tuolumne River. Even then, potential settlement of this litigation is a possibility in the future.

In litigation with the State over the proposed Don Pedro FERC Water Quality Certification

The State Water Board staff raised the stakes on these matters by issuing a Water Quality Certification for the Don Pedro FERC relicensing on January 15, 2021 that goes well beyond the Bay-Delta Plan amendments. The potential impact of the conditions included in the Certification appear to virtually double the water supply impact on our Regional Water System of the Bay-Delta Plan amendments. We requested that the State Water Board reconsider the Certification, including conducting hearings on it, but the State Water Board took no action. As a result, we were left with no choice but to once again file suit against the State. Again, the Certification includes a clause that it could be replaced by a Voluntary Agreement, but that is far from a certainty.

I hope this makes it clear that we are actively pursuing all options to resolve this difficult situation. We remain committed to creating benefits for the Tuolumne River while meeting our Water Supply Level of Service Goals and Objectives for our retail and wholesale customers.

cc.: SFPUC Commissioners
Nicole Sandkulla, CEO/General Manager, BAWSCA

Appendix C:

Appendix 2.1, *Revised Southline Specific Plan*

SOUTHLINE

SPECIFIC PLAN

Prepared by:

Lane Partners

Kimley-Horn & Associates

DES Architects + Engineers

BKF Engineers

The vision of the Southline Specific Plan is to develop a cutting-edge office/R&D campus for innovation and inspiration with unmatched access to eco-friendly transportation options, in furtherance of the City's General Plan and vision for the Specific Plan area. The Southline Specific Plan will allow for development of a thriving transit-oriented commercial campus located adjacent to the San Bruno BART station.

SOUTHLINE
SPECIFIC PLAN

Conceptual Southline Site Plan

EXECUTIVE SUMMARY

The Southline project ("Southline" or the "Project") is planned as a state-of-the-art transit-oriented commercial campus located within the City of South San Francisco, adjacent to the San Bruno BART station and proximate to two Caltrain stations (San Bruno and South San Francisco).

Implementation of the Southline project through this Specific Plan would transform the Specific Plan area – comprised of approximately 28.5 acres of functionally obsolete, aging and underutilized light industrial and warehouse buildings – into an integrated commercial campus environment of high-quality design providing for Class-A office and R&D uses (including life science uses) as well as limited supporting uses available to the public such as professional services and dining, in addition to tenant-only amenity space including a fitness center, and related ancillary uses.

This Specific Plan establishes development regulations for the Specific Plan area and allows for development of commercial buildings totaling up to approximately 2,800,000 square feet (sf) based on the development standards defined in this Specific Plan.

A major circulation feature to be implemented within the Specific Plan area is development of a new Southline Avenue roadway (provisionally named for the purpose of this Specific Plan and referred to as such throughout this Specific Plan) that is envisioned to be constructed west to east through the Specific Plan area between Huntington and South Linden Avenues. The construction of Southline Avenue is consistent with and furthers the General Plan policies calling for the extension of South Linden Avenue to the San Bruno BART station.

As part of the integrated campus design, the Specific Plan envisions the development of a central green space of approximately 1.5 acres—referred to as the Southline Commons—that offers outdoor amenities that would be accessible to both tenants and the public. It is envisioned to include pedestrian paths, outdoor meeting and gathering spaces, casual dining areas, and space for recreation and events.

The Project envisions a supportive Amenities Building, which is anticipated to be located on the southwest corner of the Specific Plan area (referred to as Building 2 on the included conceptual site plans). Planned uses of this Amenities Building may include publicly-accessible ground floor retail and dining, a community center, and other amenity uses that front onto the Southline Retail Plaza. It is anticipated that the upper floors of this Amenities Building will include other uses available only to the Southline campus tenants such as a fitness center and meeting spaces. The Southline Retail Plaza is envisioned to include features such as outdoor dining areas,

terraced seating and landscaping to serve as both a buffer and transition to the adjacent street edge.

The Project also proposes development of the Tanforan Avenue Community Parklet, envisioned within an approximately 40-foot wide buffer setback on the north side of Tanforan Avenue that will be accessible by the surrounding community, including residents along Tanforan Avenue. It should incorporate a walking pathway surrounded by significant BART, Caltrain, and SamTrans bus routes.

Given the Specific Plan area's unique proximity to multi-modal public transit, implementation of the Specific Plan is envisioned to include public transit linkages, including certain improvements to pedestrian and bicycle facilities intended to promote the use of public transit and alternatives to automobile transportation, consistent with the transportation and circulation policies as described in the South San Francisco General Plan.

These improvements are anticipated to include new public and private streets; enhanced pedestrian and bicycle facilities; improved pedestrian access to the nearby San Bruno BART station and SamTrans Transit Center; neighborhood traffic calming features; and improved compatibility with a future potential grade separation of the Caltrain tracks. Certain improvements located outside of the Specific Plan area would require review and/or approvals or actions by other agencies or entities for off-site improvements within its jurisdiction, including the City of San Bruno and BART. Future development within the Specific Plan area should utilize the existing adjacent public utility infrastructure to the extent feasible. It is anticipated that certain existing utility connections may be relocated and/or abandoned, and new utility connections will be required for implementation of the Specific Plan to accommodate increased capacity demand.

The development standards included in Chapter 2: Land Use Plan & Development Standards and the supporting design guidelines described in Chapter 5: Design Guidelines implement and refine the policies and vision of the City of South San Francisco General Plan and associated Lindenville Planning Sub-Area for the Specific Plan area. The development standards establish rules for the physical development within the Specific Plan area, including building placement, scale and form, and lot design.

The design guidelines describe and illustrate the designs, concepts and features intended to promote the high-quality development that is envisioned for the Specific Plan area, in addition to sustainability guidelines intended to reduce energy and greenhouse gas emissions, promote water conservation, minimize waste and encourage recycling, and promote employee wellness.

The Specific Plan shall be implemented through the approval of Precise Plans, which set forth in detail development criteria for proposed structures and related improvements and their arrangements on individual parcels, in addition to other approvals as may be required.

Conceptual Rendering of Southline Commons

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1 INTRODUCTION

This chapter describes the Specific Plan's organization, setting, authority, purpose and intent, relationship to other plans and policies, and the objectives that should be used to guide future development of the Specific Plan area.

1.1. Specific Plan Organization

This Specific Plan is organized per the following chapters:

Chapter 1 – Introduction

This chapter describes the Specific Plan's organization, regional setting, authority, purpose and intent, and the objectives that should be used to guide future development of the Specific Plan area**.**

Chapter 2 – Land Use Plan & Development Standards

This chapter illustrates the land use plan for the Specific Plan area and defines the Southline Campus (S-C) land use district unique to the Specific Plan. This chapter also describes the development standards applicable to the Specific Plan area, including the permitted, conditionally permitted, and prohibited land uses.

Chapter 3 – Circulation & Mobility

This chapter describes the conceptual circulation and mobility plan for all users including bicyclists, pedestrians, and vehicles. It includes the conceptual roadway network and cross-sections for selected roadways. It also describes off-site roadway improvements that are proposed as part of this Specific Plan.

Chapter 4 – Infrastructure & Public Services

This chapter provides a description of the existing major utility infrastructure and the related improvements needed at build-out of the Specific Plan and the public services required to serve users of the Specific Plan area.

Chapter 5 – Design Guidelines

This chapter explains the design principles and establishes a set of design guidelines for development within the Specific Plan area, including site design, building architecture, sustainability, lighting, landscaping, and signage.

Chapter 6 —Implementation

This chapter addresses the actions that are necessary to implement the Specific Plan by the City of South San Francisco, other agencies, and future Project Applicant(s) to achieve the goals and objectives outlined in this Specific Plan.

The figures included in this Specific Plan, including site plans, illustrations, renderings, and photos, are illustrative only. This includes the specific location and orientation of buildings; alignment and design of streets; and placement and size of open space areas and public facilities.

All conceptual site plans in the main body of the Specific Plan show the Office Buildout. Site plans of the Life Science Buildout are shown in Appendix B: Conceptual Site Plan — Life Science Buildout. Site plans of the Hybrid Buildout are shown in Appendix C: Conceptual Site Plan — Office / Life Science Hybrid Buildout.

Photos of existing conditions are labeled as such. Unless otherwise specified, all other photos and graphic illustrations shall be interpreted as conceptual, as one possible design, and shall not be considered definitive. Specific details regarding development plans for the Project will be evaluated by the City through review and approval of Precise Plans, as further described herein.

1.1. Specific Plan Setting and Existing Conditions

As shown in Figure 1-1: Project Location, the approximately 28.5-acre Specific Plan area is in the Lindenville sub-area of the City of South San Francisco, and is adjacent to the City of San Bruno.

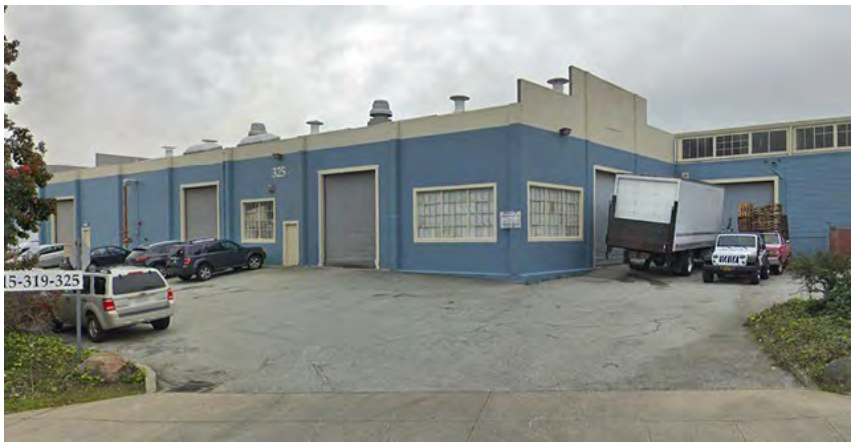
The Specific Plan area is surrounded by commercial and industrial uses to the north and east, residential uses to the south, and the San Bruno BART station and other commercial uses to the west. It is also within the vicinity of the Shops at Tanforan Mall and San Bruno Towne Center, both of which offer a range of dining, entertainment, retail activities, and commercial services, and are accessible within approximately 0.25 miles (or a five-minute walk).

From a transportation perspective, the Specific Plan area is uniquely located close to the San Bruno BART station (located immediately across Huntington Avenue to the west, approximately 0.25 miles from the Specific Plan area); the San Bruno Caltrain station (approximately 0.75 mile to the south); the South San Francisco Caltrain station (approximately 1.5 miles to the north); six regional freeway interchanges within a radius of 1.5 miles, including Interstates 280 and 380, Highway 101; and the San Francisco International Airport (approximately two miles to the south). The Centennial Way Trail, a two-mile Class-I multi-use path, is adjacent to and northwest of the Specific Plan area. The Specific Plan area is also served by various SamTrans bus routes, including the SamTrans Transit Center also located at the San Bruno BART station, which provides bus service to a range of destinations in San Mateo County.

Existing vehicular circulation surrounding the Specific Plan area includes South Maple Avenue, Huntington Avenue, Tanforan Avenue, Dollar Avenue, and South Linden Avenue.

The Specific Plan area is located in the City's Lindenville Planning Sub-Area as described in the City's General Plan. The Lindenville name is derived from a government-built housing project for military personnel and shipyard workers during World War II, located on the former marshland between Railroad Avenue, South Spruce Avenue, and San Mateo Avenue. The Lindenville Planning Sub-Area largely consists of warehousing and distribution, manufacturing, and light industrial uses.

With respect to the Specific Plan area, existing uses currently include a variety of office, industrial, warehouse, and storage facilities that were largely constructed in the 1940s and 1950s. The existing structures total nearly 386,000 square feet and include approximately 448 surface parking spaces.



View southeast from South Maple Ave.

1.2. Specific Plan Authority

This Specific Plan is authorized by California Government Code sections 65450 through 65457, which authorizes adoption of a specific plan for an area covered by a local general plan, as well as South San Francisco Municipal Code ("Municipal Code") Chapter 20.530: Specific Plans and Plan Amendments. When subsequent project-level proposals for the Specific Plan area are presented to the City of South San Francisco, City staff will use this Specific Plan as a policy and regulatory guide for subsequent project review and approval, subject to the procedures as described in Chapter 6: Implementation.

View West from Dollar Ave.

1.3. Purpose and Intent

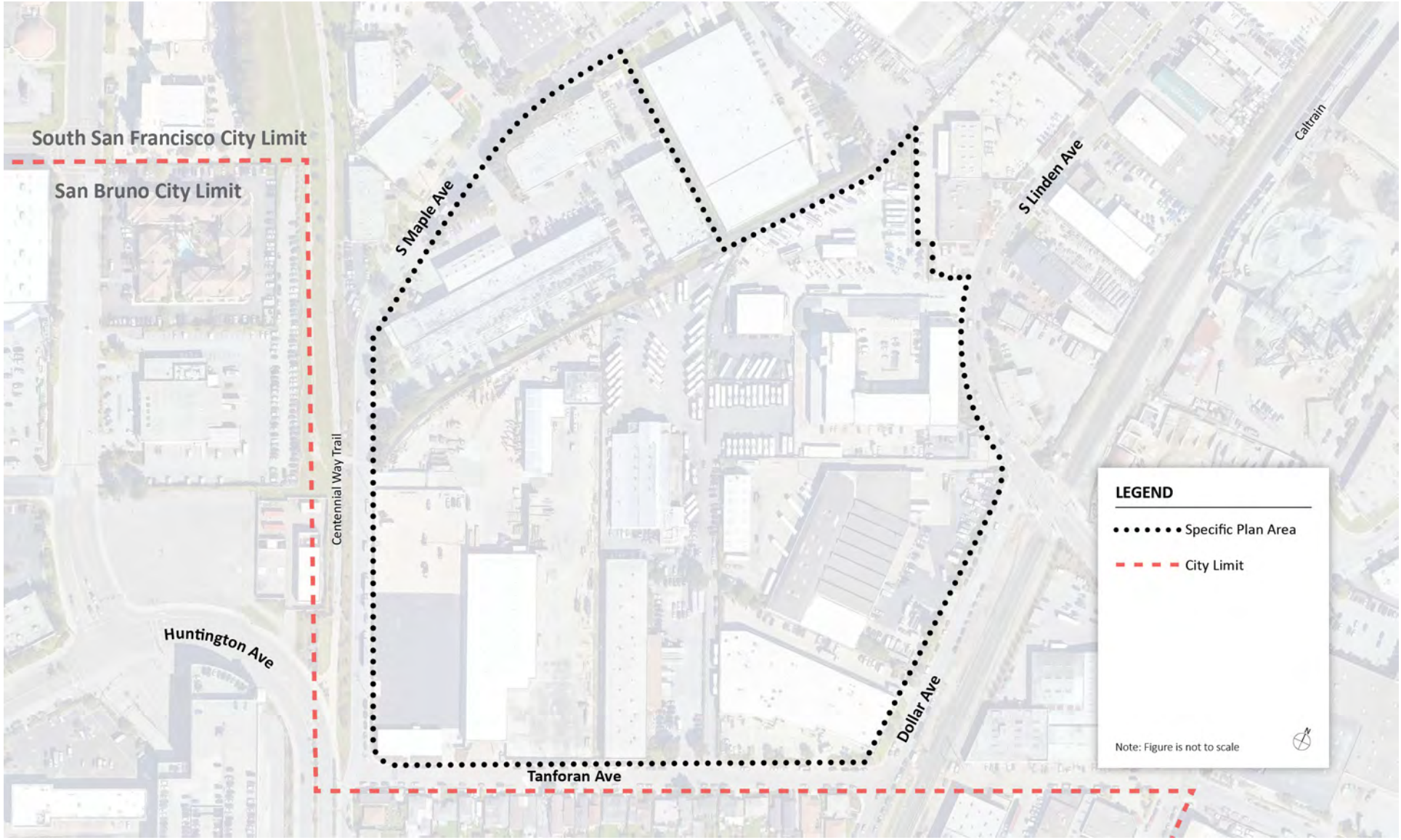
The purpose of this Specific Plan is to permit and regulate the orderly development of the area shown in Figure 1-2: Specific Plan area and related exhibits in furtherance of the City of South San Francisco General Plan ("General Plan"), as amended for implementation of this Specific Plan.

The Specific Plan defines the Southline Campus (S-C) land use district unique to the Specific Plan area and describes the following: development standards and permitted uses that shall be applied to the land use district; circulation and mobility guidelines; design guidelines; conceptual infrastructure improvements; and implementation procedures for future development within the Specific Plan area.

While the General Plan is the primary guide for growth and development in South San Francisco, the Specific Plan focuses on the unique characteristics of the Specific Plan area and sets forth land use regulations and policies that reflect the vision for redevelopment of the Specific Plan area.

Figure 1-1: Project Location

Figure 1-2: Specific Plan Area



1.4. Specific Plan Objectives

This Specific Plan is intended to create a transit-oriented commercial campus. The following objectives form the basis for guiding development within the Specific Plan area:

1.4.1. Land Use & Urban Design

- Create a state-of-the-art transit-oriented commercial campus development consistent with the General Plan designation of the Specific Plan area.
- Promote the City's ongoing development of its transit-accessible corridors with high-quality development.
- Establish a commercial campus development with sophisticated, unified architectural and landscape design and site planning, resulting in a distinctive campus identity and strong sense of place.
- Create new publicly accessible open spaces including plazas, courtyards, and green spaces within the Specific Plan area for the use of employees, residents, and visitors.
- Provide an extensive pedestrian network that links buildings and outdoor recreational spaces through paving, wayfinding signage, street furniture, and lighting.
- Provide well-designed retail and publicly available open spaces to increase local participation and usage of the Specific Plan area.
- Allow for well-designed, flexible buildings and floor plates that can accommodate a variety of commercial building uses over time to ensure that the Specific Plan is responsive to market conditions and demands.
- Establish flexibility to build the Specific Plan in phases that respond to market conditions.
- Redevelop underutilized parcels within the Specific Plan area to realize the highest and best use of the land by increasing the intensity of the land uses.
- Incorporate setbacks, landscape buffers, and other site design features to create an effective transition from the Specific Plan area to the residential neighborhood south of Tanforan Avenue.

1.4.2. Mobility & Access

- Create convenient and safe pedestrian and bike access to the San Bruno BART station and the Centennial Way Trail.
- Promote alternatives to automobile transportation to further the City's transportation objectives by emphasizing public transit linkages, Transportation Demand Management (TDM) strategies, and pedestrian access and ease of movement between buildings.
- Enhance vehicular, bicycle, and pedestrian circulation and access in the area surrounding the Specific Plan.
- Construct a new public street through the Specific Plan area to improve site access and regional roadway circulation.
- Design roadways within and adjacent to the Specific Plan area to ensure that all police, fire, and emergency

medical service vehicles can safely and efficiently navigate.

- Work cooperatively with relevant agencies to implement planned regional circulation and safety improvements.

1.4.3. Sustainability & Quality of Life

- Incorporate sustainable and environmentally sensitive design and equipment, energy conservation features, water conservation measures and drought-tolerant or equivalent landscaping, and sustainable stormwater management features.
- Provide a positive fiscal impact on the City of South San Francisco and surrounding communities through the creation of jobs, enhancement of property values, and generation of property tax and other development fees.

Northeast View of Building 7

1.5. Relationship to Existing Plans and Policies

1.5.1. City of South San Francisco

General Plan (1999)

The City's current General Plan, adopted in 1999 ""and subsequently amended ("General Plan"), outlines a vision for South San Francisco's long-range physical and economic development and resource conservation that reflects the aspirations of the community, and provides strategies and specific implementing actions that will allow this vision to be accomplished.

A new 2040 General Plan, "Shape SSF" is currently being prepared by the City but has not yet been adopted. Based on the City's planning efforts to-date, it is anticipated that the Specific Plan will be consistent with the City's vision for the Specific Plan area under the 2040 General Plan. The public review draft of the 2040 General Plan, dated February 2022, would retain a Business & Professional Office General Plan land use designation for the Specific Plan area, consistent with the current designation.

This Specific Plan builds upon the policy framework and direction set forth in the General Plan, which designated virtually all of the Specific Plan area as "Office." This designation is intended to provide sites for administrative, financial, business, professional, medical and public offices in locations proximate to BART or Caltrain stations. (General Plan, Land Use Element, p. 2-20.) The General Plan states that "[s]upport commercial uses are permitted, subject to limitations established in the Zoning Ordinance. Site planning and building design within the Office designation must ensure pedestrian comfort, and streets must be fronted by active uses." (Id.) The base maximum Floor Area Ratio ("FAR") applicable in the Office designation is 1.0, but increases may be permitted up to a total FAR of 2.5 for development meeting specific transportation demand management, structured parking, off-site improvement, or design criteria.

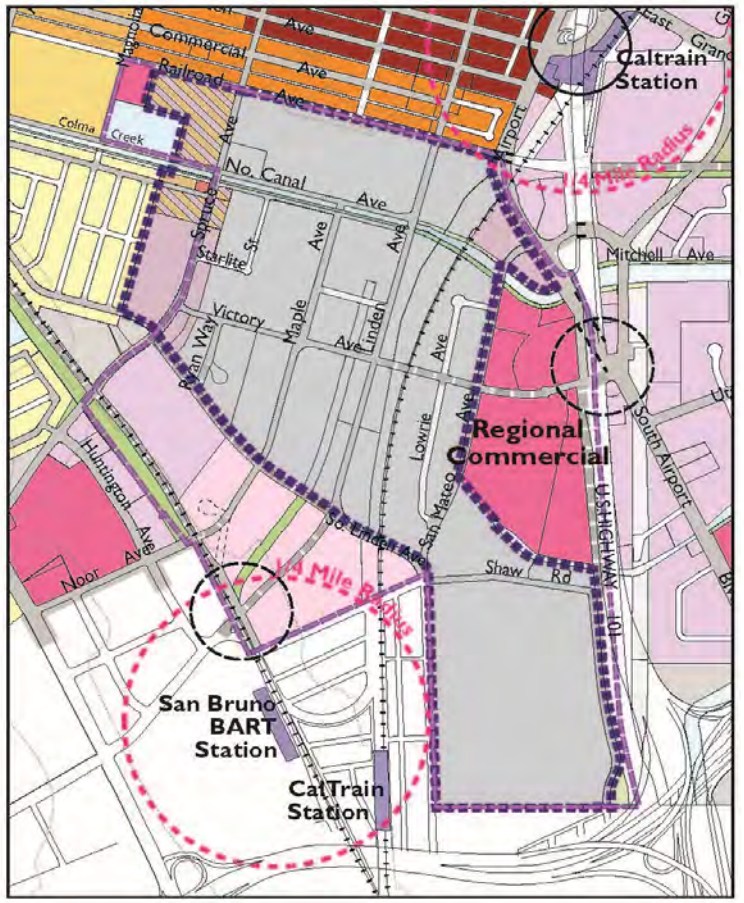
In connection with its adoption of the Southline Specific Plan, the City adopted amendments to the General Plan, which included an amendment to General Plan Figure 2-3: Special Area Height Limitations to increase the building height in the Specific Plan area to approximately 120 feet in accordance with Federal Aviation Administration requirements, and re-designation of a small, approximately 0.3-acre parcel within the Specific Plan area from "Park and Recreation" to "Office" to be consistent with the General Plan designation of the remainder of the Specific Plan area. As amended, the General Plan designates the entire Specific Plan area as Office.

The Planning Sub-Areas Element of the General Plan includes the Specific Plan area within the Lindenville Planning Sub-Area, which, according to the General Plan, is the only large-scale industrial area in the City located west of U.S. 101, and is comprised of a range of commercial uses including small business parks. The Planning Sub-Areas Element does not impose density or height standards separate from those standards found in the General Plan's Land Use element. The Lindenville Planning Sub-Area is an area that the City has identified as needing "upgrading and rehabilitation." (General Plan, Planning Sub-Areas Element, P. 3-14). Access to the area is constrained, and trucks often have to negotiate downtown streets to access U.S. 101 at the Grand Avenue intersection, creating bottlenecks at major entryways to the City of San Bruno. The General Plan indicates that the Lindenville Planning Sub-Area's proximity to the San Bruno BART station will provide opportunities for redevelopment.

To that end, the General Plan includes a number of policies that encourage redevelopment and infrastructure improvements in the Lindenville Planning Sub-Area, including the following, which apply to the Specific Plan Area:

- Providing better connectivity to San Bruno BART station, including via extension of South Linden Avenue through the Specific Plan area.
- Enhancing the appearance of the area by undertaking streetscape and other improvements.
- Improving the buffering between industrial areas in the Lindenville Planning Sub-Area and surrounding residential neighborhoods.
- Encouraging new office development in areas designated for that use.

No other Planning Sub-Area policies apply to the Specific Plan area.



Lindenville Planning Sub-Area shown in light purple perforated lines. Black circular dashed lines indicate interchange/intersection study areas. (SSF General Plan, p. 3-12)

South San Francisco Municipal Code Title 20: Zoning

South San Francisco Municipal Code Title 20: Zoning (referred to also as the "Zoning Ordinance"), is the primary document that implements the General Plan. Municipal Code Title 20: Zoning provides regulations regarding permitted land uses, development regulations, and development processes for land within the City.

The Business & Professional Office (BPO) zoning designation, applicable to the Specific Plan area prior to adoption of the Specific Plan, implemented the General Plan Office designation and allowed for a range of commercial uses including professional office, research and development, and supportive amenity uses. In connection with adoption of this Specific Plan, the Specific Plan area was rezoned to the Southline Campus (S-C) district, a zoning district specific to the Specific Plan area. This Specific Plan establishes development standards for the Specific Plan area and is intended to be the primary regulatory document for development within the Specific Plan area. Implementation of the Specific Plan is further discussed in Chapter 6: Implementation.

Parks, Trails, and Recreation Master Plan (2015)

The Parks and Recreation Master Plan is a strategic document that studies the existing park system, facilities, and recreation programming, and identifies a planning blueprint to improve, protect and expand the city's network of parks, facilities, and recreational services for the future.

Pedestrian Master Plan (2014) and Bicycle Master Plan (2011)

The City's Pedestrian Master Plan includes eight concept plans that provide site-specific recommendations based on assessments of pedestrian facilities and walking audits. Concept plans include corridors, large intersections, sections of neighborhoods and areas around activity nodes. The Pedestrian Master Plan identifies and prioritizes street improvements to enhance pedestrian access. The plan analyzes pedestrian demand and gaps in pedestrian facilities, and recommends improvements and programs for implementation.

The City's Bicycle Master Plan identifies and prioritizes street improvements to promote bicycle riding for transportation and recreation. The plan analyzes bicycle demand and gaps in bicycle facilities, and recommends improvements and programs for implementation. The recommendations are intended to provide safer, more direct bicycle routes through residential neighborhoods, employment and shopping areas, and to transit stops.

As shown in Bicycle Master Plan Figure 6-2: Existing and Proposed Bicycle Facilities, the Bicycle Master Plan identifies the Centennial Way Trail as a Class I Multi-Use Path, and Class III Bicycle Routes on South Spruce Avenue, Victory Avenue, South Linden Avenue, and Dollar Avenue. The Bicycle Master Plan also identifies bicycle parking at the South Maple Avenue / Tanforan Avenue intersection, which is proximate to the Specific Plan area.

Both the Pedestrian Master Plan and the Bicycle Master Plan are currently being updated in the *Active South City: Bicycle and Pedestrian Master Plan* in connection with the City's 2040 General Plan update, which has not yet been adopted. The current Bicycle Master Plan and Pedestrian Master Plan remain active until completion and adoption of the new *Active South City: Bicycle and Pedestrian Master Plan.*

The bicycle and pedestrian improvements contemplated in this Specific Plan are consistent with the goals and improvements envisioned in the Draft *Active South City* Plan.

1.6. Interpretation

The terms “shall”, “should”, “may”, and “could” are used within the Specific Plan. The term “shall” is used to denote a standard where compliance is required. The term “should” is used to denote a guideline that is recommended, but not required in all circumstances. The terms “may” and “could” are used to denote something that is allowed or optional, but not required.

1.7. Environmental Review

Adoption of a Specific Plan is a “Project” for purposes of the California Environmental Quality Act (CEQA), subject to environmental review. The Southline Specific Plan Environmental Impact Report (“Southline EIR”; State Clearinghouse # 2020050452) analyzes the potential environmental impacts of the development as described in this Specific Plan, in addition to the impacts of the proposed off-site improvements and related infrastructure, and evaluates mitigation measures intended to reduce or avoid significant environmental impacts to the extent feasible.

The Southline EIR is intended to provide CEQA clearance for adoption and implementation of the Specific Plan and the other approvals described in Section 1.8 below, in addition to the proposed off-site improvements and related infrastructure, and shall be relied on by the City of South San Francisco and other agencies for processing of related concurrent or subsequent approvals that are consistent with this Specific Plan, subject to the requirements of CEQA.

1.8. Project Approvals

Implementation of the Specific Plan requires approval of certain entitlements and approvals from the City of South San Francisco. The following list is limited to the entitlements and approvals subject to the City of South San Francisco’s review and approval that are anticipated for implementation of the Specific Plan.

- Certification of the EIR and adoption of CEQA findings and a Mitigation, Monitoring, and Reporting Program;
- Adoption of the Southline Specific Plan, which will operate as the zoning for the Specific Plan area;
- General Plan amendments to reflect adoption of the Specific Plan;
- Zoning map and zoning text amendments to reflect adoption of the Specific Plan;
- Subdivision Map approval for reconfiguration of the parcels and dedicating public roadways and easements;
- Use Permit approval;
- Transportation Demand Management Plan approval;
- Precise Plan(s) approval subject to the terms and policies of the Specific Plan;
- Design Review approval;
- Signage approval;
- Development Agreement; and
- Any additional actions or permits deemed necessary to implement this Specific Plan, including demolition,

grading, foundation, and building permits, public encroachment permits, any permits or approvals required for construction activity, tree removal permits, and other additional ministerial actions, permits, or approvals from the City that may be required.

As further described in Chapter 6: Implementation, in addition to the approvals by the City of South San Francisco, review and/or approvals or actions by other agencies or entities may be required, including but not limited to approvals by the City of San Bruno for off-site improvements within its jurisdiction; BART for off-site improvements within its jurisdiction; and the San Mateo County Airport Land Use Commission for determination of consistency with the SFO Airport Land Use Compatibility Plan.

2

LAND USE PLAN & DEVELOPMENT STANDARDS

This chapter illustrates the land use plan for the Specific Plan area and defines the land use district unique to the Specific Plan. This chapter also describes the development standards applicable to the Specific Plan area, including the permitted, conditionally permitted, and prohibited land uses.

2.1. Introduction

This chapter describes the Southline Specific Plan land use plan and provides for coordinated planning and design principles within the Specific Plan area. It also defines the development standards, allowed uses, and proposed Project phasing. The Southline Campus (S-C) land use district, which is unique to the Specific Plan area and is further discussed in Section 2.3 Southline Campus (S-C) District below, establishes the requirements for implementation of the Specific Plan's vision and goals.

The Southline Specific Plan is intended as the primary regulatory document for development within the Specific Plan area. Properties in the Specific Plan area shall comply with the policies, development standards and design guidelines as set forth in this Specific Plan. Properties within the Specific Plan area are subject to applicable regulations of the City of South San Francisco Municipal Code (the "Municipal Code") unless those regulations are otherwise addressed in this Specific Plan. All terms included in this Chapter shall have the same meaning as in the Municipal Code unless otherwise defined in this Specific Plan. To the extent any regulation in this Specific Plan conflicts with the Municipal Code, the regulation set forth in the Specific Plan shall prevail.

The final mix of uses developed within the Specific Plan area will depend on market conditions, tenant needs, and other factors. Appendix A: Conceptual Site Plan – Office Build Out provides conceptual site plans and renderings that represent one possible design for the development of the Specific Plan area with office uses. Appendix B: Conceptual Site Plan – R&D Build Out provides conceptual site plans and renderings that represent another possible design for the development of the Specific Plan area with R&D uses. Appendix C: Conceptual Office / Life Sciences Hybrid Buildout provides a conceptual site plan that represents a possible design for the development of the Specific Plan area with a blend of office and R&D uses.

Appendix A, Appendix B, and Appendix C are intended to demonstrate illustrative examples of the potential location and orientation of buildings; alignment and design of streets; and placement and size of open space areas and public facilities based on the development standards provided in Table 2-1: Southline Campus (S-C) Development Standards and design guidelines in described in Chapter 5: Design Guidelines. The conceptual site plans and renderings provided in Appendix A, Appendix B and Appendix C shall not be considered definitive. Both office and R&D uses are permitted within the Specific Plan area, and it is likely that Specific Plan buildout would contain a mixture of these uses. As further discussed in Chapter 6: Implementation, proposals for development within the Specific Plan area will be evaluated by the City through review and approval of project-level Precise Plans.

2.2. Southline Campus Land Use Plan

Southline is envisioned as a state-of-the-art transit-oriented commercial campus within the City of South San Francisco, adjacent to the San Bruno BART station and proximate to two Caltrain stations (San Bruno and South San Francisco). Southline will transform the existing low-density, aging and underutilized light industrial and warehouse buildings into an integrated transit-oriented commercial campus environment of high-quality design providing for Class-A office and/or R&D uses (including life science uses), as well as supporting uses such as professional services, dining, fitness, and related ancillary uses.

Ground floor spaces in the commercial buildings developed in the Specific Plan area may include tenant amenities, office, R&D, and/or other permitted uses. Where feasible, the public lobbies of new commercial buildings should front onto the newly constructed Southline Avenue (provisionally named for the purposes of this Specific Plan), which provides connectivity through the Specific Plan area, to create a unified campus environment.

View South of Building 2 (Amenities Building)

2.2.1. Land Use Program

The Specific Plan allows for development of commercial buildings totaling up to approximately 2,800,000 square feet (sf). Based on the development standards applicable to the Specific Plan area, as detailed in Table 2-1: Southline Campus (S-C) Development Standards, the commercial buildings generally are anticipated to range in height from four to seven stories. These buildings are envisioned to accommodate office and R&D tenants but may include limited office-supporting uses dedicated solely to tenant use, such as professional services, dining, fitness, and related amenity and ancillary uses.

The Specific Plan does not define or limit the specific number of commercial buildings that may be developed within the Specific Plan area, subject to the requirement that all development must be consistent with the development standards and design guidelines established in the Specific Plan.

The total commercial square footage allowed under the Specific Plan includes a supportive Amenities Building (Building 2), which is anticipated to be located on the southwest corner of the Specific Plan area as shown in Figure 2-1: Conceptual Site Plan. Planned uses within this Amenities Building may include publicly-accessible ground floor retail and amenity uses that front onto a public open space area adjacent to Huntington and Southline Avenues – an area referred to in this Specific Plan as the Southline Retail Plaza. The ground floor may also contain other publicly accessible spaces, such as a community center of approximately 1,000 sf.

It is anticipated that the upper floors of the Amenities Building will include other uses available only to the Southline campus tenants such as a fitness center and meeting spaces and one or more terraces overlooking Southline Avenue.

As part of the integrated campus design, the Specific Plan envisions the development of an approximately 1.5 acre central green space—referred to as the Southline Commons—that offers outdoor amenities that would be accessible to both tenants and the public. It is envisioned to include pedestrian paths, outdoor meeting and gathering spaces, casual dining areas, and space for recreation and events.

Figure 2-1: Conceptual Site Plan illustrates one possible land use development plan for the Specific Plan area. Conceptual renderings of the planned development are shown in Figures 2-2 through 2-4.

Figure 2-1: Conceptual Site Plan

Figure 2-2: View East from Huntington Avenue / Southline Avenue Intersection

Figure 2-3: View North of Building 3 from Southline Avenue

Figure 2-4: View South of Amenities Building (Building 2)

Figure 2-5: View Southwest of Buildings 7 and 1

2.2.2. Parking and Transit Demand Management

The Specific Plan area is in close proximity to major public transit services, including BART, Caltrain, and SamTrans bus routes. As further discussed in Chapter 3: Circulation & Mobility, implementation of the Specific Plan is envisioned to include public transit linkages, including pedestrian and bicycle facilities improvements intended to promote the use of public transit and alternatives to automobile transportation.

Development within the Specific Plan area will require implementation of a Transportation Demand Management ("TDM") plan(s) pursuant to Municipal Code Chapter 20.400: Transportation Demand Management. The City's TDM requirements apply to all nonresidential development expected to generate 100 or more average daily trips, or projects seeking an FAR bonus. As further discussed in Section 3.7 Transportation Demand Management, the TDM Plan identifies strategies, measures, and incentives to encourage future campus employees and visitors to walk, bicycle, ride transit, or carpool when commuting to and from the Specific Plan area.

It is anticipated that the Specific Plan area would also include several mobility hubs designed to accommodate shuttles and/or ride-share pickup and drop off zones, along with other features that may be included in any applicable TDM program(s) within the Specific Plan area.

The Specific Plan also anticipates provision of sufficient onsite parking to accommodate the employees or visitors who drive to the site, in conjunction with other modes of transportation.

As further described in Table 2-1: Southline Campus (S-C) Development Standards and Section 3.5 Vehicle Parking, parking will be provided at a maximum of 1.65 striped spaces per 1,000 square feet of commercial use as calculated across the entire Specific Plan area, with an option to incorporate valet parking program(s) up to 2.0 spaces per 1,000 square feet of commercial use, subject to City review and approval as described below in this Section 2.2.2. Parking in the Specific Plan area may be provided through subterranean parking under buildings, above-grade parking within the Amenities Building (Building 2), stand-alone campus parking structures (e.g., Parking Structures C and D), and/or limited off-street surface parking within the Specific Plan area.

The intent of this Specific Plan is to establish a flexible range of parking options based on tenancy needs and market conditions and to encourage the use of alternate transportation modes and reduce the reliance on single-occupancy vehicles. The specific parking strategy will be implemented through the Precise Plan process for each phase, with parking provided within the permitted range.

As described in Chapter 6: Implementation of this Specific Plan, each Precise Plan application will include parking demand information to help evaluate the anticipated parking demand based on the proposed land use mix. The parking demand information for future phases will also include parking data from previous phases, to ensure that the proposed parking is adequate to serve the proposed development, while maintaining the characteristics of a transit-oriented development and encouraging alternative transportation modes.

Prior to implementing one or more valet parking program(s) within the Specific Plan area, the tenant or owner applicant shall submit a valet operations plan to the City for review. The valet operations plan may be submitted concurrent with or separate from a Precise Plan application. Each valet operations plan shall describe the proposed use and employee density; summarize the proposed valet parking capacity; the location of valet stalls within the existing Specific Plan area parking facilities; and the number of striped stalls and total parking spaces available for tenant use, as well as the proposed hours of operation. The City shall review and approve the operations plan based on the policies set forth in this Specific Plan prior to the commencement of a valet program.

2.2.3. Architectural Character & Design

Speaking to the industrial history of the Lindenville Planning Sub-Area, it is anticipated that the Specific Plan area will embrace a contemporary interpretation of the existing industrial motif using glass, metal and "brick-like" materials in a rich color palette. The composition of each building massing and design should vary, making each building unique rather than utilizing repetitive forms throughout the Specific Plan area.

Building features are encouraged to create visual interest that will help to break down the overall scale and massing. Wall planes should vary in depth and direction to create an interesting streetscape. Building scale should be further articulated by fenestration that offers additional depth and texture. A combination of parapets, eaves, projecting roof forms should be used to create interest at the roof line. Massing hierarchy may be further emphasized by the integrated penthouse forms above each or some of the building main entries.

The proposed Parking Structures C and D are envisioned to have simple and straightforward volumetric geometry. Stairs and elevator towers should utilize distinctive mass that is different from but complementary to the overall building form.

Chapter 5: Design Guidelines provides further guidance regarding the architectural, landscape and other design guidelines that should be considered during implementation of the Specific Plan area. Specific design review of project-level proposals will be evaluated for consistency with the Specific Plan by the City in conjunction with the Precise Plan and Design Review processes as further described in Chapter 6: Implementation.

View Northeast of Building 7

2.2.4. Circulation and Mobility

As further described in Chapter 3: Circulation & Mobility, the Southline development proposes several key circulation and mobility improvements in the surrounding transportation network to accommodate increased development capacity of the Specific Plan area; to create improved connectivity and circulation for the surrounding community; to improve pedestrian and bicyclist safety; and to carry out transportation and circulation policies under the South San Francisco General Plan. These circulation and mobility improvements include new public and private streets; enhanced pedestrian and bicycle facilities; improved pedestrian access to the San Bruno BART station; neighborhood traffic calming features; and improved compatibility with a future grade separation of the Caltrain tracks. The proposed circulation and mobility improvements are more specifically described in Chapter 3: Circulation & Mobility.

A major circulation feature to be implemented within the Specific Plan area is development of the new Southline Avenue roadway (provisionally named for purposes of this Specific Plan) that is envisioned to be constructed east to west through the Specific Plan area between Huntington and South Linden Avenues, consistent with the City's General Plan policies calling for extension of South Linden to the San Bruno BART station. Southline Avenue is envisioned to have two travel lanes in each direction, a center median, a Class II bike lane on both sides, and a sidewalk on both sides that would be separated from the roadway by landscaped planting areas.

Several off-site circulation and mobility improvements are proposed outside of the Specific Plan area. These include new signalized intersections and pedestrian crosswalks, and enhanced pedestrian and bike access to the San Bruno BART station and Centennial Way Trail, as further described in Chapter 3: Circulation and Mobility.

To the extent that these improvements require work on property outside of the City of South San Francisco's jurisdiction, additional approvals from other agencies, such as the City of San Bruno, BART, etc. may be required as further described in Chapter 6: Implementation.

San Bruno BART Station

2.2.5. Infrastructure Improvements

As further described in Chapter 4: Infrastructure & Public Services, future development within the Specific Plan area will utilize the existing public utility infrastructure adjacent to the Project site to the extent feasible. It is anticipated that certain existing utility connections may be relocated and/or abandoned, and new utility connections shall be required for implementation of the Specific Plan to accommodate increased capacity demand.

New utility laterals and connections will connect to the public system as required by the City. It is anticipated that proposed onsite utilities will provide separate metered water and sewer service to each building.

As part of future development, it is anticipated that new underground utilities will be constructed on Southline Avenue and upgraded connections will be constructed to existing utilities on surrounding streets as needed to accommodate additional capacity demand. Additionally, existing overhead utility poles would be relocated underground along the immediate street frontages, as required by the City or otherwise required by the respective utility provider.

The City will determine required utility connections and improvements during project-level Precise Plan review for each development phase, or as otherwise set forth in a Development Agreement.

2.2.6. Landscape and the Public Realm

As further described in Chapter 5: Design Guidelines, landscaping and open space within the Specific Plan area is envisioned as a useful, safe, and sustainable outdoor experience, creating a sense of a cohesive "campus-like" community, while being sensitive to the adjacent residential neighborhood to the south. The Specific Plan area is anticipated to include several open space features including the Southline Commons, the Southline Retail Plaza, and the Tanforan Avenue Community Parklet, each of which are described below. These open space areas are anticipated to be privately owned and maintained, but publicly accessible. Each of these areas are shown in Figure 5-1: Conceptual Landscape & Open Space Program.

Chapter 5: Design Guidelines provides further guidance regarding the landscaping characteristics to be incorporated in the Specific Plan area. Project-level development proposals will be evaluated for consistency with the Specific Plan by the City through the Precise Plan review process as further described in Chapter 6: Implementation.

Southline Commons

The Southline Commons refers to an open-space area of approximately 1.5 acres that is anticipated to be developed north of Southline Avenue and is intended to serve as a publicly-accessible focal point and the social outdoor gathering space within the Specific Plan area. It would also provide passive open space that serves as an outdoor amenity for the Southline campus tenants. The specific location, size and programming of the Southline Commons will be determined through the Precise Plan review process as further described in Chapter 6: Implementation. A conceptual rendering is shown in Figure 2-6: Conceptual Illustration of Southline Commons.

It is anticipated that Southline Commons may include the following program features:

- Flexible space that can be used for informal gatherings as well as programed events;
- Outdoor dining area;
- Seating areas with benches, tables, chairs, etc.;
- Shade structures and/or landscaping that provides shade;
- Space for passive recreation activities such as ping pong, bocce ball, cornhole, etc.;
- Electrical power outlets to support campus events and programs; and/or
- Multi-purpose vehicle turnout space for a shuttle stop, ride-share pick-up/drop off, food trucks, etc.

The Southline Commons is intended to function largely as a pedestrian-only area, capable of hosting events and community gatherings or serve as exterior dining or social space. Outdoor programming within the Southline Commons may include corporate and cultural events and food markets, subject to issuance of appropriate permits. Periodically, some of the circulation around Southline Commons may be closed to host special events. Utilization of the Southline Commons for events is anticipated to generally occur during normal business hours, with some evening and weekend events. Property owners and their tenants may develop appropriate rules and regulations related to security, use, hours of operation and conduct within the Specific Plan area open space areas including Southline Commons.

Southline Commons would include a variety of pavers and hardscape elements to create a contemporary and durable outdoor space. Southline Commons would include a varied landscape texture, including shade trees and landscaped berms to create usable edges for sitting that also serve as green space.

Figure 2-6: Conceptual Illustration of Southline Commons

Southline Retail Plaza

The Southline Retail Plaza outdoor area will front the Amenities Building (Building 2) on Southline and Huntington Avenues. The Southline Retail Plaza would be designed to complement and support the adjacent ground floor retail, dining and other amenity uses, and is envisioned to include features such as outdoor dining areas, terraced seating and landscaping to serve as both a both buffer and transition to adjacent street edge.

Tanforan Avenue Community Parklet

Development of the Tanforan Avenue Community Parklet is envisioned within an approximately 40-foot buffer setback from Tanforan Avenue on the north side of Tanforan Avenue. This open space amenity will be designed to be an amenity for the surrounding community, including residents along Tanforan Avenue. The Tanforan Avenue Community Parklet is intended to create a transition between the Specific Plan area and the residential neighborhood to the south, and to provide an open space buffer between the new development areas, and neighboring homes along Tanforan Avenue.

The Tanforan Community Parklet is proposed to incorporate a walking pathway surrounded by significant landscaping. Passive and active amenity features may include a picnic area, a children's play area, a fruit and vegetable garden, a stormwater demonstration garden, and special plant areas such as a fragrant planting bed. The Tanforan Community Parklet is anticipated to be constructed as part of Phase 1 development.

2.3. Southline Campus (S-C) District

The Specific Plan area is zoned utilizing one zoning district, the Southline Campus (S-C) District. The S-C District establishes the development standards and requirements for implementation of the Specific Plan, as set forth in this Specific Plan. As shown in Figure 2-7: Southline Campus (S-C) District, this district covers the entire Specific Plan area.

The Southline Campus (S-C) district is intended to allow for development of a state-of-the-art transit-oriented commercial campus, including administrative, financial, business, and professional offices, R&D (including life sciences), supporting commercial services (e.g. retail, fitness, restaurants, etc.) and ancillary uses in an area that is proximate to BART and Caltrain stations.

Allowed uses in the Southline Campus (S-C) district are provided in Table 2-2: Land Use Regulations. The development standards applicable to development in the Southline Campus (S-C) district are provided in Table 2-1: Southline Campus (S-C) Development Standards.

Example of a state-of-the-art commercial campus (Samsung North America Headquarters, San Jose, CA)

Figure 2-7: Southline Campus (S-C) District

2.4. Development Standards

This section provides the land use development standards that shall apply to the Southline Campus (S-C) land use district, as further described in Table 2-1: Southline Campus (S-C) Development Standards. These development standards, in combination with the supporting design guidelines described in Chapter 5: Design Guidelines, implement and refine the policies and vision of the General Plan, including the Lindenville Planning Sub-Area, for this Specific Plan area.

Except as otherwise noted, development in the Southline Campus (S-C) district shall be consistent with the development regulations as described in Table 2-1: Southline Campus (S-C) Development Standards and Table 2-2: Land Use Regulations, subject to minor deviations as further described in Chapter 6: Implementation.

These standards establish rules for development within the Specific Plan area, including building placement, scale and form, and lot design. No lot should be created with size or dimensions rendering it incapable of meeting the land use, public utilities, or development standards of this Specific Plan.

In certain instances, Tables 2-1 and 2-2 reference the Municipal Code for development standards that apply on a generally applicable City-wide basis and are applicable to the Specific Plan. In any instances where both the Specific Plan and Municipal Code (or other City rule / regulation / guideline) provide a development standard for some aspect of site or building design, the Specific Plan shall prevail and control. Specific provisions of the Municipal Code not addressed in this Specific Plan that would otherwise apply to development in the Specific Plan area shall apply to the extent those provisions are consistent with the Specific Plan. Unless otherwise established herein, all definitions and land use terms shall be interpreted consistent with the Municipal Code.

2.4.1. Height

As the Specific Plan area is approximately two miles northwest of the San Francisco International Airport, development within the Specific Plan area shall comply with the height restrictions and related policies under federal, state and local law. These policies include those established by both the Federal Aviation Administration (“FAA”) Part 77 regulations and the Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport (“ALUCP”; most recently updated November 2012).

As set forth in Table 2-1: Southline Campus (S-C) Development Standards, maximum building heights within the Specific Plan area are governed by those requirements, as set forth in the Critical Aeronautical Surfaces provisions of the ALUCP (see Exhibit IV-17) and FAA Part 77 regulations, resulting in a maximum height of approximately 120 feet depending on the specific elevation of the relevant portion of the Specific Plan area and the applicable height contours under the above applicable regulations. No other height restrictions apply to development within the Specific Plan area.

Figure 2-8: Conceptual Building Heights is intended to provide an illustrative example as to how building heights could be tapered throughout the Specific Plan area. Project-level development proposals will be evaluated for consistency with

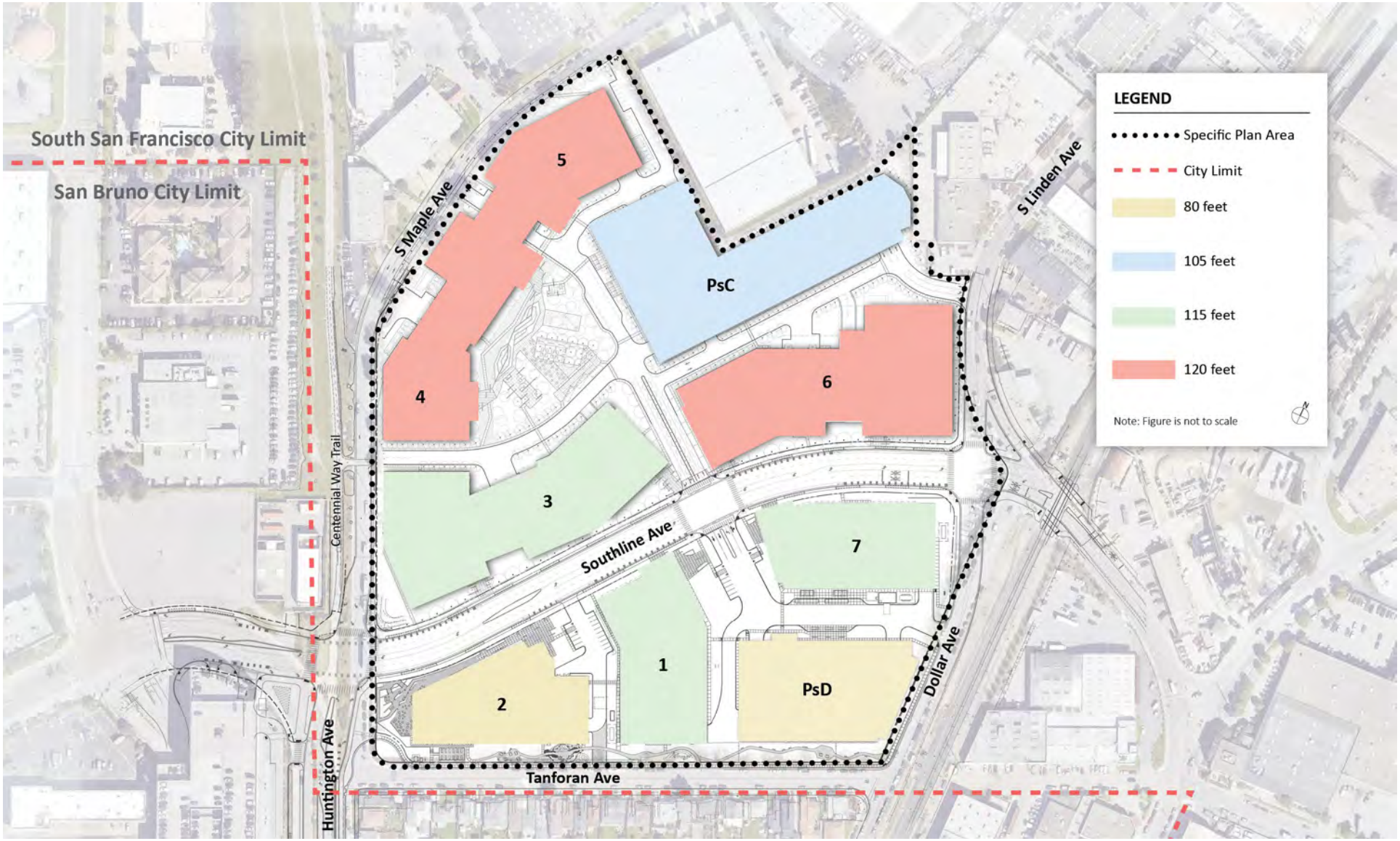
maximum height allowances through the Precise Plan review process as further described in Chapter 6: Implementation.

A shadow study was prepared for the Specific Plan to evaluate the shadows that would be cast at buildout of the Specific Plan area. The shadow study concluded that shadows would be cast on commercial and industrial properties, roadways, and rail tracks to the northwest, north, and northeast of the Specific Plan area at various times of the year between the hours of 10:00 a.m. and 3:00 p.m. However, at no time would the Specific Plan buildout cast shadows on the residential uses south of Tanforan Avenue in the City of San Bruno.

2.4.2. Modifications

Modifications to the development standards included in this Specific Plan may be necessary to respond to unique site characteristics, regulatory permitting requirements, changes in development requirements to respond to market trends, or other factors, as described in Chapter 6: Implementation.

Figure 2-8: Conceptual Building Heights



See Section 2.4.1 and Table 2-1: Southline Campus (S-C) Development Standards for additional information regarding height regulations within the Specific Plan area.

Table 2-1: Southline Campus (S-C) Development Standards

Standard	Southline Campus (S-C)	Comments / Additional Regulations
Lot and Density Standards		
Maximum Floor Area Ratio	2.4	See Municipal Code Chapter 20.040: Rules of Measurement, including Municipal Code § 20.040.008: Determining Floor Area and Municipal Code § 20.040.009: Determining Floor Area Ratio. Total allowable floor area and floor area ratio (FAR) shall be calculated based on entire Specific Plan area (inclusive of Southline Avenue and other dedicated improvements) rather than on a lot-by-lot basis. The total allowable floor area shall be 2,800,000 square feet across the entire Specific Plan area, which equates to approximately 2.4 FAR, exclusive of parking structures, and any other applicable exceptions provided under Municipal Code Chapter 20.040: Rules of Measurement.
Maximum Lot Coverage	70 %	Refer to Municipal Code § 20.040.010: Determining Lot Coverage.
Minimum Open Space Coverage	15 %	Total allowable open space area shall be calculated based on entire Specific Plan area (inclusive of Southline Avenue and other dedicated improvements) rather than on a lot-by-lot basis. Open space includes all landscaped areas, sidewalks and pathways, decorative paving and passive and active areas.
Building Form and Location		
Maximum Building Height (ft.)	Maximum height allowances under FAA Part 77 regulations and San Francisco International Airport ALUCP Critical Aeronautical Surfaces provisions	Subject to FAA Part 77 notification and determination requirements. See Figure 2-8: Conceptual Building Height.

Standard	Southline Campus (S-C)	Comments / Additional Regulations
Setbacks (feet)	See below	Setbacks are measured from property line to the exterior wall of the primary building, with the exception that setbacks from Tanforan Avenue shall be measured from that public right of way to the exterior wall of the primary building. Subterranean garages within the Specific Plan area are not subject to setback requirements. Setbacks within the Specific Plan area are not subject to Municipal Code § 20.040.012: Determining Setbacks (Yards) or § 20.300.011: Projections into Required Yards. Accessory buildings and structures within the Specific Plan area are not subject to Municipal Code § 20.300.002: Accessory Buildings and Structures, including setback requirements included therein; see Chapter 5: Design Guidelines regarding accessory buildings and structures.
Front	10	
Side, Interior	10	
Side, Street	10	
Tanforan Avenue	40	Setbacks are 40 feet as measured from Tanforan Avenue right of way, with the exception of the cul-de-sac at the western end of Tanforan Avenue, where buildings may be sited within 20 feet from the Tanforan Avenue right of way.
Southline Avenue	0	Landscape buffers should be used to visually screen and soften the perimeter of the Specific Plan area, including along Southline Avenue. See Section 5.4.6 (Landscape Edge) and Figures 3-2a and 3-2b Conceptual Southline Avenue Cross-Sections.
Rear, Interior	10	
Parking and Loading		
Maximum Parking (spaces per 1,000 sf)	1.65	Maximum ratio of 1.65 striped stalls with option of valet parking up to 2.0 ratio. See Section 2.2.2 Parking and Transportation Demand Management for information regarding valet parking requirements. Maximum parking ratio shall be calculated based on entire Specific Plan area (inclusive of Southline Avenue and other dedicated improvements) rather than on a lot-by-lot basis. Parking incorporated within Building 2 (Amenities Building) shall not count towards the maximum 1.65 parking ratio; parking within Building 2 (Amenities Building) shall be utilized for Specific Plan area visitors and Amenities Building customers, staff, and affiliates.

Standard	Southline Campus (S-C)	Comments / Additional Regulations
Minimum Bicycle Parking	1 bicycle space per 3,000 sf	Approximately 90% of bicycle spaces will be provided for long-term use and the remaining 10% will be for short-term use. The specific allocation and location of short-term and long-term spaces will be established under each Precise Plan. Table 2-1 and the Chapter 5: Design Guidelines of this Specific Plan establish the bicycle parking requirements for the Specific Plan area; Municipal Code § 20.330.008: Bicycle Parking does not apply.
Loading Space	1 space / building	Minimum size shall not be less than 12 feet wide, 45 feet long, and 14 feet high, exclusive of driveways for ingress and egress, maneuvering areas and setbacks.

2.5. Land Use Regulations

Table 2-2: Land Use Regulations, establishes the permitted, conditionally permitted, and prohibited uses within the Specific Plan area. The uses listed in Table 2-2: Land Use Regulations have the same meaning as those use classifications as defined under Municipal Code Chapter 20.620: Use Classifications, unless otherwise defined in this Specific Plan.

Within the Specific Plan area, all land area and structures/facilities therein are intended to be developed, divided, and/or used for those activities listed in Table 2-2: Land Use Regulations. Table 2-2 also includes references to generally applicable Municipal Code sections and other ordinances that the City uses to regulate development, where relevant.

Land uses in the table are grouped into general categories based on common function, product, or compatibility characteristics. These allowed use categories are called "use classifications." Use classifications describe one or more uses having similar characteristics but do not list every use or activity that may appropriately be within the classification. The following rules apply to use classifications:

Similar Uses. In cases where a specific land use or activity is not specifically listed in Table 2-2: Land Use Regulations, the Chief Planner may assign the land use or activity to a classification that is substantially similar in character. Certain prohibited uses are listed for clarity in Table 2-2: Land Use Regulations, but this list is not comprehensive; use classifications and sub-classifications not listed in Table 2-2: Land Use Regulations, or not found to be substantially similar to the uses below are prohibited.

Illegal Uses. No use that is illegal under local, state, or federal law shall be allowed in any land use sub-designation within the Specific Plan area.

Use regulations in Table 2-2: Land Use Regulations are shown using the following symbols:

P Land use permitted by right.

C Land use allowed with the approval of a conditional use permit per generally applicable provisions of Municipal Code Chapter 20.490: Use Permits.

MUP Land use allowed with the approval of a minor use permit per generally applicable provisions of Municipal Code Chapter 20.490: Use Permits.

- Land use not allowed / not permitted.

TUP Temporary use permit per generally applicable provisions of Municipal Code Chapter 20.520: Temporary Use Permits.

Table 2-2: Land Use Regulations

Use [1, 2]	Southline Campus (S-C)	Additional Regulations[3]
Public and Semi-Public Uses		
Community Assembly, small, 2,000 sq. ft. or less	P	
Cultural Institutions	P	
Government Offices	P	
Park and Recreation Facilities	P	
Public Safety Facilities	P	
Commercial Uses		
Business Services	P	
Commercial Entertainment and Recreation [4]	See sub-classifications below	
Indoor Entertainment	C	
Indoor Sports and Recreation	C	
Outdoor Entertainment	C	
Outdoor Sports and Recreation	P	
Eating and Drinking Establishments [4]	See sub-classifications below	
Coffee Shops / Cafes	P	
Restaurants, Full Service	P	
Restaurant, Limited Service	P	
Lodging	See sub-classifications below	
Hotels and Motels	C	

Use [1, 2]	Southline Campus (S-C)	Additional Regulations[3]
Maker Space	P	
Offices	See sub-classifications below	
Business and Professional	P	
Medical and Dental	P	
Walk-In Clientele	P	
Personal Services	See sub-classifications below	
General Personal Services	P	See Personal Services in Municipal Code Chapter 20.350: Standards and Requirements for Specific Uses and Activities
Retail Sales	See sub-classifications below	
General Retail Sales	P	
Parking Services	P	
Employment Uses		
Clean Technology	P	
Handicraft / Custom Manufacturing	P	
Research and Development (R&D)	P	
Residential Uses	**NP**	
Transportation and Utilities Uses		
Communications Facilities	See sub-classifications below	
Antennae and Transmission Towers	C	See Municipal Code Chapter 20.370: Wireless Communications Facilities

Use [1, 2]	Southline Campus (S-C)	Additional Regulations[3]
Facilities within Buildings	P	
Transportation Hub [5]	P	
Utilities – Major	C	
Utilities – Minor	P	
Other Applicable Use Regulations		
Nonconforming Uses	See Additional Regulations	See Municipal Code Chapter 20.320: Nonconforming Uses, Structures, and Lots
Temporary Uses [6]	TUP	See Municipal Code Chapter 20.340: Temporary Uses
Other uses determined by the Chief Planner to be similar to and compatible with described permitted and conditionally permitted uses	P	See Chapter 6: Implementation; see also Municipal Code § 20.490.002: Use Permit Applicability

Notes:

1 Unless otherwise indicated, uses listed in this Table 2-2 have the same meaning as those use classifications as defined under Municipal Code Chapter 20.620: Use Classifications

2 Certain uses permitted or conditionally permitted within the Specific Plan area are subject to confirmation that no subsequent CEQA analysis is required, or completion of subsequent CEQA analysis. See Southline Specific Plan EIR for further information regarding scope of CEQA analysis.

3 Uses are subject to ALUCP Policy NP-2 and Table IV-1 Noise/Land Use Compatibility Criteria, as applicable.

4 Includes food trucks/mobile food facilities, outdoor food kiosks as authorized by Specific Plan operator, Owner's Association, or similar entity.

5 Use includes facilities for accommodation of shuttles and ride-share pickup and drop off zones, along with other features that may be included in any applicable Transportation Demand Management ("TDM") programs within the Specific Plan area. Excludes light-fleet based services or freight forwarding uses.

6 Temporary uses include, for example, produce markets, flea markets, craft and art fairs, auction gallery and other similar uses.

2.6. Phasing

This Specific Plan is anticipated to be implemented over time and in a phased approach, although phasing is not required. Generally, the Specific Plan envisions sequencing envisions two or more phases developed over approximately 10 years. Table 2-3: Conceptual Development Plan by Phase describes the square footages of development proposed for Phase 1 and the square footages of development for future phases and Project buildout, and the anticipated sequence of Specific Plan area construction is shown in Figure 2-9: Conceptual Phasing Plan. While a phased approach is anticipated to occur, the Specific Plan does not restrict or otherwise limit concurrent development of overlapping phases or buildout of the Specific Plan area, subject to review and approval of Precise Plans and any other necessary approval(s) as described in Chapter 6: Implementation.

The exact boundaries of each phase, sequencing, and development timing, including the exact boundaries within the Specific Plan area of these phases and the square footage developed within each phase may change due to market trends, availability of financing, and other factors.

As described in Chapter 6: Implementation, any future development shall be responsible for the construction of the required private and public infrastructure necessary to support each phase of development within the Specific Plan area (e.g., water, sewer, stormwater) and, in relevant circumstances, in adjacent off-site areas as determined by the City, and unless otherwise modified by separate agreement, such as a Development Agreement. It is anticipated that constructed public infrastructure associated with development of the Specific Plan will be dedicated to and accepted by various relevant public agencies (i.e., City of South San Francisco, City of San Bruno, California Water, PG&E, etc.).

Furthermore, improvements along Huntington Avenue south of Southline Avenue are subject to ongoing coordination between BART and/or the City of San Bruno to complete a right-of-way transaction that is separate from entitlements associated with this Specific Plan.

2.6.1. Phase 1 Improvements

As shown in Figure 2-9: Conceptual Phasing Plan, Phase 1 development proposes the construction of Building 1, Building 2 (Amenities Building), and Building 7. Phase 1 also includes construction of Parking Structure D, as well as limited surface parking to provide sufficient parking for that phase. Phase 1 development includes development of the Tanforan Avenue Community Parklet, which will allow for a dense landscape buffer between the proposed development and the residential neighborhood to the south.

During Phase 1, the remaining portions of the Specific Plan area outside of the Phase 1 area as shown on Figure 2-9: Conceptual Phasing Plan are anticipated to remain generally unchanged. However, building demolition, ground disturbances to accommodate infrastructure improvements, construction activities and staging, surface parking, and site preparation activities may occur as further described in Chapter 6: Implementation.

Phase 1 Utilities and Circulation and Transportation Improvements

It is anticipated that Phase 1 will involve the construction of the utilities infrastructure required to service the Phase 1 development, in addition to the majority of the proposed offsite circulation and transportation improvements. Specifically, Phase 1 circulation and transportation improvements are proposed to include the below list. The location of these of these improvements are shown in Figure 3-3: Off-Site Roadway Improvements.

1. Development of the new Southline Avenue connection west to east through the Specific Plan area between Huntington Avenue and South Linden Avenue.
2. Realignment of Dollar Avenue and South Linden Avenue.
3. Reconfiguration of the existing at-grade rail crossing at South Linden Avenue.
4. Roadway and pedestrian improvements along Tanforan Avenue.
5. Roadway and pedestrian improvements along Huntington Avenue from Southline Avenue southward to the San Bruno BART garage intersection.
6. Upgrade to the existing signalized intersection at Huntington Avenue / BART garage entry.
7. Synchronizing signals at the rail crossing and the signals along Southline Avenue (Huntington Avenue, project entrance, South Linden Avenue) to support safe vehicular circulation.
8. Construction of new signalized intersections at:
    a) Huntington Avenue / Southline Avenue
    b) Sneath Lane / Huntington Avenue
    c) Southline Avenue /Main Campus Entry
    d) South Linden Avenue / Dollar Avenue/ Southline Avenue

As shown in Figure 2-9: Conceptual Phasing Plan, some of these improvements are outside of the Specific Plan area and will require review and/or approvals or actions by other agencies or entities, including the City of San Bruno and/or BART for off-site improvements within its jurisdiction, further described in Chapter 6: Implementation.

2.6.2. Future Phase Improvements

If phased development occurs, development of the future phases could occur in one phase, or could be in multiple future phases. Development of the future phases would include construction of the remaining square footage of development as allowed under this Specific Plan, in addition to any associated infrastructure, parking, and landscaping and open space, subject to subsequent Precise Plan approval and adherence to Specific Plan development standards and design guidelines.

Anticipated off-site improvements in future phases include:

- Widening of and street frontage improvements along portions of South Maple Avenue.
- Upgrades to public utility backbone infrastructure needed to serve future phases, as needed. However, private utility laterals serving future phase development

that would be located within Phase 1 roadways will be installed during Phase 1 and stubbed for use in future phases to avoid future disruption to those roadway areas.

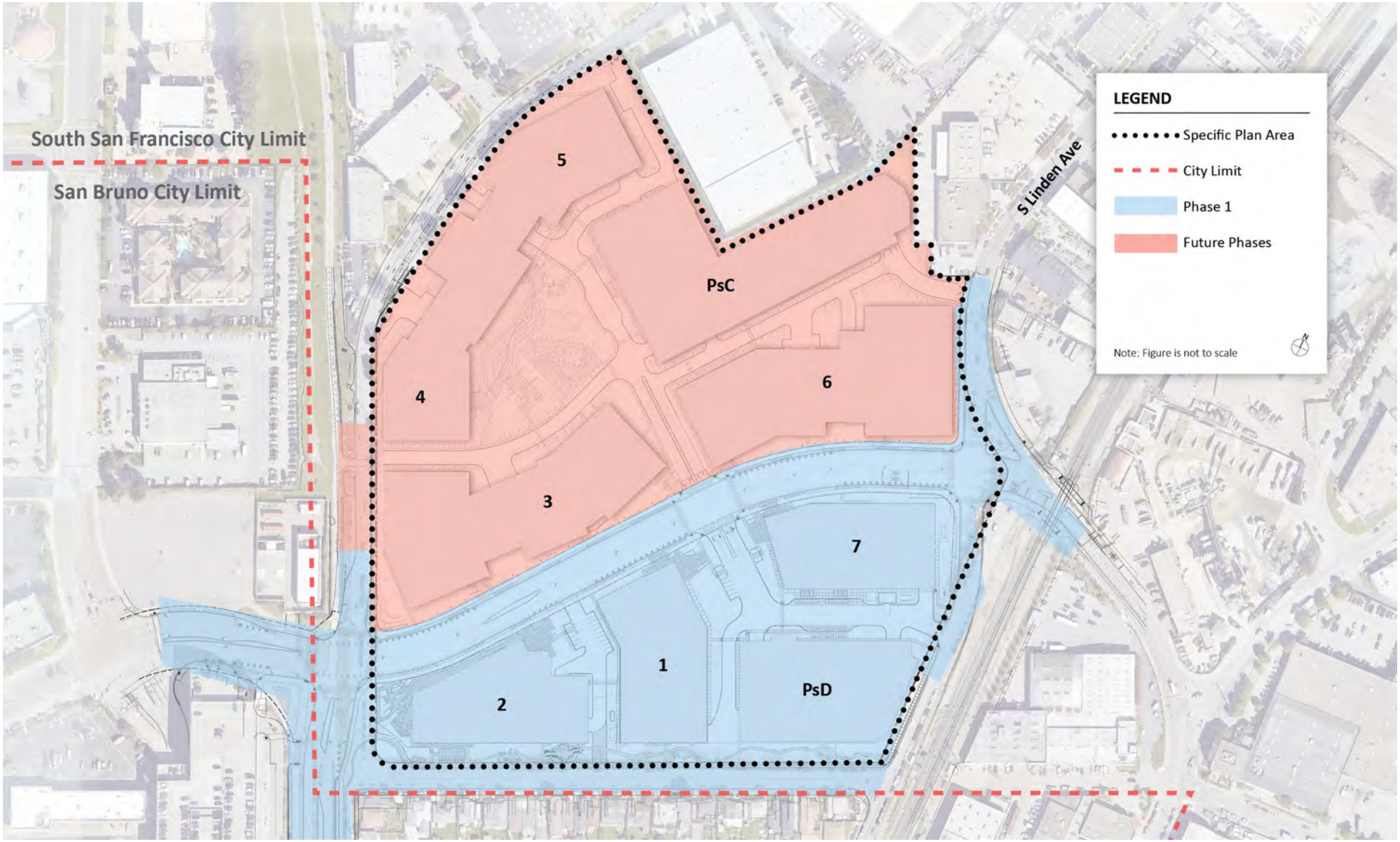
Table 2-3: Conceptual Development Plan by Phase

Use	Phase 1 (sf) [1]	Future Phases (sf)	Buildout (sf)
Office / R&D [2]	615,000	2,115,290	2,730,290
Public Amenity Areas [3]	13,500	-	13,500
Tenant Amenity Areas [4]	56,210	-	56,210
Total [5]	**684,710**	2,120,330	**2,800,000**

Notes:

1. Specific development square footage allocated to Phase 1, or any other phase is subject to project-level Precise Plan review and approval by City, as further discussed in Chapter 6: Implementation. Any square footage allocated to Phase 1 that is not constructed during Phase 1 may be developed in subsequent phases within the Specific Plan area.
2. The Southline EIR provides a programmatic analysis of an Office Buildout Scenario and a Life Sciences Buildout Scenario, to evaluate and disclose the greatest potential impacts that could result from Specific Plan buildout under either scenario. Because both office and life science uses are permitted within the Specific Plan area, it is likely that the Specific Plan buildout would contain a mixture of these uses. See the Southline EIR for additional information regarding Specific Plan CEQA review.
3. Square footage anticipated to be available for use by Southline campus tenants and public.
4. Square footage anticipated to be reserved for exclusive use of Southline campus tenants; not available for public use.
5. The total square footage allocations in this Table 2-3 are intended to provide information regarding one conceptual buildout of the Specific Plan area. With exception for the total buildout square footage of 2,800,000 sf, the square footages provided in this Table 2-3 are not intended as caps on development of specific uses or phases.

Figure 2-9: Conceptual Phasing Plan



Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

3

CIRCULATION & MOBILITY

This chapter describes the conceptual circulation and mobility plan for all users including bicyclists, pedestrians, and vehicles. It includes the conceptual roadway network and cross-sections for selected roadways. It also describes off-site roadway improvements that are proposed as part of this Specific Plan.

3.1. Introduction

Southline is planned as a transit-oriented commercial campus, taking advantage of its unique proximity to robust public transit options. Circulation and mobility planning is a key element of the Specific Plan given the unique proximity of the Specific Plan area to the San Bruno BART station, the San Bruno Caltrain station, adjacent SamTrans bus routes, the Centennial Way Trail, regional freeway connections to Interstates 280 and 380, and Highway 101, and regional and local serving retail and entertainment opportunities. As discussed in Section 1.4 Specific Plan Objectives, a number of the Specific Plan objectives relate to circulation and mobility, including:

- Promote alternatives to automobile transportation to further the City's transportation objectives by emphasizing public transit linkages, Transportation Demand Management (TDM) strategies, and pedestrian access and ease of movement between buildings.
- Create convenient and safe pedestrian and bike access to the San Bruno BART station and the Centennial Way Trail.
- Construct a new public street through the Specific Plan area to improve site access and regional roadway circulation.
- Enhance vehicular, bicycle, and pedestrian circulation and access in the area surrounding the Specific Plan.

To accomplish these objectives, this Specific Plan incorporates a "complete streets" approach that prioritizes creation of a truly multi-modal transportation system. This is consistent with the City's General Plan goals and policies that encourage providing infrastructure and design features into street design, enhanced capacity and new linkages to provide "complete streets" that are safe, comfortable, and convenient routes for walking, bicycling and public transportation to increase use of these modes of transportation," among other benefits.

Utilizing this approach, driving to and from the Specific Plan area is an option but not a necessity, and multi-modal mobility options are provided for employees, guests, and the general public. The circulation and mobility improvements proposed in connection with the Specific Plan are intended to improve access to the Specific Plan area, and also to improve circulation in the surrounding area for all users, including to the San Bruno BART station.

This chapter includes guidelines intended to prioritize the pedestrian and bicyclist experience within the Specific Plan area and the surrounding transportation network to ensure safe connections within and surrounding the Specific Plan area.

3.1.1. Mobility Guidelines

The following circulation and mobility guidelines are intended to facilitate the implementation of this Specific Plan.

Multimodal Circulation

- Promote circulation infrastructure and design that allows for alternative transportation modes including public transit, pedestrian travel, bicycle, and shuttles.
- Encourage use of alternative modes of transportation and reduce single-occupancy vehicle trips through implementation of a robust TDM program achieving 45percent mode shift consistent with City requirements for projects proposing FAR of up to 2.5.
- Create a circulation network that integrates the built environment and open space, both within and adjacent to the Specific Plan area.
- Synchronize signals at the rail crossing and the signals along Southline Avenue (Huntington Avenue, project entrance, South Linden Avenue) to support safe vehicular circulation.

Pedestrian and Bicycle

- Facilitate pedestrian circulation within and adjacent to the Specific Plan area to minimize automobile trip generation.
- Use pedestrian-only walkways (sidewalks and promenades) to provide (Americans with Disabilities Act [ADA]-compliant) safe and convenient connections within the Specific Plan area.
- In appropriate areas, define walkways with distinctive paving materials and lighting.
- In appropriate areas, provide places for seating along pedestrian walkways.
- Where feasible, inset walkways from roadways with a landscape buffer to promote safe, pedestrian-friendly circulation.
- Provide short-term bicycle parking at grade level that is conveniently located to serve shoppers, customers, messengers, guests and other Campus visitors.
- Provide long-term bicycle parking in above- and below-grade parking structures that serve employees and others who generally stay for longer periods of time.
- Promote the use of walking and bicycling by Campus tenants by providing convenient long-term bicycle parking, showers, and changing facilities.
- Provide designated Class II bike lanes on both sides of Southline Avenue. In other Specific Plan areas, bicycle circulation would be accommodated by Class III bicycle routes (e.g. internal roadways).
- Clearly delineate bicycle access and parking by lane markings, soft hit posts, bollards, wayfinding signage, and other appropriate measures.
- Utilize green-painted “bike boxes” at key intersections within the Specific Plan area to help facilitate safe and convenient bicycle circulation.
- Bike repair station in the Amenities Building (Building 2).

Transit Demand Management

As further discussed in Section 3.7 Transportation Demand Management below, development of the Specific Plan will include implementation of a robust TDM program. The following guidelines apply:

- Prepare and implement a transportation demand management plan (TDM plan), in compliance with Municipal Code Section 20.400: Transportation Demand Management.
- Promote the use of existing transportation facilities (e.g. BART, Caltrain, SamTrans) to maximize the potential for alternative transportation usage.
- Incorporate monitoring and enforcement as part of a TDM plan to help sustain a long-term reduction in vehicle trips.
- Provide preferred parking for carpools, vanpools and low emission and fuel-efficient vehicles.
- Provide information kiosks in building lobbies to inform employees regarding alternative transportation services and facilities.

Transit Access

- Encourage connections to public transit, particularly safe and convenient pedestrian and bicycle access to the San Bruno BART station.
- Incorporate one or more “mobility hubs” within the Specific Plan area to support a conveniently accessible use by shuttles, ride share hires (e.g., Uber, Lyft), and/or private vehicle drop-off / pickup use. Anticipated locations include an area adjacent to Parking Structure north of Southline Avenue and on the south side of Southline Avenue, in locations that do not impede the primary flow of traffic.

On-Site Parking and Loading

- To improve pedestrian circulation, off-street parking should be consolidated either in below-grade or architecturally-integrated above-grade parking structures.
- Locate loading and delivery zones away from pedestrian circulation areas and adjacent residential neighborhoods to the greatest extent practicable.
- Design the internal roadway network to support accessible loading and delivery zones that do not impede the primary flow of traffic.
- Parking access should be clearly delineated by lane markings, signals, and wayfinding signage to reduce conflicts and improve safety.
- Provide adequate queuing space at parking garage entrances.

3.2. Circulation & Mobility Improvements

Proposed circulation and mobility within and around the Specific Plan area includes upgrades to existing, and construction of new, roadways, pedestrian pathways and bike lanes and routes. Consistent with the mobility guidelines above, these improvements will be designed to provide a variety of travel options (vehicle, pedestrian, bike, transit, shuttle service) and provide safe and seamless pedestrian access to the nearby San Bruno BART station. Figure 3-1: Conceptual Specific Plan Area Vehicular Circulation Improvements depicts the vehicular circulation components anticipated within the Specific Plan area.

3.2.1. Specific Plan Area

Roadway Circulation

Southline Avenue

As shown in Figure 3-1: Conceptual Specific Plan Area Vehicular Circulation Improvements, a major circulation and mobility feature of Specific Plan is the creation of the new Southline Avenue (provisionally named for purposes of this Specific Plan), which would serve as the primary gateway to the Specific Plan area. In addition to providing connectivity to the surrounding community, it will also serve as the primary access to internal private roadways, parking, and loading areas within the Specific Plan area.

As envisioned in the South San Francisco General Plan, Southline Avenue will be a new west-east arterial that will bisect the Specific Plan area and create a connection between Huntington Avenue and South Linden Avenue. In addition to providing access to the Specific Plan area, Southline Avenue would also provide an important connection between the San Bruno BART station and Downtown South San Francisco, and enable a future connection to US-101 and the East of 101 area via the City of South San Francisco's proposed Utah Avenue Interchange project.

As shown in Figures 3-2a and 3-2b: Southline Avenue Roadway Cross-Sections, Southline Avenue is envisioned to consist of two travel lanes in each direction separated by a turning lane, or median. A Class II bike lane, landscape planting, and wide sidewalk will be provided on both sides of Southline Avenue.

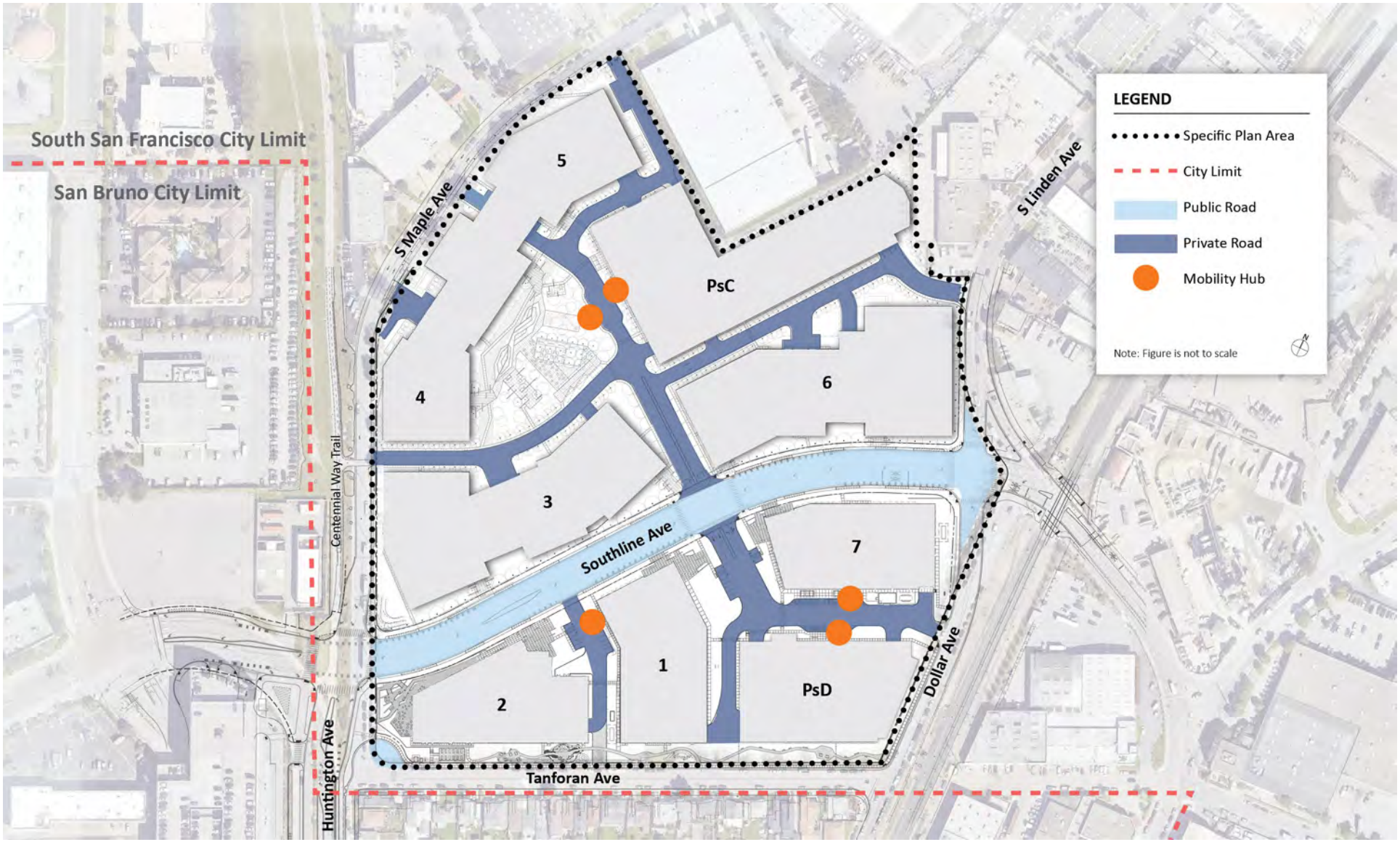
Southline Avenue is envisioned to connect to a new signalized intersection at Huntington Avenue (described in Section 3.2.2 Off-Site Circulation Improvements) and would also include a new signalized mid-block intersection at the internal roadway intersection within the Specific Plan area. Upon completion of Southline Avenue, it is anticipated that Southline Avenue and associated improvements within South San Francisco will be dedicated to the City of South San Francisco.

Internal Roadway Improvements

Within the Specific Plan area, various privately owned and maintained internal roadways will provide access to above- and below-ground parking, loading and service areas, and building lobbies.

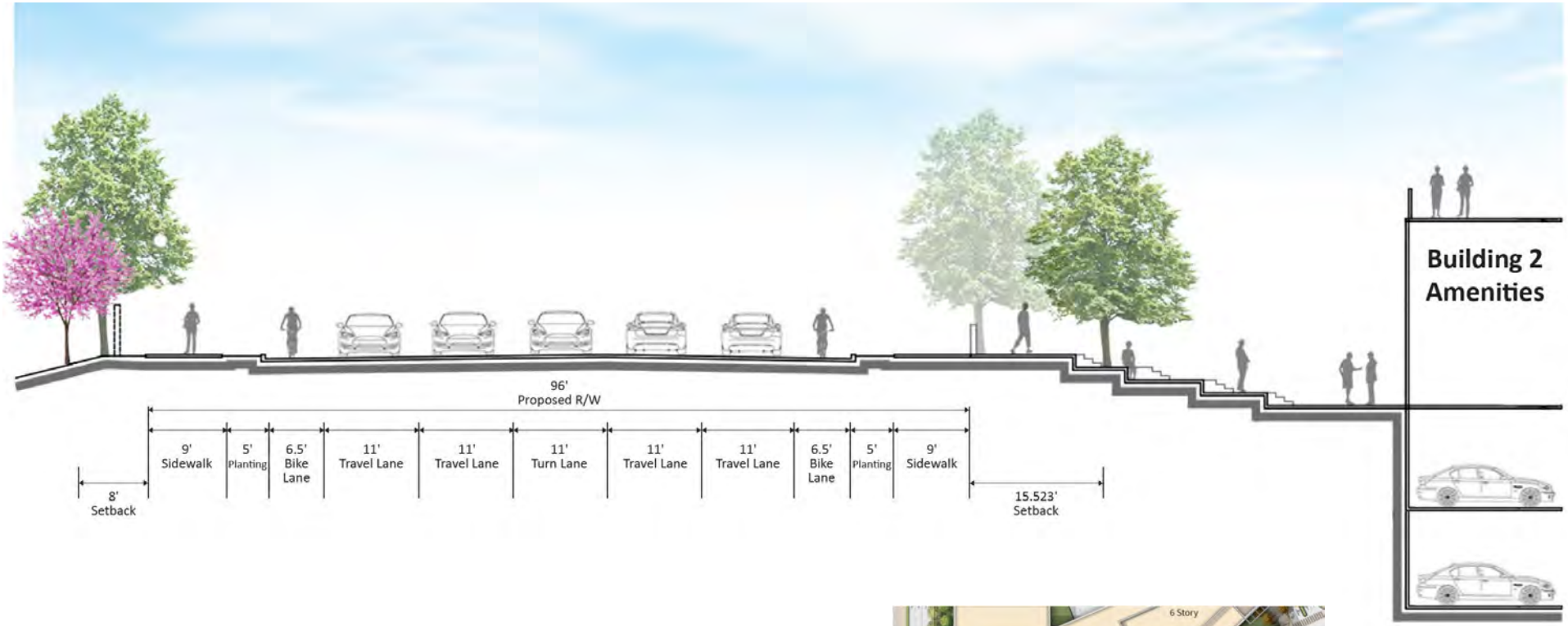
The configuration of these roadways may vary depending on their specific location and function as build out of the Specific Plan progresses. This specific design and configuration of internal roadways will be reviewed through the Precise Plan process described in Chapter 6: Implementation.

Figure 3-1: Conceptual Specific Plan Area Vehicular Circulation Improvements



Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

Figure 3-2a: Southline Avenue Roadway – Cross-Section A



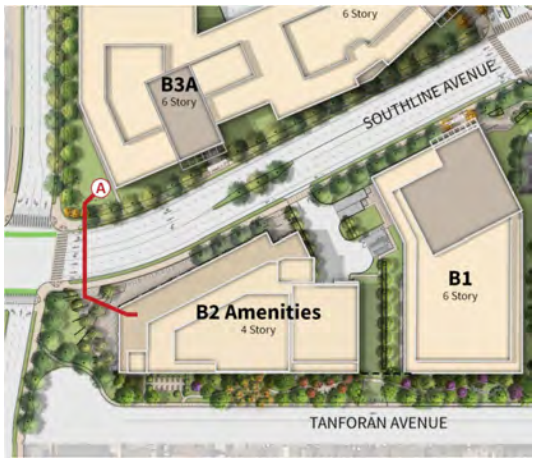
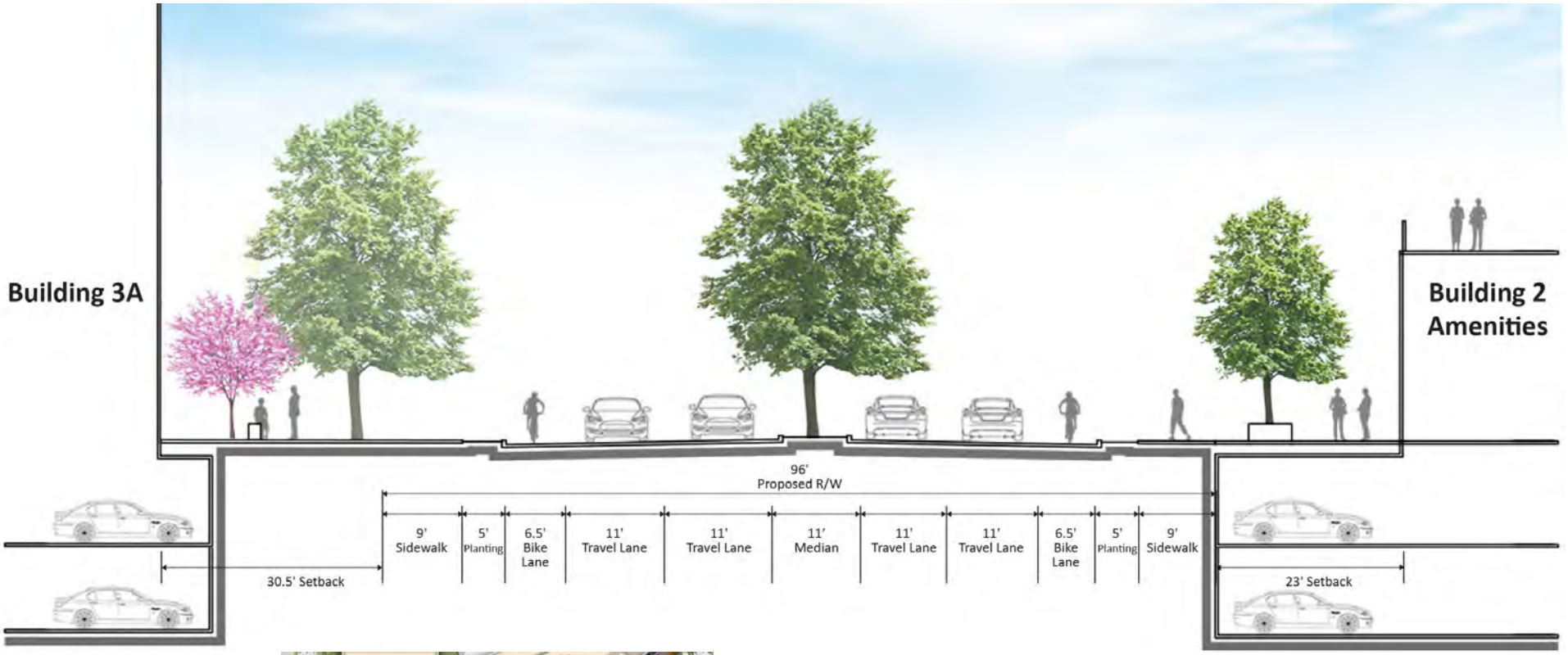
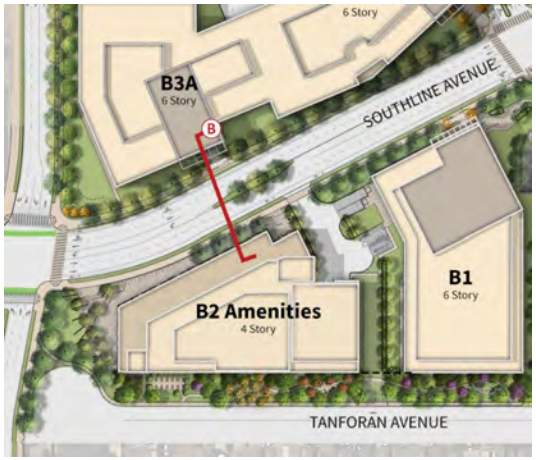


Figure 3-2b: Southline Avenue Roadway – Cross-Section B





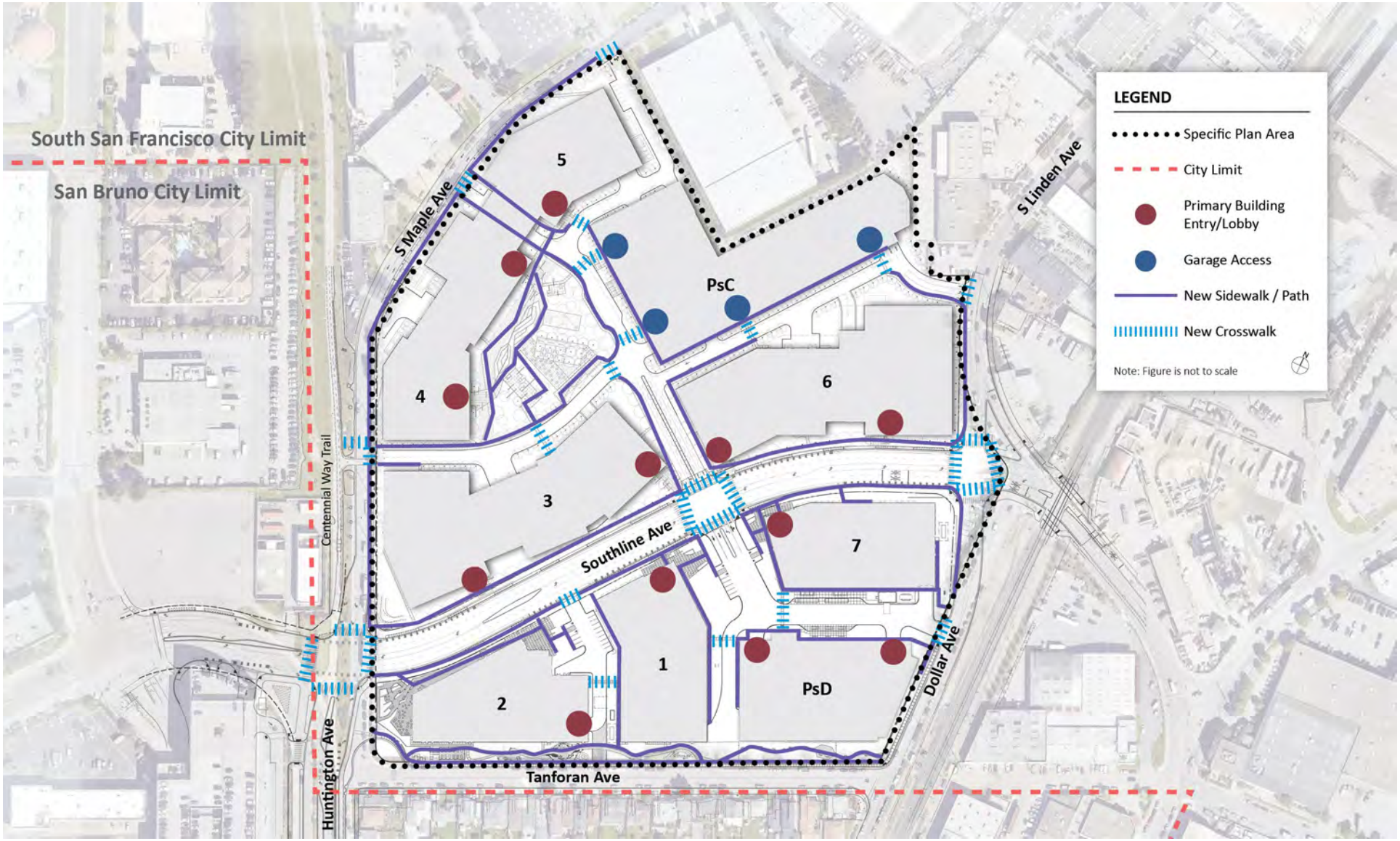
Pedestrian Circulation

Figure 3-3: Conceptual Specific Plan Area Pedestrian Connectivity Plan provides one conceptual layout of potential pedestrian facilities located in the Specific Plan area in a manner that reflects the goals and policies of the Specific Plan.

As set forth in Section 3.1.1 Mobility Guidelines, the arrangement of on-site pedestrian facilities will be ADA-accessible and provide on-site walkable connectivity between buildings, on-site vehicle and bicycle parking areas, Southline Commons, mobility hubs, and connectivity across Southline Avenue. In appropriate areas, pedestrian walkways may include distinctive formal and informal hardscape features such as concrete unit pavers, ceramic wood tile, and decomposed granite. Areas for seating and benches may be located and integrated with these walkways. Where appropriate, landscaping should be used to provide safe, pedestrian-friendly separation from adjacent roadways. See also Section 5.4.8 Streetscape.

As described in Section 3.2.2 Off-site Circulation Improvements, improvements are envisioned to also include improved off-site pedestrian and bicycle facilities to enhance access to the Centennial Way Trail and the San Bruno BART station.

Figure 3-3: Conceptual Specific Plan Area Pedestrian Connectivity Plan



Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

Bicycle Circulation

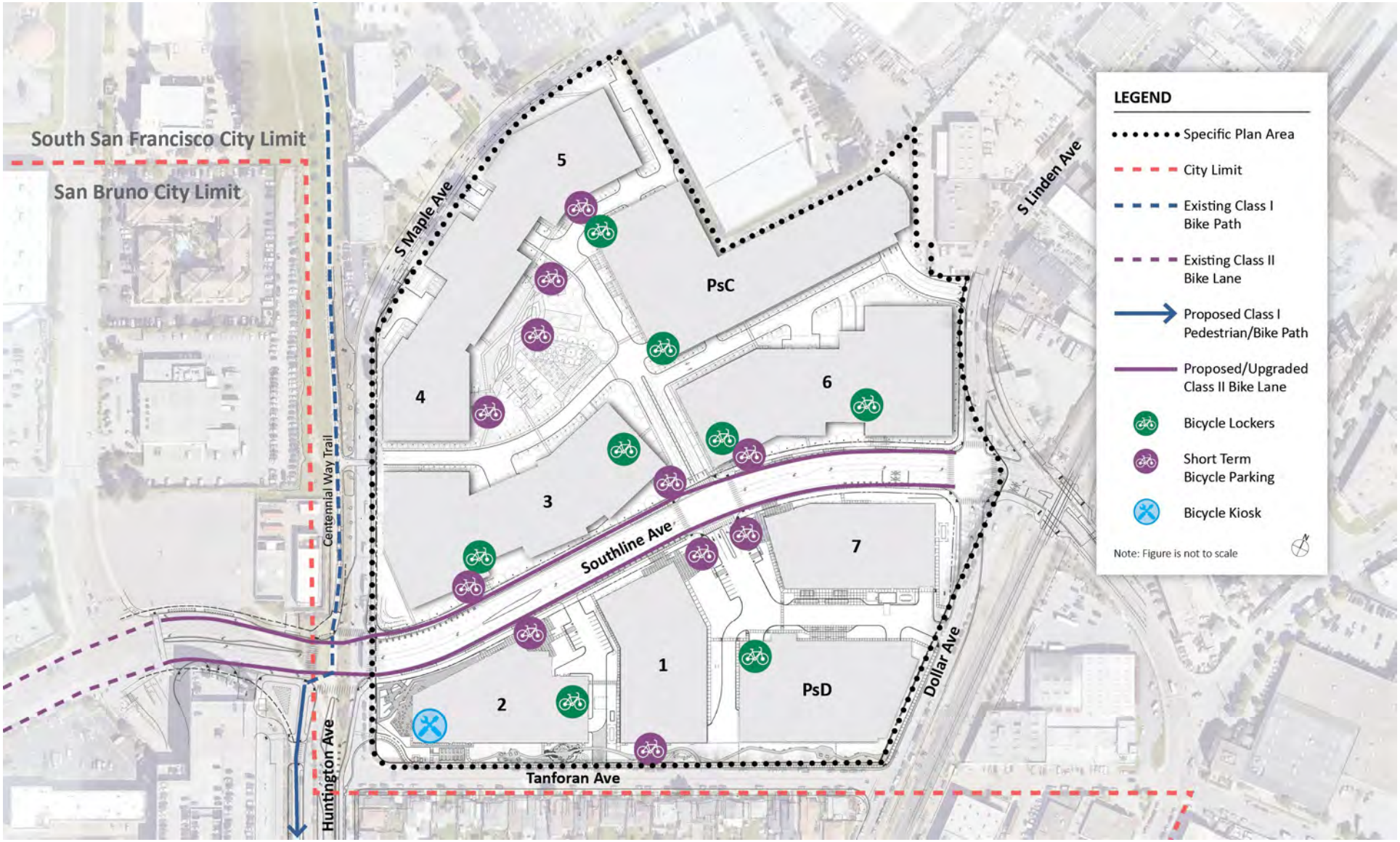
Bicycle circulation within the Specific Plan area is envisioned to include Class II bike lanes on both sides of Southline Avenue, and Class III bike routes on internal roadways within the Specific Plan area where bicyclists and slower-moving vehicles can share the road.

As shown in Figure 3-4: Conceptual Specific Plan Area Bicycle Connectivity Plan, the Class II bike lanes on Southline Avenue will connect to the existing Centennial Trail (Class I) to the west, and the existing Class II bike lanes on Dollar and South Linden Avenues. Green-painted "bike boxes" will be added at key intersections within the Specific Plan area to help facilitate safe and convenient bicycle circulation.

Bicycle parking requirements within the Specific Plan area are further described in Table 2-1: Southline Campus (S-C) Development Standards. Because development of Southline is intended to encourage transit-oriented development, bicycle parking within the Specific Plan area should allocate more spaces to long-term uses in order to facilitate bicycle commuting to the Southline campus by tenants and employees, as described in Table 2-1. Precise Plan applications shall include information regarding the anticipated bicycle parking demand and usage in order to evaluate the specific bicycle parking requirements for that phase.

Short-term bicycle parking will be provided throughout the Specific Plan area. Final locations of short-term bicycle parking will be determined during Precise Plan review, but generally will be provided on surface-level bike racks, conveniently located adjacent to the Southline Retail Plaza and proximate to building entries throughout the Specific Plan area. Long-term bicycle parking (referred to as "Bike Lockers" in Figure 3-4) will be provided in below- and above-grade parking structures, in addition to other buildings as feasible. Where appropriate, buildings will include showers on the first level, and lockers and showers will be provided in the Amenities Building.

Figure 3-4: Conceptual Specific Plan Area Bicycle Connectivity Plan

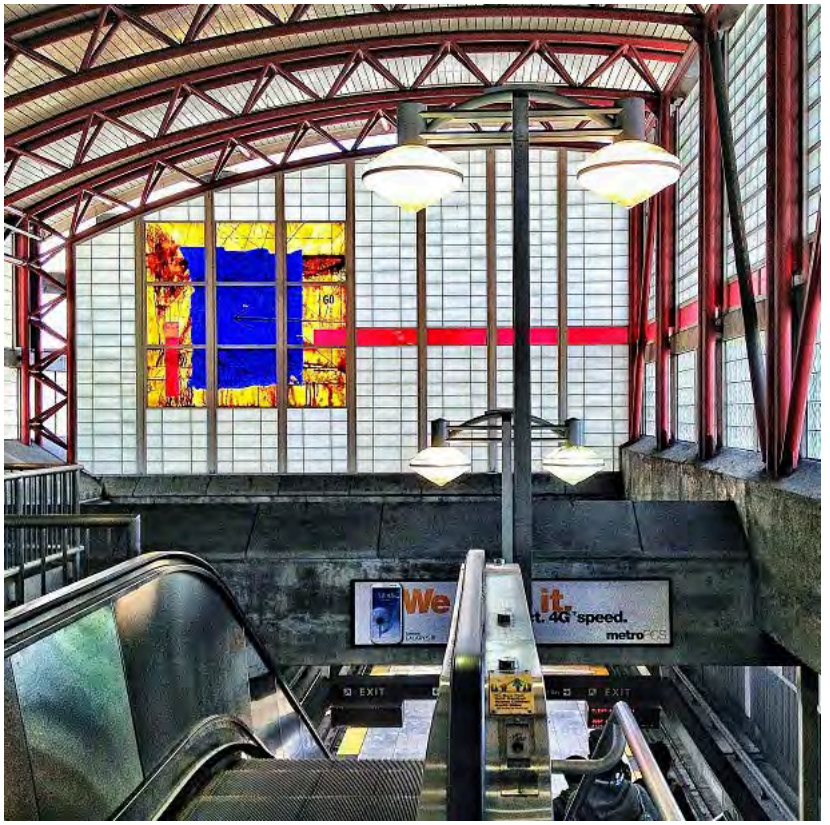


Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

3.2.2. Off-Site Circulation & Mobility Improvements

A number of off-site circulation improvements, including new signalizations of certain intersections, located outside of the Specific Plan area, are planned in connection with development of the Specific Plan area. Unless otherwise noted, these improvements are envisioned to occur in connection with Phase 1 development.

Figure 3-5: Conceptual Off-Site Signal and Pedestrian Crosswalk Improvements illustrates the key vehicular and pedestrian/bicycle circulation improvements within and adjacent to the Specific Plan area. Additionally, Figures 3-6(a) through (e): Conceptual Improvements – Huntington Avenue provide more detailed descriptions and supporting figures regarding four off-site sub-areas where off-site improvements are anticipated in connection with development of the Specific Plan. Improvements outside of the Specific Plan area may require additional review and approvals or actions by the City of South San Francisco, and/or other review and approval by other agencies or entities, including approvals by the City of San Bruno, BART, Peninsula Corridor Joint Powers Board (Caltrain), SamTrans and/or California Public Utilities Commission.



San Bruno BART Station

Figure 3-5: Conceptual Off-Site Signal and Pedestrian Crosswalk Improvements

Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

Huntington Avenue

As shown in Figures 3-6 (a) through (e): Conceptual Improvements – Huntington Avenue, it is envisioned that portions of Huntington Avenue will be improved from the proposed Southline Avenue, south to the existing BART station garage and pedestrian entrance.

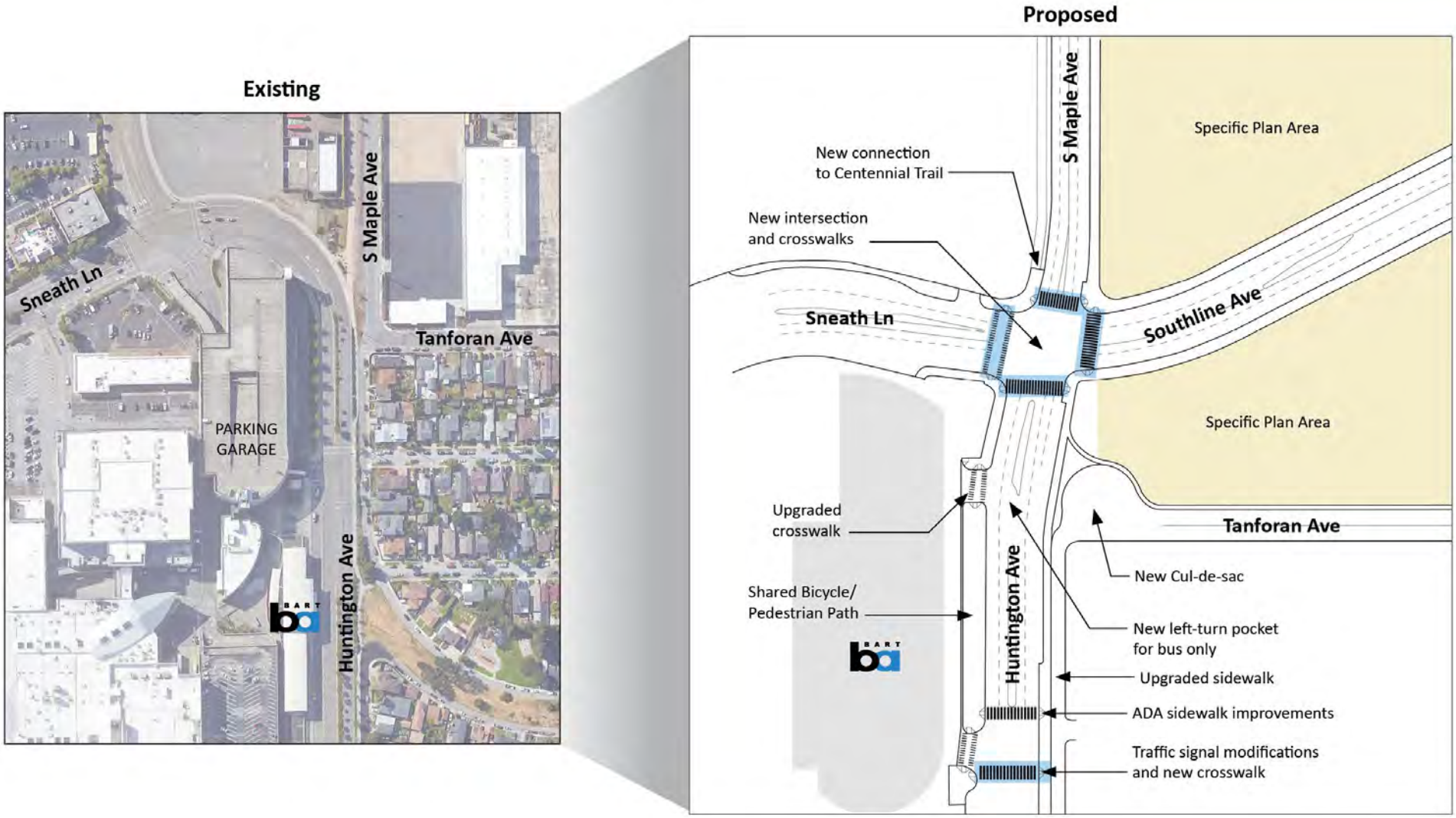
Anticipated improvements include the following:

- New pedestrian / ADA-compliant ramps at intersections, wider ramps and crosswalks on the Centennial Way Trail adjacent to South Maple Avenue.
- A pedestrian path on the east side of Huntington Avenue.
- A new dedicated, signalized northbound left turn lane on Huntington providing a new entrance into the transit center for SamTrans buses.
- Transit signal priority devices on the signal mast(s) at the Huntington / Southline Avenues intersection for SamTrans and shuttle buses.
- A new multi-use pedestrian/bike pathway on the west side of Huntington Avenue from Southline Avenue to the BART station and SamTrans transit center.
- Bulb-outs and high-visibility crosswalks at the BART station garage intersection to facilitate safe pedestrian crossing.
- Reconfiguration of the west end of Tanforan Avenue to create a new cul-de-sac allowing for residential access only (i.e., no through-access to Huntington Avenue).

San Bruno BART Station

San Bruno BART Station

Figure 3-6a: Conceptual Improvements – Huntington Avenue (Site Plan)



Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

Figure 3-6b: Conceptual Improvements – Huntington Avenue (Rendering – Site Plan)

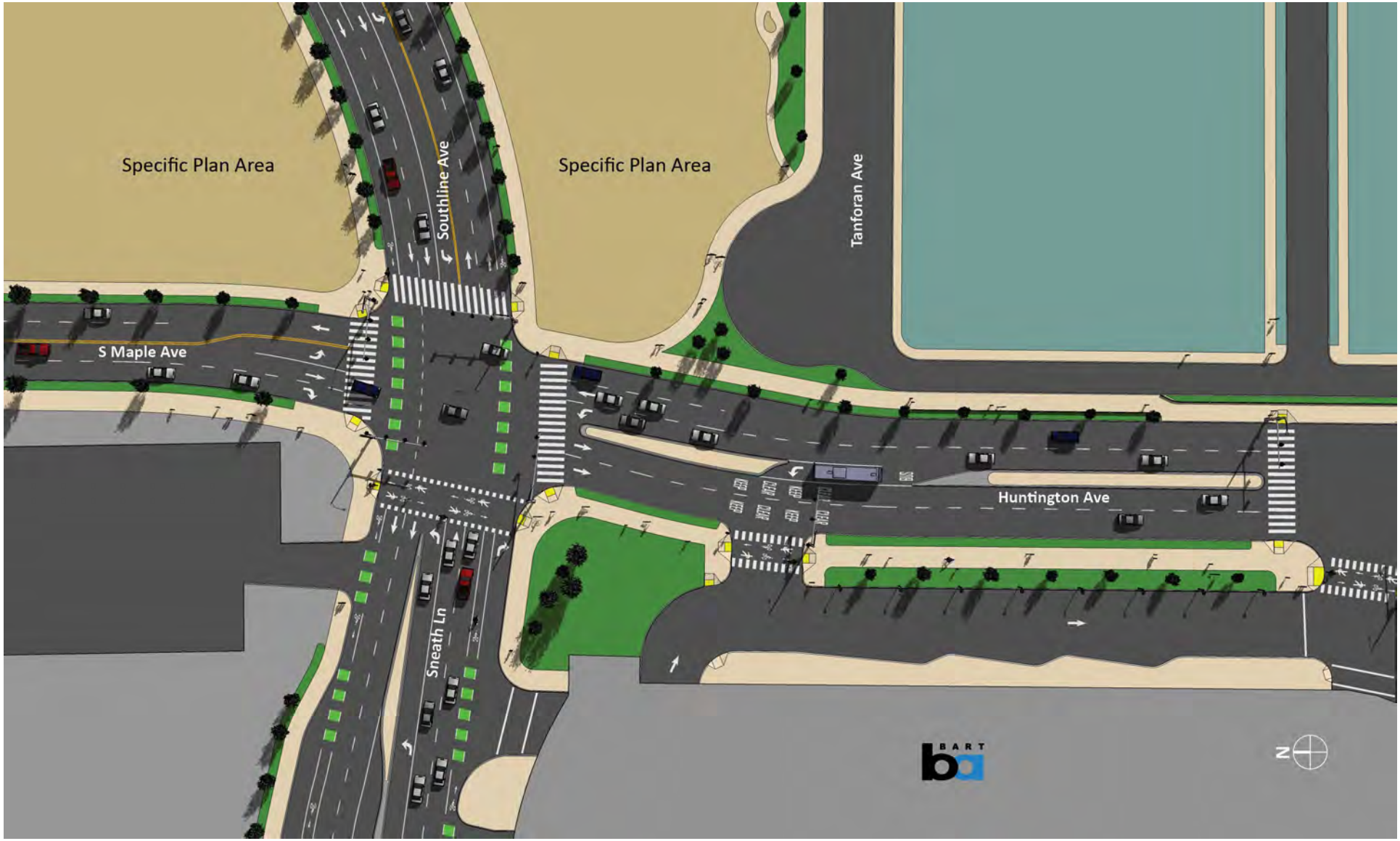


Figure 3-6c: Conceptual Improvements – Huntington Avenue (Rendering – Viewing Northwest)

Figure 3-6d: Conceptual Improvements – Huntington Avenue (Rendering – Viewing Southeast)

Figure 3-6e: Conceptual Improvements – Huntington Avenue (Rendering – Viewing Southwest)

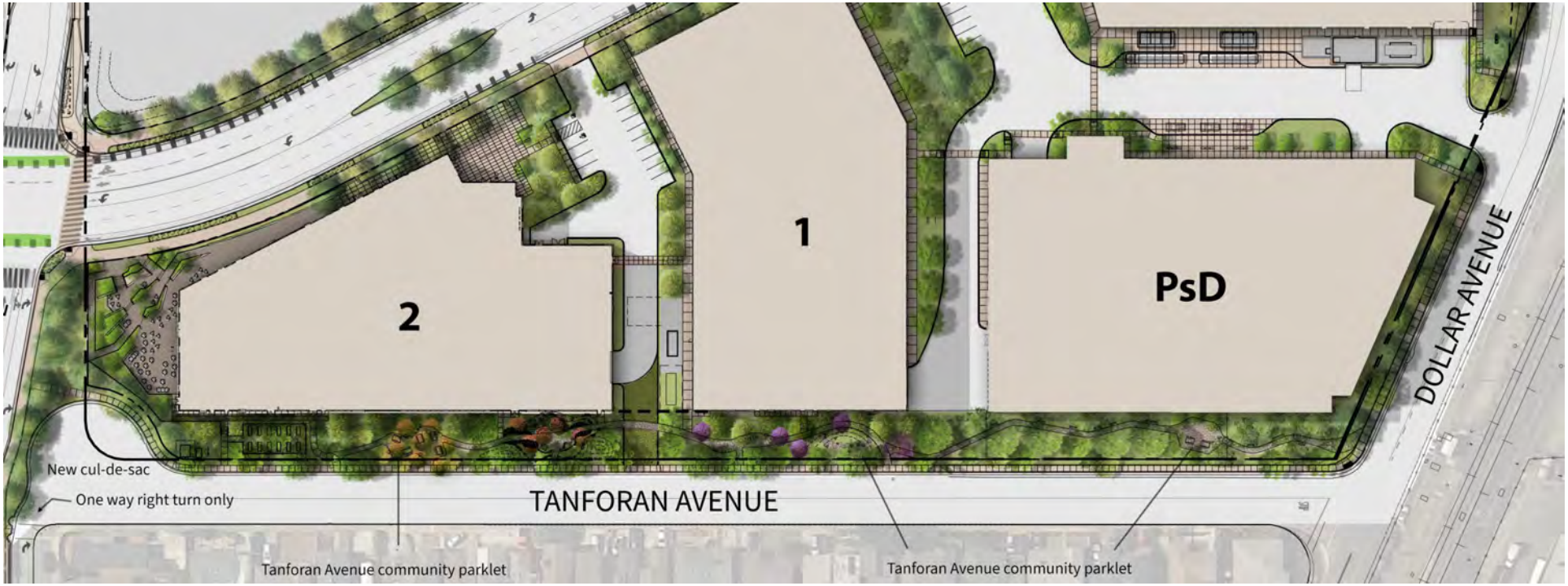
Tanforan Avenue Improvements

As shown in Figure 3-7: Tanforan Avenue Improvements, Tanforan Avenue would be converted to a cul-de-sac adjacent to Huntington Avenue allowing for residential access only. This reconfiguration would prohibit through-traffic and is intended to create a safer, slower-traffic environment for the existing Tanforan Avenue residents directly to the south of the Specific Plan area. With the exception of required emergency vehicle access, there would be no vehicular access from Tanforan Avenue into the Specific Plan area.

The existing residential community located on Tanforan Avenue to the south of the Specific Plan area would continue to have access from the existing one-way northbound Huntington Avenue east to Tanforan Avenue, via the existing one-way northbound roadway. Images of the existing conditions on Tanforan Avenue prior to implementation of the Specific Plan are shown here for context.

Tanforan Avenue residences; View West of Tanforan Avenue

Figure 3-7: Tanforan Avenue Improvements



South Linden and Dollar Avenues

Anticipated improvements include re-alignment of roadways to accommodate the new Southline Avenue and to provide pedestrian access improvements. These include:

- Realignment of Dollar Avenue and South Linden Avenue.
- Reconfiguration of the existing at-grade rail crossing at South Linden Avenue.
- Construction of a new signalized intersection at South Linden Avenue / Dollar Avenue/ Southline Avenue.
- Design and right-of-way dedications that incorporate future roadway and infrastructure features that can accommodate the potential future grade separation, which would be completed by others and is not part of the Specific Plan project.

Images of the existing conditions of this area prior to implementation of the Specific Plan are shown here for context.

View West on South Linden Avenue

View North on Dollar Avenue

South Maple Avenue Improvements (Future Phase)

South Maple Avenue currently includes one travel lane north and one travel lane south. On-street parking is available on one or both sides at various locations.

Anticipated roadway improvements include reconfiguration of the roadway and revisions to parking at various locations. A sidewalk on the east side and existing Centennial Way Trail on the west side should be separated by a landscaped planting area. Widening of and street front improvements along a portion of South Maple Avenue are anticipated to occur during future phases of development within the Specific Plan area.

Images of the existing conditions of this area prior to implementation of the Specific Plan are shown here for context.

View North on South Maple Avenue

View South on South Maple Avenue

3.3. Vehicle Parking

Vehicle parking in the Specific Plan area will consist of below- and above-grade parking structures and limited surface parking areas. As described in Table 2-1: Southline Campus (S-C) Development Standards, parking may be provided at a maximum ratio of 1.65 striped spaces per 1,000 square feet of commercial use, with an option to incorporate valet parking up to 2.0 spaces per 1,000 square feet of commercial use, upon City review and approval, based on demand, type of use, employee density and operational characteristics. Under a valet operations program(s), parking attendants would be staffed to park excess vehicles in drive aisles and related areas, providing greater vehicle capacity as needed, particularly during peak parking periods.

The maximum parking ratio established under this Specific Plan is consistent with the City's existing policies to allow for and support reductions in onsite parking requirements for areas, such as the Specific Plan area, located within 0.25 miles of BART or Caltrain stations. This Specific Plan establishes flexible parking option based on tenancy needs and market conditions through subterranean and above-grade garages, and limited surface parking throughout the Specific Plan area. The specific parking strategy as to allocation and location of parking will be determined through the Precise Plan review process for each phase. The City encourages reduced parking, below the maximum parking ratio with the incorporation of TDM strategies at this site to encourage transit use and reduction of single-occupancy vehicle commuting.

Phase 1 Parking

Phase 1 parking is anticipated to include structured parking in Parking Structure D, above-grade parking located within the Amenities Building (Building 2 as shown in Figure 2-1: Conceptual Site Plan), and surface parking within the Phase 1 area.

Future Phases Parking

Building construction in future phases will include development of below-grade and above-grade structured parking and limited surface parking.

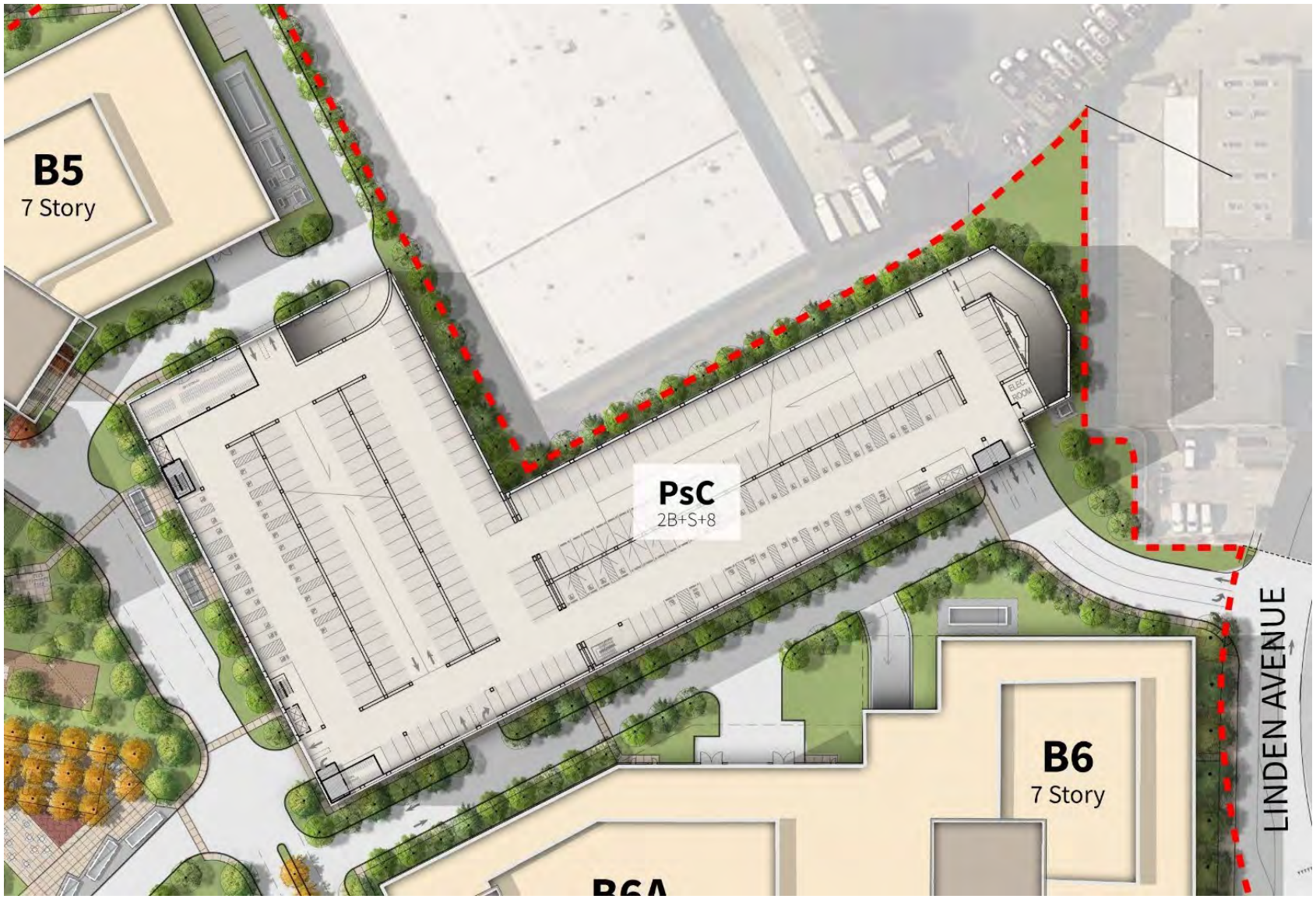
In coordination with the City of South San Francisco, the Project Applicant(s) shall monitor parking during Phase 1 to determine how much parking is needed and constructed for future phases. Precise Plan applications for subsequent phases following Phase 1 operation shall include information regarding existing parking demand and usage in order to evaluate additional on-site parking required and to ensure that onsite parking remains within the maximum parking ratio of 1.65 striped spaces per 1,000 square feet and up to 2.0 spaces per 1,000 square feet with incorporation of valet, upon City review and approval.

Future phases of development should utilize any excess parking spaces available within the Specific Plan area based on the results of parking demand and usage analysis for Phase 1.

At buildout of the Specific Plan, Parking Structure C is envisioned to be up to nine stories in height with both subterranean and roof level parking providing a maximum of approximately 3,350 spaces. It is anticipated that Parking

Structure C may be developed in phases to provide additional parking within the Specific Plan area; Figure 3-8: Parking Structure C – Conceptual Construction Phasing depicts potential phasing. Primary access to Parking Structure C would be from South Linden Avenue.

Figure 3-8: Parking Structure C – Conceptual Construction Phasing



Parking Structure C – Project Buildout

3.4. Transit Connectivity

The Specific Plan area is uniquely located in close proximity to public transit, including adjacent to the San Bruno BART station and the SamTrans Transit Center, which are across Huntington Avenue to the west of the Plan area. As discussed in Section 3.2.2 Off-Site Circulation Improvements, proposed off-site improvements include pedestrian crossings at the new Southline Avenue / Huntington Avenue intersection, and pedestrian improvements south on Huntington Avenue providing enhanced and safer pedestrian and bicycle access to the San Bruno BART station.

Public bus transit is provided by SamTrans via the SamTrans Transit Center located at the San Bruno BART station, approximately 0.5 miles from the Specific Plan area, which provides bus service throughout San Mateo County and to Peninsula BART stations, Caltrain stations, the San Francisco Airport, and downtown San Francisco. Routes include express buses to the Daly City BART station and Palo Alto Transit Center, and ECR routes, 140, 141, and 398.

As shown in Figure 3-1: Conceptual On-site Vehicular Circulation Improvements, mobility hubs will be incorporated throughout the Specific Plan area to be used for shuttle buses, ride-share hires (e.g., Uber, Lyft), and/or private vehicle drop-off / pickup use. Anticipated locations include an area within the Amenities Building parking area, the Parking Structure north of Southline Avenue adjacent to Southline Commons, and on the south side of Southline Avenue, in locations that do not impede the primary flow of traffic.

It is envisioned that shuttle buses will be managed by the campus tenants, similar to other transit demand management programs throughout the City. Separately, a shuttle service will be provided for service between Southline and the South San Francisco and/or San Bruno Caltrain stations.

3.5. Transportation Demand Management

Development within the Specific Plan area will require preparation and implementation of a transportation demand management plan (TDM plan), in compliance with Municipal Code Section 20.400: Transportation Demand Management. The City's TDM requirements apply to all nonresidential development expected to generate 100 or more average daily trips, based on the Institute of Traffic Engineers (ITE) trip generation rates or a project seeking a floor area ratio (FAR) bonus.

As further described in Section 20.400, the purpose of the TDM plan is to:

- Reduce the amount of traffic generated by new nonresidential development, and the expansion of existing nonresidential development;
- Ensure that expected increases in traffic resulting from growth in employment opportunities in the City of South San Francisco are adequately mitigated;
- Reduce drive-alone commute trips during peak traffic periods by using a combination of services, incentives, and facilities;
- Promote the more efficient utilization of existing transportation facilities and ensure that new developments are designed in ways to maximize the potential for alternative transportation usage; and
- Establish an ongoing monitoring and enforcement program to ensure that the desired alternative mode use percentages are achieved.

The Southline TDM Plan has been prepared in connection with this Specific Plan. The Southline TDM Plan includes both a Preliminary TDM Plan (as defined under Municipal Code Chapter 20.400: Transportation Demand Management) for the Phase 1 Precise Plan, the first Precise Plan to be processed under the Southline, along with conceptual TDM measures anticipated to be utilized for the buildout of the Southline Specific Plan area. The Southline TDM Plan, inclusive of both Phase 1 and full buildout, has been designed to achieve a 45-percent alternative mode-shift consistent with City requirements for comparable projects proposing a floor area ratio (FAR) up to 2.5 per Municipal Code Chapter 20.400: Transportation Demand Management.

The Southline TDM Plan identifies a number of program measures to improve mobility efficiency. These may include but are not limited to:

Mobility Hubs – Providing designated areas to accommodate shuttles, ride-share pickup and drop off zones and/or other alternative-mobility options for use by tenants and the general public that promote shared-transit options such as shuttles, car share, rideshare (e.g., Uber, Lyft, etc.).

Active Transportation – Providing direct, high-quality pedestrian and bicycle connections between building entrances, the Centennial Way Trail, and Sneath Lane; and providing ample bicycle parking spaces in several locations throughout the Specific Plan area, as well as a bike repair station in the Amenities Building.

Carpooling & Vanpooling Services – Providing ride-matching services for carpools and vanpools users thorough 511.org

and/or other programs; and providing approximately 10% of vehicle spaces reserved parking spaces for such vehicles.

Caltrain Shuttle Service – Shuttle service to the South San Francisco and/or San Bruno Caltrain stations may be provided.

Transit Services – Constructing pedestrian improvement along Huntington Avenue to improve access to the BART station and SamTrans transit station including wider sidewalks and crosswalks; installing transit signal priority hardware at the new Huntington Avenue / Sneath Lane to maintain or improve transit and shuttle operations.

Reduced Parking and Employee Surveys – Conducting semi-annual employee commute surveys and reduce on-site parking by 25% or more, as compared to the typical City of South San Francisco requirements for comparable projects.

Various TDM Amenities – Providing computer app-based commute monitoring system, carshare program, flex-time and telecommuting, guaranteed ride home program, showers and changing rooms, information boards and kiosks, and TDM coordinator(s).

Monitoring. As required by the City of South San Francisco's Transportation Demand Management Ordinance, a Final TDM Plan(s) for development within the Specific Plan area will include requirements for monitoring and auditing the performance of the measures within the TDM program, which may be revised or amended as needed to meet the TDM performance objectives. Implementation of the Final TDM Plan(s) will be monitored annually and adjusted accordingly. Leases for all tenants will include provisions regarding the mandatory TDM measures and appointment of a TDM coordinator (which may be shared among multiple tenants).

Additional TDM program measures may be implemented as needed to achieve the required 45 percent alternative mode shift for the Specific Plan area. These measures may include TDM amenities as carshare or bikeshare programs, app-based commute monitoring system, flex-time and telecommuting, or employer-sponsored mode shift incentives and/or subsidies.

Additional information regarding timing and strategy for implementation of the Southline TDM across phases of development within the Specific Plan area is further discussed in Chapter 6: Implementation.

The Final TDM Plan(s) shall contain the requirements for monitoring and auditing the performance of the measures within the TDM program and shall be amended as needed to meet the performance objectives of the plan.

4

INFRASTRUCTURE & PUBLIC SERVICES

This chapter provides a description of the existing major utility infrastructure and the related improvements needed at build-out of the Specific Plan and the public services required to serve users of the Specific Plan area.

4.1. Introduction

Implementation of the Specific Plan will require the construction of infrastructure and provision of public services and utilities to serve the Specific Plan area in accordance with the development program described in Chapter 2: Land Use Plan & Development Standards. In connection with development within the Specific Plan area, infrastructure, services and utilities should be designed to meet the standards of the City of South San Francisco and other utility agencies with oversight authority. (See Chapter 6: Implementation for further discussion.) Infrastructure and public services addressed in this chapter include water, sewer, storm drainage, solid waste disposal, and dry utilities.

Table 4-1: Service Providers lists the various service providers for the Specific Plan area, which are those known to operate services at the time this Specific Plan was prepared and may be subject to change.

As shown in Table 4-1: Service Providers, the Specific Plan area is served by existing storm drainage, sanitary sewer conveyance systems, and wastewater treatment infrastructure that are owned, operated, and maintained by the City of South San Francisco. Potable water infrastructure is owned, operated, and maintained by the California Water Service Company (Cal Water). Electric and gas service is provided by Pacific Gas & Electric.

The Specific Plan area is not in an area supplied with recycled water, as the City of South San Francisco does not have an existing or planned recycled water distribution system in place.

Existing water, sewer, storm drainage, electrical, gas, and communications utilities are located in public utility easements throughout and adjacent to the Specific Plan area.

Demolition and rerouting of certain existing infrastructure will be required as part of implementation of the Specific Plan, including rerouting/realignment of portions of existing water and wastewater lines, and undergrounding a portion of the existing overhead utilities along the immediate street frontages, as may be conditioned by the City or otherwise required by the respective utility provider.

Table 4-1: Service Providers

Service	Current Provider
Water	California Water Service Company (Cal Water)
Wastewater	City of South San Francisco
Storm Drainage	City of South San Francisco
Electric Service	Pacific Gas & Electric
Gas Service	Pacific Gas & Electric
Police Protection	City of South San Francisco
Fire Protection	City of South San Francisco
Emergency Medical	City of South San Francisco

4.1.1. Sequencing of Infrastructure

Specific requirements regarding timing and sizing of infrastructure will be determined by the City for each phase during the Precise Plan approval process (see Chapter 6: Implementation). As each phase of infrastructure is built, it is anticipated that the constructed public infrastructure will be dedicated to and accepted by the City of South San Francisco.

4.2. Water Supply

4.2.1. Existing & Future Water Supply

Cal Water owns and operates the existing domestic water facilities within and around the Specific Plan area. The area is entirely contained within Cal Water's South San Francisco District, which serves the communities of South San Francisco, Colma, a small portion of Daly City, and an unincorporated area of San Mateo County known as Broadmoor, which lies between Colma and Daly City. A significant portion of the City's water supply is purchased under contract from the San Francisco Public Utilities Commission. The remaining is groundwater derived from wells owned by Cal Water.

The Specific Plan area has Cal Water distribution mains located in each of the public street frontages. A six-inch cast-iron main, installed in 1943, provides water service to the current parcels fronting Tanforan Avenue, Dollar Avenue, and S. Linden Avenue. A twelve-inch asbestos-cement main, installed in 1964, provides water service to the current parcels fronting Maple Avenue. The twelve-inch AC main is also located within Tanforan Avenue, and supplies the twelve-inch main, but does not provide water service to those parcels. There is no public recycled water infrastructure, and no current plans for it to be provided in the future.

An assessment of the water supply available to serve the Specific Plan area is described in the Water Supply Assessment for the Southline Specific Plan (EKI Environment & Water, Inc.).

4.2.2. Specific Plan Water Infrastructure Improvements

At full buildout, development of the Specific Plan area is conservatively estimated to use approximately 460,000 gallons per day (515 acre-feet / year [AFY]) for indoor demand and approximately 18,000 gallons per day (20 AFY) for irrigation demand for a total water demand of approximately 478,000 gallons per day (533 AFY) (Water Infrastructure Technical Study, BKF, December 2020).

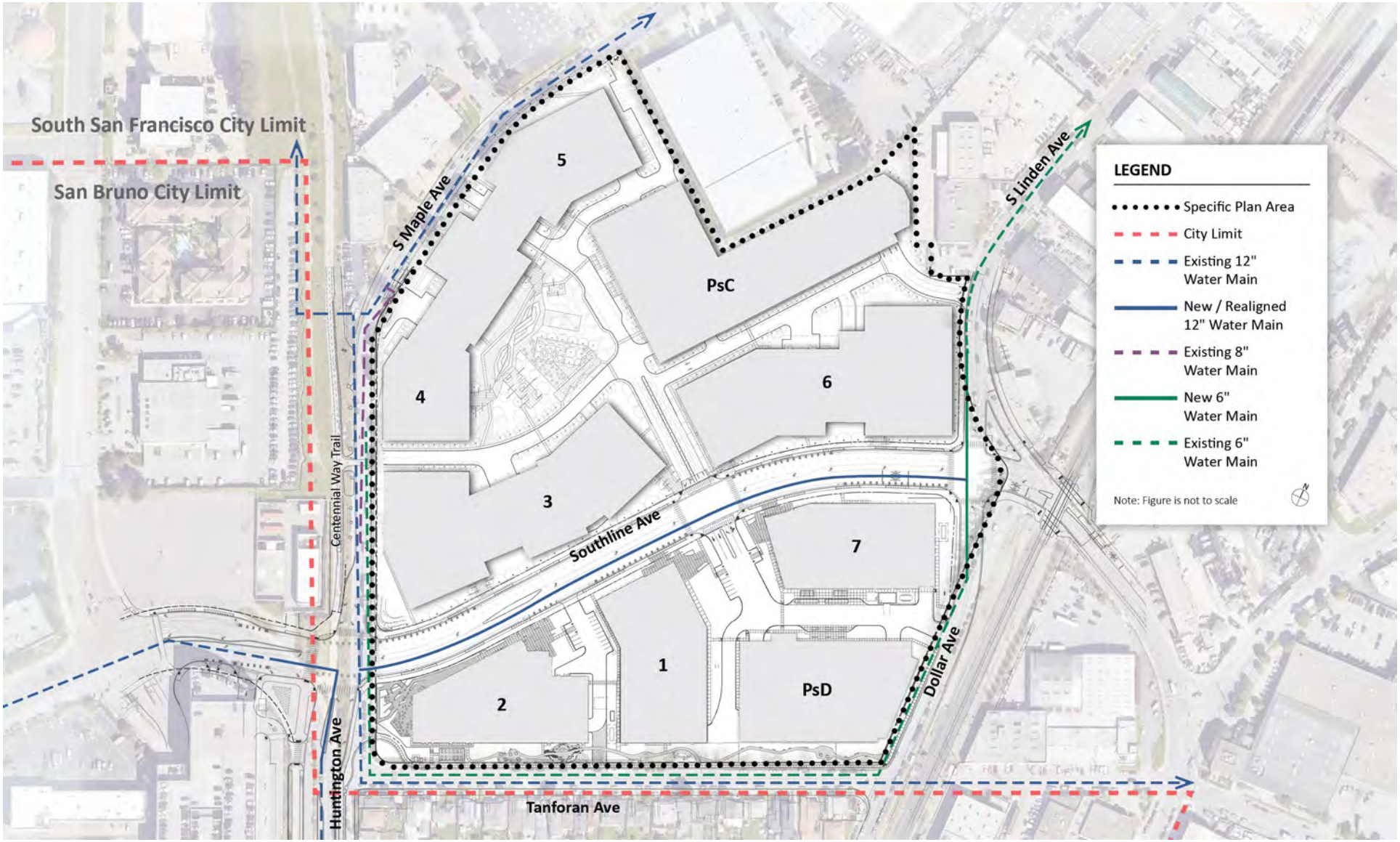
In general, existing water facilities are anticipated to be sufficient to support project buildout. Development within the Specific Plan area would include construction of certain limited potable water infrastructure to serve the Specific Plan area, as shown in Figure 4-1: Conceptual Water Supply Improvements.

Based on design requirements from Cal Water, it is anticipated that implementation of the Specific Plan will include installation of certain new infrastructure to serve the Specific Plan area, including a new public 12-inch water main from South Maple Avenue along the entirety of Southline Avenue to the existing six-inch water line on South Linden Avenue. This improvement is anticipated to occur as part of Phase 1 development. New service connections from new buildings within the Specific Plan area to existing water lines are anticipated to be constructed along Tanforan Avenue, South Maple Avenue, and South Linden Avenue concurrent with the construction of each building.

Additionally, a segment of the existing six-inch water main along South Linden and Dollar Avenues would be relocated to conform with the proposed realignment of that intersection and the proposed reconfiguration of the existing at-grade rail crossing at South Linden Avenue. Other limited infrastructure improvements may be required based on final design in coordination with the City and Cal Water.

Currently, the Specific Plan area is not supplied with recycled water as the City of South San Francisco does not have an existing or planned recycled water distribution system in place.

Figure 4-1: Conceptual Water Supply Improvements



Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

4.3. Wastewater

4.3.1. Existing Wastewater

Regulatory Setting

The City of South San Francisco owns and maintains all of its sanitary sewer systems and infrastructures within the public rights-of-way. Collected wastewater is conveyed to the South San Francisco Water Quality Control Plant (WQCP), adjacent to San Francisco Bay on Colma Creek. The WQCP is jointly owned by the cities of South San Francisco and San Bruno. The WQCP provides secondary wastewater treatment for the cities of South San Francisco, San Bruno, and Colma. It also provides the dichlorination treatment of chlorinated effluent for the cities of Burlingame, Millbrae, and the San Francisco International Airport, prior to discharging the treated wastewater into San Francisco Bay.

The average dry weather flow through the WQCP is nine million gallons per day (MGD). Peak wet weather flows can exceed 60 MGD. The State Water Resources Control Board has adopted a Waste Discharge Requirements Order which requires the City of South San Francisco to develop and implement a Sanitary Sewer Management Plan (SSMP).

The latest City of South San Francisco SSMP, prepared by Batis Training and Consulting and adopted in June 2014, identifies ongoing maintenance and system improvements necessary to maintain the sewer system. The City issued an updated Preliminary Draft SSMP in February 2020 (Akel Engineering Group, February 2020) (2020 Draft SSMP). The City anticipates that the final updated SSMP will be substantially consistent with the 2020 Draft SSMP. As such, the 2020 Draft SSMP was used as the basis for wastewater infrastructure capacity design for this Specific Plan.

Existing Conditions

As identified in the 2020 Draft SSMP, the Specific Plan area is in Tributary Basin B-9 within the South San Francisco West Sanitary Sewer System. As shown in Figure 4-2: Conceptual Wastewater Improvement Plan, wastewater from the Specific Plan area discharges to existing public sanitary sewer mains in the adjacent public roadways. These public mains are part of the Lowrie Trunk system, and drain to the FLS-11 lift station on Shaw Road, which pumps the wastewater to the WQCP.

The southern portion of the Specific Plan area drains to a 24-inch vitrified clay pipe (VCP) main in Tanforan Avenue, identified as LO-P14 in the 2020 Draft SSMP. The northwest portion of the Specific Plan area drains to an eight-inch VCP in South Maple Avenue. This main in turn drains to an 18-inch VCP identified as LO-P12 and LO-P13, which then drains east to an 18-inch main identified as LO-P14 and then to a 27-inch main in Lowrie Avenue. The eastern portion of the Specific Plan area drains north to LO-P14 and then to the 27-inch main in Lowrie Avenue.

The 2020 Draft SSMP identifies LO-P15 located within Tanforan Avenue as a segment needing capacity improvements, and is indicated to be upsized to a 27-inch main. The next segment downstream, LO-P16, is also identified to be upsized in the list of 2020 Draft SSMP recommended capital improvements. Additionally, pump station LS-11 is indicated to be deficient and requiring a

capacity upgrades as part of the recommended capital improvements.

4.3.2. Specific Plan Wastewater Improvements

Buildout of the Specific Plan area will increase wastewater/sanitary sewer flows to the public sanity sewer system. There is sufficient capacity at the WQCP to provide wastewater treatment for the proposed flows from buildout of the Southline Project. (Sanitary Sewer Technical Study, BKF, December 2020).

It is anticipated that each building will include at least one new lateral to connect to existing mains. Wastewater will be conveyed via both on-site pump stations and gravity flow. All improvements will be designed and constructed consistent with City of South San Francisco requirements.

In conformance with the 2020 Draft SSMP, it is anticipated that several public sewer mains that directly serve the Specific Plan area will be upsized to account for the additional sanitary sewer flow generation associated with regional development, including buildout of the Specific Plan area. These anticipated improvements are shown in Figure 4-2: Conceptual Wastewater Improvement Plan.

Phase 1 Usage and Improvements

At full occupancy of Phase 1, sanitary sewer flow generation during maximum day wet weather flow (worst case) will be approximately 112,987 gallons per day (GPD) of sanitary sewer flow, an increase of approximately 83,813 GPD as compared to existing flows (29,175 GPD) for the Phase 1 area.

Anticipated upgrades to be completed in connection with Phase 1 include:

- Relocation of the existing main associated with the realignment of Huntington Avenue.
- Relocation of a segment of the existing eight-inch sanitary sewer along South Linden and Dollar Avenues to conform with the proposed realignment of the intersection and proposed reconfiguration of the existing at-grade rail crossing at South Linden Avenue.

Future Phases Usage and Improvements

It is estimated that upon full occupancy at buildout of the Specific Plan, sanitary sewer flow generation during maximum day wet weather flow will be approximately 451,360 GPD. This is an increase of approximately 369,346 GPD over existing generation of 82,014 GPD at buildout.

Anticipated upgrades to be completed in connection with future phases include:

- Public main upgrades to the northerly portion of South Maple Avenue (LO-P12) and the public main that runs from South Maple through an easement to Lowrie Avenue (LO-P13).

No further improvements, including any modifications to existing pump stations, are anticipated to be required to serve the Specific Plan area (Sanitary Sewer Technical Study, BKF, January 2021). Specific requirements regarding timing and sizing of this sanity sewer infrastructure will be determined by the City for each development phase during the Precise Plan review and approval process (see Chapter 6: Implementation).

Figure 4-2: Conceptual Wastewater Improvement Plan

Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

4.4. Stormwater

4.4.1. Existing Stormwater

Regulatory Setting

The existing storm drainage infrastructure within the Specific Plan area is owned, operated, and maintained by the City of South San Francisco. South San Francisco is part of the Colma Creek watershed within the County of San Mateo's Colma Creek Flood Control Zone. The City of South San Francisco owns and maintains storm drainage infrastructure within the public rights-of-way, which then discharge to County flood control facilities. The Specific Plan area is on the boundary between two South San Francisco drainage watersheds: South Region (Sub Watershed B) and Lower Region (Sub Watershed A).

The State of California regulates water quality in the region through the San Francisco Bay Regional Water Quality Control Board (RWQCB). The City of South San Francisco is a permittee of the Municipal Regional NPDES Permit (MRP) administered by the RWQCB. As a permittee, the City is responsible for requiring that all qualifying development projects, including development within the Specific Plan area, comply with the City's MRP requirements and other applicable state and local stormwater and water quality requirements.

The 2016 Storm Drain Master Plan, prepared by Michael Baker International, identifies existing storm drain facilities within the City of South San Francisco and provides a comprehensive long-range plan for implementation and development of drainage facility improvements.

Existing Conditions

Existing onsite storm drainage systems within the Specific Plan area convey storm runoff to the adjacent public roadways. Under existing conditions, the southern portion of the Specific Plan area drains to a reinforced concrete pipe (RCP) in Tanforan Avenue. The northwest portion of the Specific Plan area drains to a culvert in South Maple Avenue. The northeastern portion of the Specific Plan area drains north via the roadway gutter in both Dollar Avenue and South Linden Avenue, as there is no public storm drain infrastructure in these two roadways. The roadway drains to a culvert that crosses South Linden Avenue north of the Specific Plan area.

The 2016 Storm Drain Master Plan identifies an existing 42" RCP within Tanforan Avenue as a storm drain segment to be improved by installing a parallel 66" RCP. Additional downstream segments are also identified for capacity improvements. The 2016 Storm Drain Master Plan does not note any other deficiencies within the system serving the Specific Plan area.

4.4.2. Specific Plan Stormwater Improvements

Development within the Specific Plan area shall be required to comply with the City's standard development conditions regarding both stormwater conveyance and water quality, in addition to any other applicable federal, state and local requirements regarding stormwater discharge.

As described in the Stormwater Drainage Study Technical Study (BKF, January 2021), implementation of the Specific Plan anticipates providing a reduction in the overall peak runoff from the Specific Plan area by increasing the pervious area

through new landscaping and permeable areas compared to existing conditions.

Onsite Stormwater Facilities

As shown in Figure 4-3: Conceptual Storm Drainage Improvement Plan, site grading and drainage improvements within the Specific Plan area is anticipated to maintain the existing drainage basins by creating two drainage areas: Drainage Area A, which drains to the south, and Drainage Area B, which drains to the north.

New stormwater facilities associated with Phase 1 development within the Specific Plan will be constructed along a portion of the new Southline Avenue, and will connect to the existing 42-inch storm drain that extends along Tanforan Avenue through a new storm drain line to be installed onsite and anticipated to be dedicated to the City. Other on-site stormwater facilities will be constructed concurrent with project buildout.

Offsite Stormwater Facilities

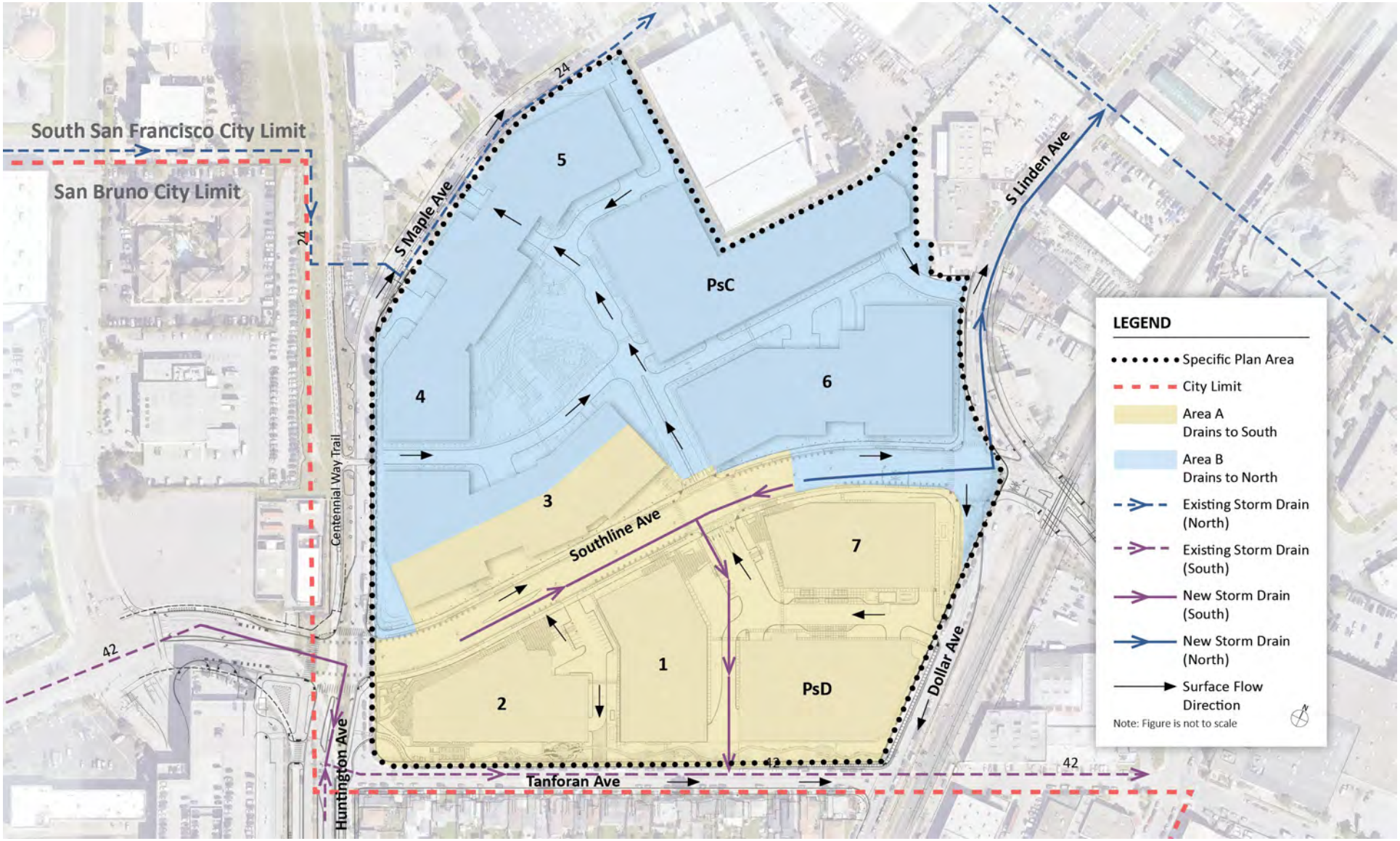
Implementation of the Specific Plan is anticipated to include certain offsite storm drainage infrastructure improvements including new storm drain mains constructed within South Linden and Dollar Avenue that will connect to the existing box culvert crossing S. Linden Avenue and the 42” main within Tanforan Avenue. Subject to approval by other public agencies, offsite storm drainage infrastructure improvements are also anticipated to include the realignment of the existing 42” main within Huntington Avenue to conform to the proposed intersection improvements at Huntington Avenue / Southline Avenue. Both of these improvements are planned as part of Phase 1.

As further described in Chapter 6: Implementation, in addition to the approvals by the City of South San Francisco, coordination, review, and/or approvals or actions by other agencies or entities may be required for installation of any improvements within its jurisdiction.

Stormwater Treatment

Consistent with C.3 requirements in the MRP and the City of South San Francisco requirements, stormwater runoff from the Specific Plan area will be treated through Low Impact Development methods, which may consist of bioretention basins, flow through planters, pervious permeable pavements, and other site design features intended to manage stormwater runoff flows from the Specific Plan area and to reduce stormwater pollution.

Figure 4-3: Conceptual Storm Drainage Improvement Plan



Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

4.5. Dry Utilities

4.5.1. Existing Dry Utilities

The Pacific Gas and Electric Company (PG&E) currently provides both electric and gas services to the Specific Plan area. Electrical infrastructure in the Specific Plan area is provided overhead on joint poles as well as underground in joint trench. Natural gas pipelines are below ground in adjacent public rights-of-way.

4.5.2. Specific Plan Dry Utilities Improvements

Cable, phone, gas and electric infrastructure improvements will be required to adequately serve development within the Specific Plan area. These dry utility infrastructure improvements are anticipated to include undergrounding a portion of the existing overhead utilities along the immediate street frontages, as conditioned by the City or otherwise required by the respective utility provider.

Where feasible and required by the City, new dry utilities improvements should be located underground and in building service areas. Above-ground facilities should be screened from view utilizing landscaping and/or other appropriate screening methods. The extent and timing of dry utility improvements will be determined for each development phase as part of the Precise Plan review (see Chapter 6: Implementation).

4.6. Public Services

Relevant public services include police, fire protection, and emergency medical services, all of which are provided by the City of South San Francisco within the Specific Plan area. Any increased demand on public services associated with implementation of the Specific Plan will be financed through development fees and the payment of annual property taxes associated with new development within the Specific Plan area.

5

DESIGN GUIDELINES

This chapter explains the design principles and establishes a set of design guidelines for development within the Specific Plan area, including site design, building architecture, sustainability, lighting, landscaping, and signage.

5.1. Introduction

The following design guidelines describe and illustrate the designs, concepts and features intended to promote the high-quality development that is envisioned for the Specific Plan area. These design guidelines should be used in conjunction with the development standards described in Chapter 2: Land Use Plan & Development Standards, and should be used to guide the review and approval of subsequent Precise Plans for development within the Specific Plan area, as described in Chapter 6: Implementation.

As discussed in Chapter 1: Introduction, a number of the Specific Plan objectives relate to ensuring high-quality development including:

- Create a commercial campus development with sophisticated, unified architectural and landscape design and site planning, resulting in a distinctive campus identity and strong sense of place.
- Create well-designed, flexible buildings and floor plates that can accommodate a variety of commercial uses over time to ensure that the Specific Plan is responsive to market conditions and demands.
- Provide well-designed retail and publicly available open spaces to increase community access to and usage of the Specific Plan area.
- Create new publicly accessible open spaces including plazas, courtyards, and green spaces within the Specific Plan area.
- Incorporate sustainable and environmentally sensitive design and equipment, energy conservation features, water conservation measures and drought-tolerant or equivalent landscaping, and sustainable stormwater management features.

Rendering of Building 7

Specifically, these design guidelines serve the following functions:

- Promote cohesive design and identify for the Southline campus that respects the Specific Plan area's industrial past and reflects the overall character of Lindenville.
- Create simple building designs that result in efficient use of space, materials, and resources while maintaining a high level of design integrity and authentic architectural style.
- Provide guidelines and recommendations for development to maintain a high level of community cohesiveness and unity, while still allowing for flexibility and phased implementation over time.
- Encourage sustainable design solutions that reduce energy consumption, use water efficiently, and minimize waste.
- Promote walkability and provide opportunities for social interaction.

These design guidelines are intended to implement the overall vision of the Specific Plan and relevant Specific Plan objectives. The design guidelines do not intend to prescribe one specific design or promote a particular style, rather they provide guidance for future designers as to the degree of excellence, innovation, and creative execution expected by the City of South San Francisco for the design of the Specific Plan area.

The graphics and images shown are intended to convey the general concept and possible implementation of the guidelines, and should not be interpreted as the only design option. It is not anticipated that each guideline should apply equally to every component within the Specific Plan area, and will be interpreted during implementation. When implementing these design guidelines, the overall objective is to ensure that development follows the intent and spirit of the guidelines that it is consistent with the overall vision of the Specific Plan.

Graphics and photographic images shown herein are included as a visual reference and should not be interpreted as the only design solution. Creative approaches consistent with the design guidelines of this Specific Plan are encouraged.

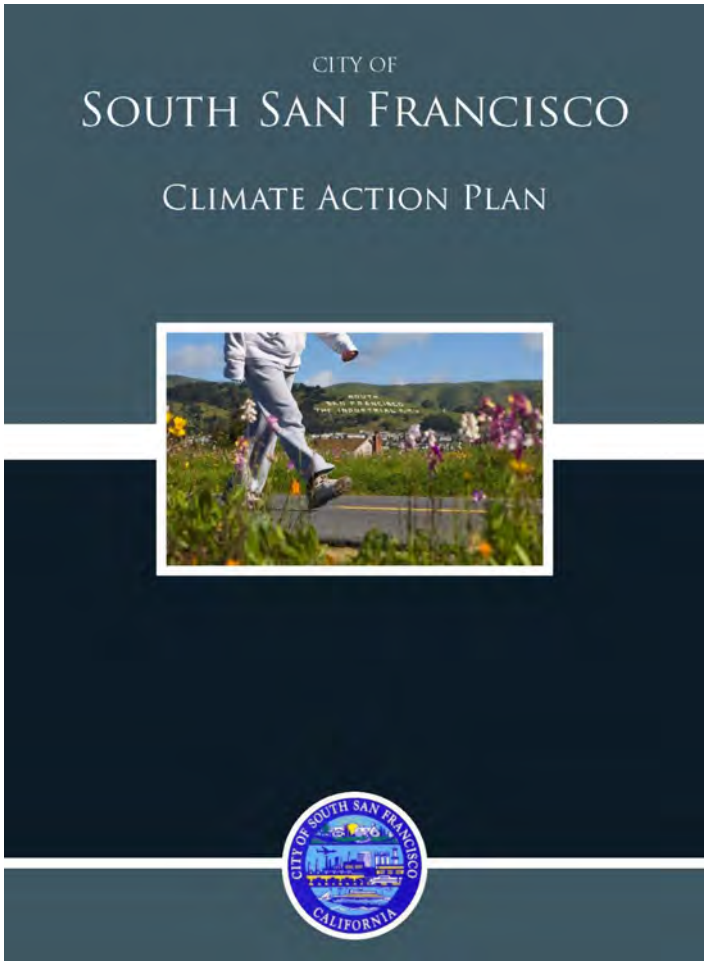
5.2. Sustainability Guidelines

The Southline Campus will incorporate a range sustainability features intended to reduce energy and greenhouse gas emissions, promote water conservation, minimize waste and encourage recycling, and promote employee wellness. These features are consistent with goals, policies, and programs as described in the City of South San Francisco's Climate Action Plan (2014).

Unless noted otherwise, the following sustainability guidelines should apply to all phases of Specific Plan implementation:

Transportation

- Promote a safe and inviting pedestrian environment, taking advantage of the Specific Plan areas proximity to the San Bruno BART station and San Bruno Caltrain station.
- Achieve an alternative mode-shift reduction of 45 percent through the implementation of a TDM program. See also Section 3.7 Transportation Demand Management for additional discussion.
- Provide mobility hubs designed to accommodate shuttles and ride-share pickup and drop off zones that promote shared-transit options such as shuttles, car share, rideshare, and/or other alternative-mobility options.
- Provide Class II and III bike lanes and routes within the Specific Plan area that are also connected to existing and planned off-site bicycle networks. See also Section 3.4 Bicycle Circulation for additional discussion.
- Provide electric vehicle charging infrastructure in parking structures and surface parking for at minimum ten percent of the parking spaces.
- Provide parking in below- and above-ground structures in lieu of surface parking, thereby minimizing heat island impacts associated with surface asphalt parking.



Energy / Greenhouse Gas Emissions

- Achieve at minimum LEED Silver (version 4) or equivalent performance, and CalGreen compliance.
- Prioritize and integrate responsive design strategies that compliment a climate-responsive design.
- Achieve at least 10% reduction over American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) 90.1-2010 requirements to reduce energy-related GHG emissions for each building by implementing energy-efficient measures. Examples include:
  - Low energy systems
  - Displacement ventilation
  - Heat recovery systems
  - Efficient mechanical systems and information technology and equipment such as load scheduling
  - Energy efficient windows
  - Additional insulation and external and internal shade structures
  - LED lighting and daylighting and occupancy controls
  - Efficient space heating and cooling systems
  - Natural ventilation
  - Onsite renewable energy use and storage

- Require 100% carbon-free electricity be purchased for all electricity consumption.
- Evaluate options to reduce on-site emissions from construction equipment during the construction phase. Options include using Tier 4 engines where commercially available, using grid electric power instead of diesel generators, and enforcing idling time restrictions for vehicles on the project site.
- As part of ongoing tenant operations, utilize exterior electrical power infrastructure that support reduced emissions from maintenance equipment.

Waste Reduction

- Maximize diversion of construction and demolition waste, targeting a 75% diversion rate, consistent with 2025 targets as required by SB 1383.

- As part of ongoing tenant operations, incorporate extensive recycling and composting facilities to divert organic materials away from landfills and incorporate dedicated space and waste collection infrastructure for batteries, mercury-containing lighting fixtures, and electronic waste.

Water Conservation

- Comply with state and local requirements regarding efficient water usage for landscaping, including the City's adopted Water Efficient Landscape Ordinance.
- Utilize native/adaptive and drought-tolerant landscaping to reduce overall exterior water needs.
- Install weather-based irrigation controls, drip irrigation, rotary spray, targeted hydrozoning, and other efficient methods for delivering landscape water to reduce potable water use. See also Section 5.4.9 Landscape Planting Plan.
- Install high-efficiency water fixtures for toilets, urinals, showerheads and lavatories.

Design for Employee and Community Wellness

- Prioritize wellness as part of the design, development, and operations of Southline.
- Improve the health of tenants, visitors, and the surrounding community.
- Integrate the best management design and operations strategies that optimize health.
- Provide passive open space and public spaces that provide opportunities for tenant and community recreation and gatherings.
- Provide on-site health and fitness and recreation amenities for use by building tenants.
- Utilize the Southline Commons as a place for employee and public entertainment, events and programs.
- Create flexible and intimate outdoor spaces that provide personal and small group gatherings for eating and socializing (e.g. Southline Commons, Southline Retail Plaza).
- Provide a fruit and vegetable garden as part of the Tanforan Avenue Community Parklet.
- Strive to achieve employee wellness Fitwel certification, or equivalent.

5.3. Architectural Design Guidelines

These architectural design guidelines describe and illustrate building designs, concepts, and features meant to promote the high-quality development that is envisioned for the Specific Plan area. These design guidelines are to be used in conjunction with the development standards described in Chapter 2: Land Use Plan & Development Standards.

Architectural design guidelines apply to commercial buildings, as described below. This chapter also provides specific guidelines for the campus parking structure.

5.3.1. Tenanted Buildings

Design considerations for commercial buildings include the following:

Building Facades

- Building design and materials should evoke an Industrial Modern aesthetic that is sensitive and well suited to the surrounding architectural vernacular.
- Building skin aesthetics should have a variety of exterior wall and fenestration expression, such as glazed curtain walls, individual window openings with metal surround, pilaster aesthetics, articulated mullions and variation of mullion patterns, metal spandrel and expressed metal profiles, and parapet caps, etc.

Building Form & Massing

- Building massing should have a simple volumetric geometry that should be broken up via stepping, indentations, bending and carving out negative spaces to promote sensitivity to scale, bulk and proportion.
- Building forms across the Specific Plan area should have differences in volumes and shapes to create architectural variety.
- Building forms should create an interesting street edge by utilizing a variety of fenestration patterns, entries, and portals.
- Building forms should incorporate architectural elements and building articulation to create pronounced building entry points such as wall offsets, bay windows, terraces and awnings, canopies and sunshades, to create visual cues and interest.
- Where appropriate, building corners should be articulated via inclusion of terraces and variety of skin treatment.
- Roof penthouses and mechanical and/or electrical equipment screening should complement the rest of the building form.
  - Roofing should be of light color or reflective materials, reducing heat island effect.
  - Solar roof tiles and/or panels are encouraged, where feasible.

Building Materials & Colors

- Exterior materials and finishes should be complementary throughout the Southline campus.
- Utilize a variety of high-quality materials to create architectural interest.
- Exterior material cladding should be of high quality, sophisticated and durable.
- Building cladding and glazing colors may differ between buildings to create variety and identity.
- Materials to be considered for use throughout the Southline campus include but are not limited to:
  - Cementitious / terracotta tile or glass fiber reinforced concrete;
  - High performance glazing (vision and spandrel) with aluminum mullion system;
  - Metal panel and metal profiles for canopies, accent spandrel, accent trims, sunshades, parapet caps and accent screens; and
  - Ribbed metal panel and louvers for roof screening.

Building 1 - Southeast View

Building 7 - Northwest View

Amenities Building

Roof Articulation

- Mechanical penthouses and roof equipment should be screened using unified materials throughout the Specific Plan area. Screening materials should be visually appealing and well-integrated into the building architecture.

Building Entrances

- Building entries should be located so they have prominence, visibility and easy access from walkways, driveways, and/or common areas.
- Building entries should utilize an architectural statement that is different from the rest of the building aesthetics to enhance importance, wayfinding to the “front door” and to heighten aesthetic appeal and arrival experience.
- Entry canopies should be designed to provide weather protection. Entry design should be well integrated into the building architecture.
- Transparent materials should be utilized on areas around entry doors to enhance visual connectivity from exterior to interior and to promote a welcoming character.

Loading / Service Areas and Mechanical Equipment

- Service/loading areas, storage areas, trash enclosures, and mechanical equipment should be screened from views through a combination of wall, fences and/or landscaping.
- Trash enclosures and mechanical equipment housing should be compatible with building architecture of the primary structures, consistent with these Chapter 5 Design Guidelines.
- All exterior ground-mounted equipment – including, but not limited to, mechanical equipment, electrical equipment, emergency generators, boilers, storage tanks, risers, electrical conduit, gas lines, and cellular telephone facilities – should be screened from view; wall-mounted equipment is discouraged.

Building 7 - Service Yard

5.3.2. Campus Parking Structures

The Specific Plan parking structures – Parking Structure C and D – are common use facilities anticipated to be shared by users across the Specific Plan campus, subject to shared parking agreements as needed. Parking Structure C – located north of Southline Avenue – is anticipated to include up to two levels underground and up to nine levels above ground at full parking structure buildout. Parking Structure D – located south of Southline Avenue and adjacent to Tanforan Avenue – is anticipated to include up to six levels above ground. Design considerations for the campus parking structures include the following:

Form & Massing

- The campus parking structures' massing should have a simple and straightforward volumetric geometry.
- The campus parking structures' massing should incorporate a pronounced entry form expression for pedestrians, bicyclists, and vehicles.
- Stairs and elevator towers should have a distinctive mass that is distinct from but complementary to the overall building form.

Facade

- The exterior aesthetics of parking structures should focus on simple lines and fenestration expressions.
- The design character should be compatible with that of the tenanted buildings across the Southline campus.
- Where appropriate, stairs and elevator towers should have an exterior design aesthetic that is articulated to create a distinctive visual accent.
- The exterior appearance of guard walls and rails should complement the overall campus parking structure form.
- Guard rails for the topmost parking tier should have a slight design variation from that of the lower tiers to create aesthetic interest in the facade treatment and help with visual proportion and scale.
- Incorporate building materials and/or landscaping to screen vehicle headlights onto adjacent buildings, where applicable.
- Ground floor openings between pilasters, when required for security and/or safety, should incorporate screening that is visually interesting and compatible with the overall campus parking structure aesthetics.
- Roof penthouses and mechanical and/or electrical equipment walls or screening should complement the rest of the building form of the campus parking structures.

Materials & Colors

- Exterior materials and finishes should be complementary throughout the Southline campus.
- Utilize a variety of high-quality materials to create architectural interest.
- Exterior material cladding should be of high quality, sophisticated and durable.

- Building cladding and glazing colors may differ to create variety and identity.
- Materials to be considered for use in the campus parking structures include but are not limited to:
  - Painted structural concrete/cement plaster columns, guard walls, beams and underside of slabs.
  - Glass fiber reinforced concrete, metal panels or cementitious panels, terracotta or stone tile accent and concrete masonry blocks.
  - Glazing (vision and spandrel) with aluminum mullion system.
  - Metal profiles for canopies and accent trims.
  - Perforated, special pattern metal, ribbed metal, accent panel, green screen.
  - Metal rails or cables.

Parking Structure C

5.3.3. Vehicular, Bicycle and Pedestrian Entries

The following design guidelines apply to both the tenanted buildings and the campus parking structures.

- Vehicular, bicycle and pedestrian access should be designed with safety of all users in mind.
- Entries to the buildings and campus parking structures should be located so they have prominence, visibility and convenient access from campus driveways or common areas.
- Vehicular entries should be articulated with visual architectural identifiers for ease of way finding.
- Pedestrian and bicycle entries should utilize architectural features or graphics signage that differ from the surrounding aesthetics to assist with way finding and to heighten aesthetic appeal and pedestrian/vehicular arrival experience.
- Entry canopies at all buildings should be designed to provide weather protection and should be well integrated into the building architecture.
- Building entry points should utilize transparent glazing on areas around entry doors to enhance visual connectivity from outside to inside and promote a welcoming character.
- Wayfinding signage should be provided to direct vehicles to on-site parking, including Parking Structures C and D.

5.4. Landscape and the Public Realm

The public realm within the Specific Plan area includes all exterior places, linkages and built forms that are physically or visually accessible to the public. The design guidelines in this section apply to development components within the public realm, including streetscapes, pedestrian paths, plazas, and open space. All publicly accessible open space within the Specific Plan area will be owned and maintained privately.

5.4.1. Landscape Concept

The landscape elements (including planting, lighting, hardscape, etc.) within the Specific Plan area should be designed to reflect a contemporary campus setting that is compatible with the Industrial Modern building architecture and aesthetic described above. Figure 5-1: Conceptual Landscape & Open Space Program illustrates a conceptual layout for landscape and open space components within the Specific Plan area.

Opportunities for internal open space within buildings will include outdoor balconies for all office/life science buildings and an outdoor terrace for the Amenities Building.

Figure 5-1: Conceptual Landscape & Open Space Program

Note: Areas shown outside of the Specific Plan area may be subject to separate review by other agencies.

Landscaping and open space should be designed to create a distinct visual identity that should be accomplished through cohesive landscape design of streetscapes, street and outdoor common area furniture, walls, entry features, plant selection, distinctive street lighting and directional signage, and other similar elements.

The landscape design within the Specific Plan area should create and promote useful, safe, sustainable and unique outdoor amenities which promote a sense of community and are integrated with and accessible to the surrounding community.

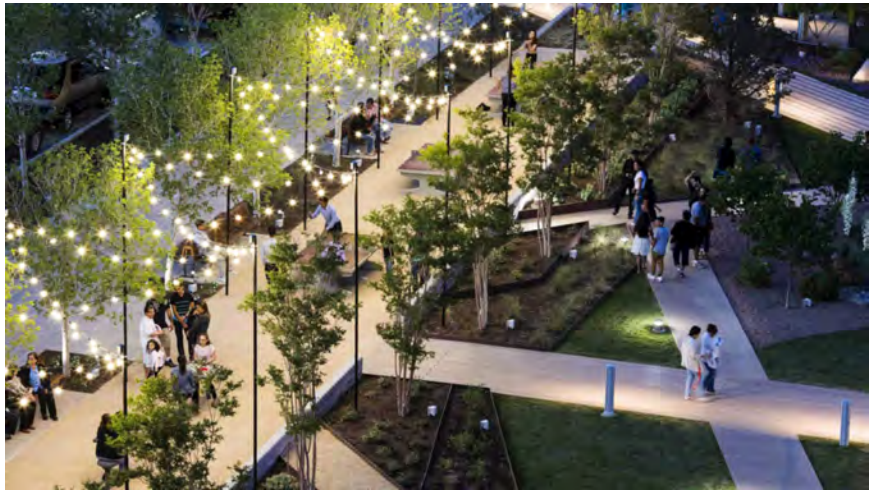
The following design guidelines should be considered.

- Design useful spaces that have a purpose, such as outdoor amenity spaces that provide recreation opportunities, or sustainable plant materials that provide added functionality within bioretention areas.
- Promote safe landscapes that are open, transparent, and promote pedestrian and bicycle accessibility.
- Utilize sustainable hardscape materials which are rich in color, variation, and texture.
- Create a sense of place through integrating visually appealing materials that are compatible with the surrounding urban fabric.

5.4.2. Southline Commons

Southline Commons, an approximately 1.5-acre open space in the northwestern portion of the Specific Plan area, envisioned to serve as the publicly-accessible focal point and the social outdoor gathering space within the Specific Plan area. It will also provide passive open space that serves as an exterior amenity for the campus tenants. Anticipated programming for the Southline Commons is described in Chapter 2: Land Use & Development Standards.

Design of the Southline Commons should include a variety of pavers and hardscape elements to create a contemporary and durable outdoor space; a varied landscape texture, including shade trees and landscaped berms to create usable edges for sitting that also serve as green space; and the use of flexible seating should create gathering spaces for all users and for different purposes.



5.4.3. Southline Retail Plaza

The Amenities Building (Building 2 as shown on Figure 2-1: Conceptual Site Plan) should be set back from the sidewalk along both Huntington Avenue and Southline Avenue to create a wide sidewalk and linear plaza that is fully accessible to the public and is anticipated to be utilized by Campus tenants and patrons of the ground floor public amenity and retail area. This setback area is referred to as the Southline Retail Plaza.

The Southline Retail Plaza is envisioned to incorporate design amenities that may include but are not limited to:

- Moveable seating and tables.
- Informal, flexible gathering areas.
- Outdoor dining areas.
- Awnings and shade coverings.
- Planting to soften facades and accent entries.
- Unique hardscape materials (e.g. pavers, surface texture treated concrete) providing interest and a sense of place.

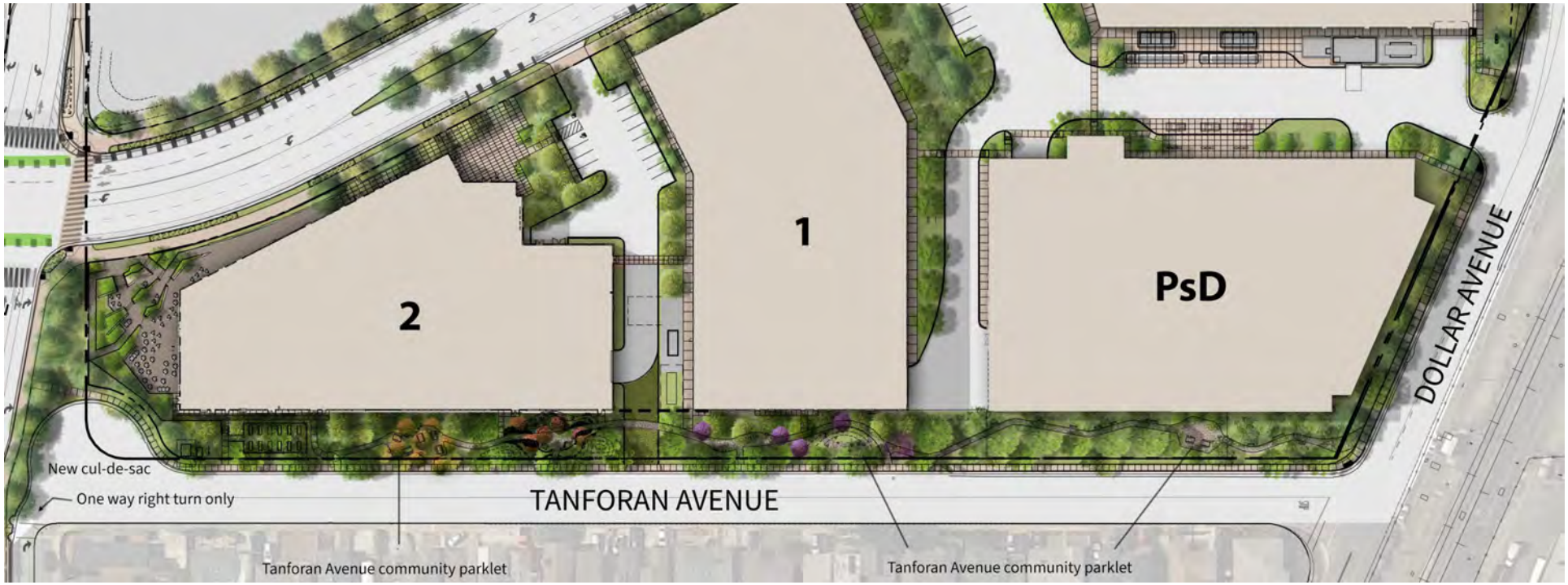
5.4.4. Tanforan Avenue Community Parklet

Buildings on the north side of Tanforan Avenue will be set back by approximately 40 feet from the Tanforan Avenue right of way to allow for the Tanforan Avenue Community Parklet – a publicly accessible landscaped area. The Tanforan Avenue Community Parklet is intended to provide a publicly accessible outdoor amenity area for Southline employees and the community, and to create a transition between the Specific Plan area and the residential neighborhood to the south. The Tanforan Avenue Community Parklet is anticipated to be constructed as part of Phase 1 development.

The Tanforan Avenue Community Parklet is envisioned to include a number of passive and active amenities, such as a walking path, a children's play area, a picnic area, a stormwater demonstration garden, and a fruit and vegetable garden. Landscaping should include a row of tall trees adjacent to the tenant building façade to provide a visual screen between the Specific Plan area and the adjacent residential neighborhood to the south. Additional landscaping may include mid-height trees, shrubs, grasses, and ground covers. The walking path is envisioned as a four- to eight-foot wide decomposed granite pathway to visually differentiate it from the sidewalk adjacent to Tanforan Avenue.

Figure 5-2: Conceptual Tanforan Avenue Community Parklet Site Plan illustrates one possible layout and programming for this component of the Specific Plan area.

Figure 5-2: Conceptual Tanforan Avenue Community Parklet Site Plan



5.4.5. Landscape Gateways

As shown in Figure 5-1: Conceptual Landscape Design, primary and secondary "gateway" entry points will be incorporated into the public realm to visually indicate a transition into the Specific Plan area from the surrounding community.

Gateway landscaping should provide an entry point for way finding and include complementary signage and lighting for a cohesive experience. All entries shall be designed to be accessible, as required by the Americans with Disabilities Act .

Primary Landscape Gateway

As shown in Figure 5-1: Conceptual Landscape Design, the primary gateway entry point will be on the west side of the Specific Plan area, at the new intersection of Southline Avenue at Huntington Avenue.

Primary gateway features should include "Southline" monument signage and ornamental plant material that is visually distinct and enduring. Other primary gateway features may include accent lighting and special hardscape features such as pavers or surface texture-treated concrete. Design parameters for the monument sign will be further refined in the signage application(s) under Municipal Code Chapter 20.360: Signs that will be submitted to the City in connection with development within the Specific Plan area, as further described in Chapter 6: Implementation.

The southeast corner of the primary gateway area is anticipated to include a small terraced area for seating and planting that will integrate with and complement the Southline Retail Plaza.

Secondary Landscape Gateway

As shown in Figure 5-1: Conceptual Landscape Design, secondary gateways into the campus should be located along various points on the north and south of Southline Avenue.

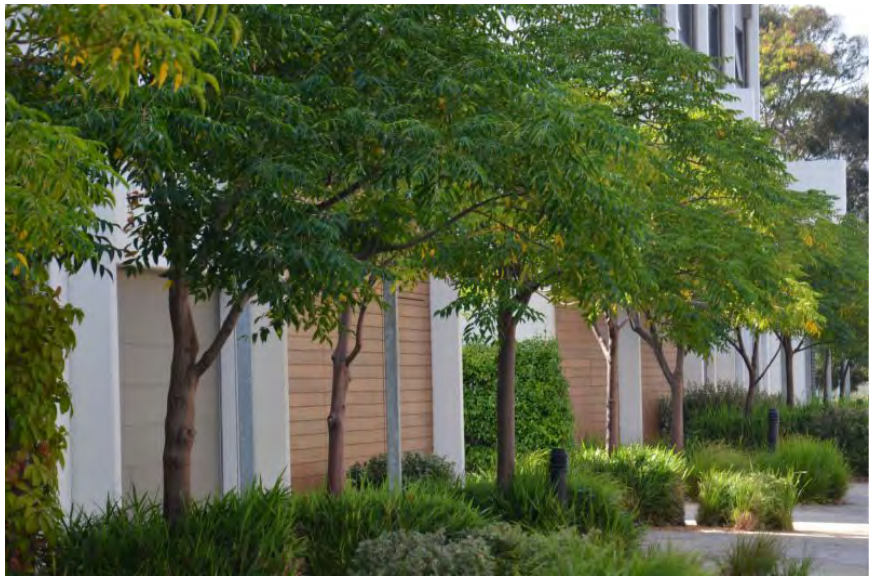
Secondary gateway features include distinctive landscaping, accent lighting, and low-profile directional signage to assist with wayfinding and pedestrian access.

5.4.6. Landscape Edge

Landscape edges should be generally located along the perimeter of the Specific Plan area and internally to provide visual screening, including along Southline Avenue. Where feasible, landscape buffers should also serve a biofiltration function for stormwater runoff.

Landscape buffers are envisioned to include the following design features:

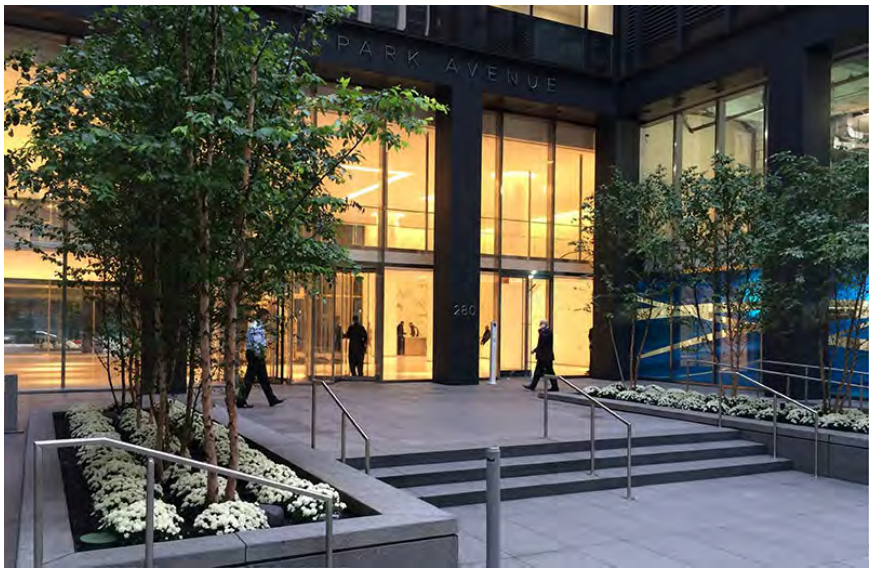
- Landscape buffers should be used to visually screen and soften the perimeter of the Specific Plan area, including along Southline Avenue.
- Landscape buffers should include a combination of native and/or adaptive trees. They should be complemented by layered ground plant materials that are site and microclimate appropriate, including shrubs, ornamental grasses and groundcovers.
- Landscape buffers should include, where feasible, stormwater treatment areas that are compliant with low impact development policies, incorporating native and/or adaptive landscaping that is drought tolerant and able to handle periods of inundation.



5.4.7. Lobby Plazas

As shown in Figure 3-3: Conceptual Pedestrian Connectivity Plan, primary entries and building lobbies should be located at key main building entries within the Specific Plan area. The following design guidelines should be considered:

- Lobby plazas should face public streets, internal roadways, or public realm open spaces and provide a seamless entry sequence into the building.
- Lobby plazas should be designed to be in scale with the building lobby and incorporate an integrated landscape edge and signage identifying the entries.
- When space program allows, entry plazas may include:
  - Seating areas;
  - Planting to soften facades and accent entry into the buildings; and
  - Unique materials providing interest and a sense of place.



5.4.8. Streetscape

The streetscape includes common area elements such as landscaping, sidewalks and pathways, and transit shuttle shelters. It also includes exterior lighting and signage. These features should be considered in context with vehicular, pedestrian, bicycle, and transit circulation as described in Chapter 3: Circulation & Mobility.

The following design guidelines should be considered for all streetscape features including furnishings, exterior lighting and signage. Specific design parameters for Southline campus signage will be further refined in the signage application(s)s in connection with Municipal Code Chapter 20.360: Signs that will be submitted to the City, as further described in Chapter 6: Implementation.

General

- Architectural features and building articulation should be aesthetically and functionally integrated with the streetscape design where feasible and practical.
- The incorporation of awnings, canopies, and architectural elements over doorways and windows can project into the building, sidewalk, and planting zones. These elements provide protection from the weather and assist in way-finding for pedestrians.
- Adequate soil volume should be provided in all tree planting spaces to foster healthy root growth for street trees. Innovative use of subgrade structural elements and suspended paving is encouraged to provide sufficient soil volume while accommodating pedestrian traffic.
- The planting spaces around trees can either be entirely planted, grated, or paved. The planting design strategy should be consistent within the overall design of the Specific Plan area.
- Incorporate creative stormwater remediation and other Low Impact Development techniques into the streetscape where feasible.
- Consider both sides of the road, including alignment and spacing of street trees and parking in all streetscape designs.
- Utilize color concrete, stamped concrete, pavers, or other materials to visually identify pedestrian cross-walks.

Streetscape Furnishings

Streetscape furnishings are an important element of the streetscape that serve an aesthetic and practical purpose in establishing the quality and character of a place, and help contribute to the bike and pedestrian-friendly goals of this Specific Plan. Amenities may include benches, tables and chairs, litter and recycling receptacles, fencing, bicycle parking, and shuttle shelters.

The following design guidelines should be considered for streetscape furnishings, such as benches, tables and chairs, litter and recycling receptacles, bicycle parking, and shuttle shelters. These guidelines also address amenities associated with outdoor dining. Images shown are for illustrative purposes only and do not represent one preferred type of street furnishing.

- Locate furnishings outside of pedestrian areas of travel so as not to impede pedestrian movement.
- Removable outdoor dining furnishings should be coordinated in their design and made of durable high-quality materials that can withstand constant use and exposure to the elements.
- Umbrellas and outdoor heating devices are permitted in appropriate areas that accommodate outdoor dining and gathering.
- Use of high-quality free-standing planters that can withstand harsh weather is encouraged in hardscape areas.
- Bicycle parking should be easily accessible and identifiable but carefully located to minimize conflicts with safe pedestrian and vehicle flow.

- Provide innovative, efficient, and attractive designs for bike parking areas such as stacked racks or architectural bike stations that are integrated into the surrounding environment.
- Design of shuttle shelters should be contemporary in character and incorporate the use of transparent materials and lighting to make shelters open and safe.
- As part of signage approvals(s), wayfinding signage should be incorporated throughout the Campus to help direct users to various Campus amenities, including to mobility hubs and/or shuttle shelters.
- Shelters should incorporate informational signage regarding transit routes and other transportation options.
- Shuttle shelters may be integrated into a building structure where practical.

5.4.9. Landscape Planting Guidelines and Plan

As shown in Figure 5-3: Conceptual Planting Plan, the plant plan for trees, shrubs, and ground covers envisioned for use within the Specific Plan area is based on the natural and cultural landscape of the broader San Francisco Peninsula. Special attention is paid to the distinct microclimates specific to South San Francisco to create a cohesive, site specific, and balanced landscape.

Tree Plantings

Implementation of the Specific Plan would result in a substantial increase in tree plantings in the Specific Plan area and adjacent off-site improvement areas. In Phase 1, it is envisioned that 98 existing trees will be removed and 312 new trees planted. In later phases, an additional 78 existing trees will be removed and 319 new trees planted. As a result, at full Project buildout, a total of 176 existing trees will be removed and 631 new trees will be added for a net gain of approximately 455 trees.

Street Trees

As shown in Figure 5-3: Conceptual Planting Plan, along both sides of Southline Avenue and the west side of Maple Avenue and Huntington Avenue, a mix of Red maple (*Acer rubrum*) and Chinese pistache (*Pistacia chinensis*) should provide seasonal color and create a distinctive visual boundary to the campus setting. Interior trees should include a variety of accent and canopy trees, as well as screen/evergreen trees.

Sustainable Plantings

Plant materials utilized within the Specific Plan area should conform to the Department of Water Resources "Water Use Classification of Landscape Species" guide, emphasizing use of both native and adaptive species of trees, shrubs, and ground cover. Figure 5-3: Conceptual Planting Plan includes plant materials that are characterized as "low" to "very low" water demand, and were chosen for hardiness, functionality, and aesthetics.

Landscaping within the Specific Plan area should be consistent with the City's Water Efficient Landscape Ordinance, Section 20.300.007 of the Municipal Code, to ensure landscape water conservation.

Parking lots and other potential hardscape "heat islands" should be mitigated by trees, vegetation, and other landscape screening/shading devices in order to reduce heating and cooling energy use; filter air pollution and greenhouse gas emissions; sequester and store carbon; and help lower the risk of heat-related illnesses. Likewise, appropriately selected street trees for local streetscapes should be incorporated to create shade and accomplish similar energy-saving results within the Specific Plan area.

Landscape Planting Guidelines

The following design guidelines apply to landscape planting plan:

- Create a design and low maintenance planting plan that visually enhances the community image that is appealing and function for both tenants and visitors.
- Utilize local, low-water native and/or adaptive plant materials.

- Employ water conservation measures though use of drought-tolerant plant material and water conserving irrigation systems and practices, such as low-flow, water-efficient spray heads and emitters.
- Where practical, drought resistant trees and large shrubs should be irrigated with a drip system during active growth periods between November and March when normal rains are insufficient.
- Reinforce the principles of Low Impact Development for storm drainage, water infiltration and groundwater recharge.
- The plant palette should incorporate drought tolerant and aesthetically pleasing bioretention plantings consistent with the City of South San Francisco's Water Efficient Landscape Ordinance and Municipal Regional NPDES Permit C.3 Stormwater guidelines.
- Utilize landscaping to screen parking lots, trash enclosures, delivery areas, equipment buildings, and other similar elements from public views.
- Create a landscape that fosters appropriate public use of recreation/opens space areas and the streetscape.

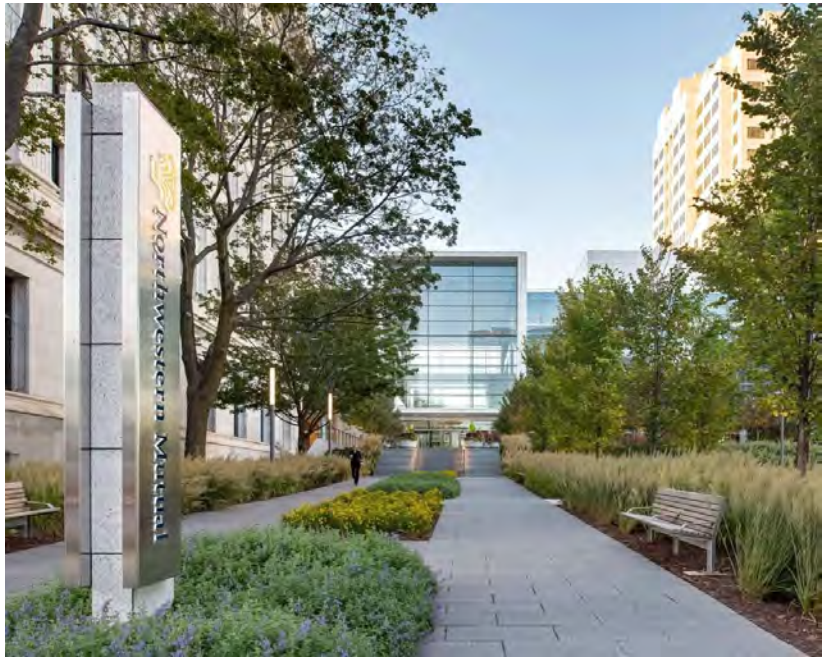


Figure 5-3a: Conceptual Planting Plan

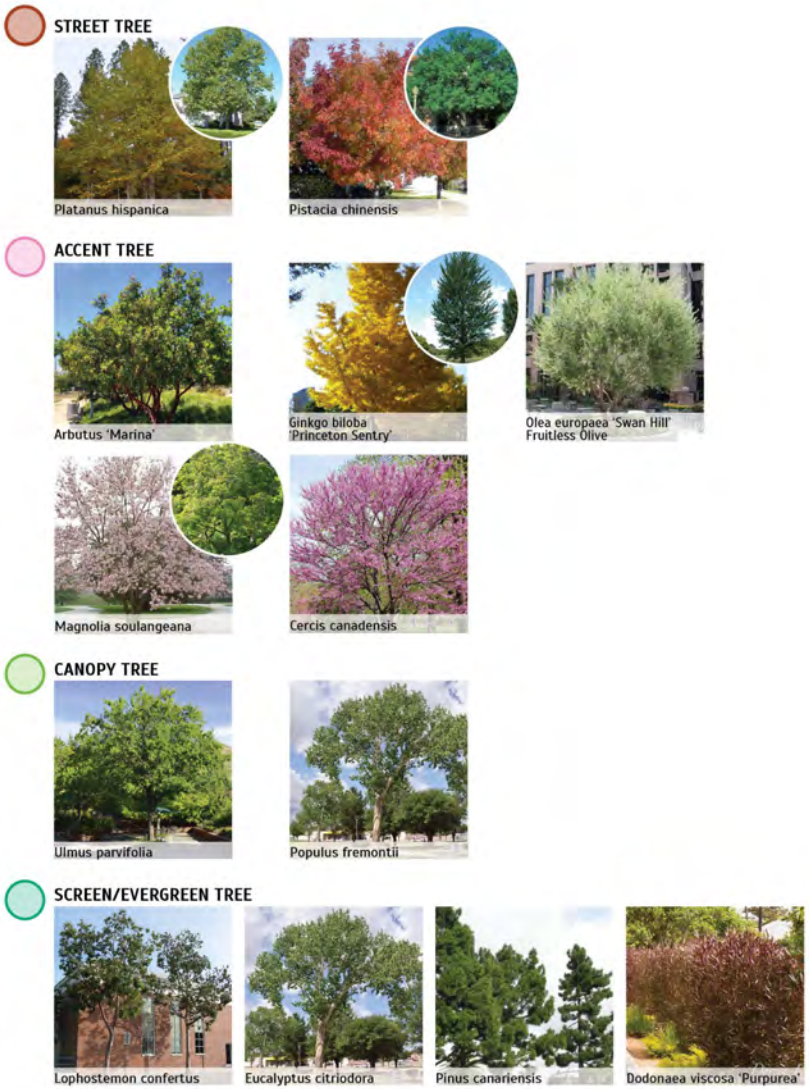


Figure 5-3b: Conceptual Planting Plan

5.4.10. Exterior Lighting

Exterior lighting in the Specific Plan area should be designed to help create a safe environment for pedestrians, bicyclists and vehicles, while avoiding spillover into adjacent areas as feasible. A conceptual lighting plan for the Specific Plan area is shown in Figure 5-4: Conceptual Lighting Plan.

Exterior lighting should include building mounted and accent lighting for signage and lighting in and around buildings. Lighting sources may also include pathway lighting and mounted lighted on wayfinding signage. The quality of light from all fixtures should create a pleasant and safe environment that encourages pedestrian activity at night.

The following guidelines should be considered for all exterior lighting:

- Lighting fixtures should direct illumination downward to minimize light impacts on surrounding areas. Up-lighting, spot-lighting, and decorative color lighting may be appropriate for prominent buildings, signage, landscaping, and other features.
- Exterior lighting should be unobtrusive and should not cause excessive glare or spillover into adjacent areas. In certain areas, it may be appropriate to limit the luminosity of certain lighting or signage, and/or provide structural or vegetative screening from sensitive uses.
- Wall-mounted lighting fixtures should be compatible with the architectural style and character of the building. The color, size, placement, and number of fixtures should enhance the overall design and character of the Specific Plan area.

- Pole mounted lights in the streetscape should illuminate wayfinding signage and vehicle, bicycle and pedestrian rights of way.
- Scale, materials, colors, and design detail of light posts and fixtures should reflect the desired character of the Specific Plan area and the architectural style of the surrounding buildings. Light posts should be appropriately scaled to pedestrians near sidewalks and pedestrian pathways.
- Bollard lighting is encouraged to illuminate walkways and gathering spaces, while avoiding spillover into adjacent areas.
- Incorporate site lighting into hardscape elements such as steps, railings and paving to illuminate the pedestrian realm.
- Exterior building lights should be incorporated into the overall Southline Campus design and site lighting.
- Building entry and security light fixtures selection should be compatible with the overall Southline Campus architecture and placement should be coordinated with building elements.
- Energy efficient, low voltage lighting is encouraged. Decorative and landscape lighting should be low intensity.
- Seasonal (e.g. holidays) lighting strategy should be considered for prominent pedestrian activity zones, such as Southline Commons.

Figure 5-4: Conceptual Lighting Plan

5.4.11. Signage

All signage should be designed to complement the innovative and dynamic architectural design of the Southline Campus. Signage should be graphically complementary to the architectural aesthetic and contribute towards a cohesive Southline Campus environment.

As further discussed in Chapter 6: Implementation, signage within the Specific Plan area would be implemented through compliance with Municipal Code Chapter 20.360: Signs, which includes a Master Sign Program under Section 20.360.010: Master Sign Program.

The purpose of a Master Sign Program is to provide a method for an applicant to integrate the design and placement of signs with the overall development design to achieve a unified appearance.

REDDACLIFF PLACE

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LIFE SCIENCES

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IMPLEMENTATION

This chapter addresses the actions that are necessary to implement the Specific Plan by the City of South San Francisco, other agencies, and future Project Applicant(s) to achieve the goals and objectives outlined in this Specific Plan.

6.1. Policy

This Specific Plan establishes controlling legislative policies regarding the development of the Specific Plan area. This chapter describes the Specific Plan's administration, subsequent approvals, amendments, severability and funding and financing strategy of those legislative policies.

6.2. Administration

This Specific Plan has been prepared in accordance with both California Government Code Section 65451, which sets forth the basic content of specific plans, and the Municipal Code Chapter 20.530: Specific Plans and Plan Amendments.

Development within the Specific Plan area shall be subject to this Chapter 6: Implementation. The City of South San Francisco Department of Economic and Community Development, Planning Division, is primarily responsible for the administration, implementation, and enforcement of this Specific Plan. The primary administrator of the Specific Plan is the Chief Planner of the City of South San Francisco. As used herein, Chief Planner shall include his/her authorized designee.

6.2.1. General Plan

This Specific Plan is in conformance with, and implements, the 1999 South San Francisco General Plan ("General Plan"). In connection with its adoption of the Southline Specific Plan, the City adopted amendments to the General Plan to reflect adoption of the Specific Plan, which included an amendment to General Plan Figure 2-3: Special Area Height Limitations to increase the building height in the Specific Plan area from 80 feet to 120 feet, consistent with the maximum height allowances under FAA Part 77 regulations and the San Francisco International Airport ALUCP's Critical Aeronautical Surfaces provisions, and re-designation of a small, approximately 0.3-acre parcel within the Specific Plan area from "Park and Recreation" to "Office" to be consistent with the General Plan designation of the remainder of the Specific Plan area.

A new 2040 General Plan, "Shape SSF" is currently being prepared by the City but has not yet been adopted. Based on the City's planning efforts to-date, it is anticipated that the Specific Plan will be consistent with the City's vision for the Specific Plan area under the 2040 General Plan. The land use alternative selected by the City Council in November 2020 would retain a consistent Business & Professional Office General Plan land use designation for the entire Specific Plan area, consistent with the current designation.

6.2.2. Municipal Code

In connection with adoption of this Specific Plan, the City adopted Municipal Code Chapter 20.290: Southline Campus District, to codify the land use standards of this Specific Plan, and made conforming edits to the Zoning Map to reflect

adoption of the Specific Plan. No other changes to the Municipal Code are proposed. If there are any inconsistencies or conflicts between the requirements of the Specific Plan and the requirements of the Municipal Code or other applicable City rule, regulation, or policy, the provisions of the Specific Plan take precedence, control, and govern in the Specific Plan area.

Any activities regulated by the Municipal Code but not addressed in the Specific Plan shall be subject to the City regulations, unless application of those regulations would frustrate the policy, purpose, or objectives of the Specific Plan. To the extent any City regulation(s) would frustrate the policy, purpose, or objectives of the Specific Plan, such regulations shall not apply.

All references to the Municipal Code in this Specific Plan shall be to the South San Francisco Municipal Code.

Development within the Specific Plan area shall comply with all federal, State, and local building codes in force at the time of building permit for that portion of development, unless otherwise provided in a Development Agreement to the extent permitted by law.

6.2.3. Interpretation

The Chief Planner shall have the responsibility to interpret the provisions of the Specific Plan. If an issue or situation arises that is not sufficiently provided for in the Specific Plan or is outside its scope, the Chief Planner shall be guided by the purpose and intent and the interpretation provisions under Municipal Code Chapter 20.030: Rules for Construction of Language.

If ambiguity arises concerning the appropriate use classification of a particular land use, the Chief Planner shall have the authority to interpret whether the use is substantially similar to one or more other uses permitted by the Specific Plan. If the Chief Planner interprets that the use is substantially similar to a permitted use, then the use shall be permitted.

Where the use is not identified in the Specific Plan and there is no similar use permitted by the Specific Plan, the Chief Planner shall have the authority to interpret whether the use is consistent with the purpose and intent of the Specific Plan, in which case the Chief Planner shall have authority to permit or conditionally permit the use as appropriate.

6.2.4. Substantial Conformance Review

To attain the highest quality development consistent with the site plan, design, conditions, and commitments associated with this Specific Plan, all subsequent development plans shall be in substantial conformance with the Specific Plan. Prior to the issuance of permits for development within the Specific Plan area, the Chief Planner shall review applications for consistency with the General Plan, substantial conformance with the Specific Plan, and conformance with other applicable regulations.

Substantial Conformance Criteria

A proposal for development within the Specific Plan area "substantially conforms" to the Specific Plan if it substantially conforms with the requirements in Chapter 2: Land Use Plan & Development Standards and does not materially conflict with the guidance in Chapter 3: Circulation & Mobility, Chapter 4:

Infrastructure & Public Services and Chapter 5: Design Guidelines, evaluated in the context of the overall objectives and vision of this Specific Plan.

Minor Modifications

Without limiting the foregoing provisions regarding substantial conformance, upon written request by an applicant, the Chief Planner may approve minor modifications from the Specific Plan. Minor modifications are those that do not materially affect the objectives of the Specific Plan and shall not require an amendment to the Specific Plan. Examples of minor modifications include the following:

- Modifications to the specific location and distribution of open space, including Southline Commons, throughout the Specific Plan area as long as equivalent or superior open space is provided as calculated across the Specific Plan.
- Deviations required to meet applicable health and safety regulations.
- Deviations necessary to respond to unanticipated site conditions or requirements imposed by other agencies.

This non-exhaustive list is intended by way of example and shall not preclude the Chief Planner from determining that other deviations requested by an applicant constitute minor deviations that do not materially affect the objectives of this Specific Plan.

6.2.5. Amendments

The Specific Plan may be amended as governed by State Law, and Chapter 20.530 Specific Plans and Plan Amendments of the South San Francisco Municipal Code as applicable.

6.2.6. CEQA Review

In compliance with the California Environmental Quality Act (CEQA), the City has prepared an environmental impact report (Southline EIR) (SCH No. 2020050452) analyzing the potential environmental impacts of the development as described in this Specific Plan, including the proposed off-site improvements and related infrastructure. The City also adopted a Mitigation Monitoring and Reporting Program to require all reasonably feasible mitigation measures be implemented by means of conditions, agreements, or other measures in connection with implementation of the Specific Plan.

The Southline EIR is intended to provide CEQA clearance for adoption and implementation of the Specific Plan and the other approvals described in Section 1.8: Project Approvals, including the proposed off-site improvements and related infrastructure. The Southline EIR may be relied on by other agencies, including the City of San Bruno, BART, and other applicable agencies, for purposes of approving off-site improvements and related infrastructure development related to and consistent with the Specific Plan within those agencies' respective jurisdictions.

Consistent with State law, future discretionary actions required for development within the Specific Plan area, including issuance of Precise Plans as described below, are

subject to environmental review in compliance with CEQA. It is intended that the City, and other relevant agencies, will utilize and rely on the Southline EIR and the Mitigation Monitoring and Reporting Program in conducting CEQA review for development within the Specific Plan area.

6.3. Subsequent Approvals – City of South San Francisco

6.3.1. Precise Plans

As set forth in Section 20.530.014 of the City's Municipal Code, a specific plan may be implemented through Precise Plans, which set forth in detail development criteria for proposed structures and related improvements and their arrangements on individual parcels; parcel maps, design review, and sign permits. This section provides the criteria for issuance of Precise Plans for development within the Southline Specific Plan area.

Phasing

Implementation of the Southline Specific Plan is anticipated to occur in several phases, generally as set forth in Section 2.6: Phasing, above. Individual phases of development will be implemented through Precise Plans, as described in this Chapter 6. While a phased approach is anticipated to occur, the Specific Plan does not restrict or otherwise limit concurrent buildout of the Specific Plan area, subject to review and approval of Precise Plans and any other necessary approval(s) as described in this chapter.

Land Use Improvements Prior to Precise Plan Approval

Except as provided here, following the adoption of this Specific Plan and prior to approval of a Precise Plan(s), no new development, including any building permit, variance, or certificate of occupancy shall be issued for any new structure within the Specific Plan area.

Continued operation of existing uses within the Specific Plan area shall not require approval of a Precise Plan; regulation of existing uses within the Specific Plan area should be read in harmony with the City's Municipal Code Chapter 20.320: Nonconforming Uses, Structures and Lots, regarding non-conforming structures, uses and lots, as applicable. Additionally, the following activities and City approvals shall not require prior approval of a Precise Plan as long as the activities and approvals are in substantial conformance with the Specific Plan as described in Section 6.2: Phasing, above:

- Permits for site preparation within the Specific Plan area, including but not limited to demolition, grading, excavation and shoring, and utilities infrastructure activities.
- Permits for development of roadways, circulation improvements, or other components of infrastructure identified in the Specific Plan or required to serve the Specific Plan area (Note that these improvements may be subject to certain review and approval by other agencies.).
- Actions required in whole or part by a requirement of any applicable governmental agency.
- Interior or minor exterior modifications of existing buildings which do not alter the nature, character or intensity of a use.
- Modifications to existing landscaping.

- Signage within the Southline Campus (S-C) District, including any permitted change in sign copy, that is included as part of and consistent with an approved Sign Program, in accordance with Municipal Code Chapter 20.360: Signs.
- Temporary uses that are intended to be of limited duration and that will not permanently alter the character or physical facilities of the Specific Plan area, in accordance with Municipal Code Chapter 20.520: Temporary Use Permits.

Precise Plan Procedures

Submittal of a Precise Plan shall be subject to the following review procedures:

Filing Fees

A Precise Plan application fee shall be paid for all private development proposals pursuant to the current Master Fee Schedule of the City at the time of application or as otherwise specified in a Development Agreement.

Application

When a Precise Plan is required by the Southline Specific Plan, the Precise Plan shall be submitted to the Chief Planner. The Chief Planner shall check the application for completeness and substantial conformance with the Specific Plan. The Precise Plan application shall also constitute the Design Review application as required under Municipal Code Chapter 20.480: Design Review.

Precise Plan Application Contents

The following information and drawings shall be required for Precise Plan consideration by the City, which includes all materials required for Design Review. The Chief Planner may require either less or additional information as necessary to meet the intent and purpose of this chapter.

- All applicable tentative, final, or parcel maps within the area covered by the Precise Plan;
- A legal and physical description of the development site within the Specific Plan area including boundaries, easements, existing topography, natural features, existing buildings, structures and utilities;
- A plot or site plan, drawn to scale which depicts all proposed on-site improvements and utilities and the locations of the same in accordance with the standards established in the Specific Plan and the Municipal Code, as applicable;
- Anticipated vehicle and bicycle parking demand and usage in order to evaluate the specific parking requirements for that phase;
- A landscape plan drawn to scale which sets forth information pertinent to the landscape requirements of the Specific Plan and Municipal Code, Title 20: Zoning, as applicable;
- Grading, drainage, and erosion maintenance plans;
- Architectural plans and exterior elevations indicating profiles, glazing and materials drawn to scale;

- Scaled drawings of all signs and light standards with details of height, area, color and materials specific therein;
- Plans for off-site improvements associated with the Precise Plan application; and
- Any other drawings of additional information necessary for the review authority to review and make its determination.

Guidelines for Review

In reviewing Precise Plans, the City shall adhere to the standards set forth in this chapter and shall further attempt to foster and promote the general character and purposes of the Specific Plan.

Development within the Specific Plan area is also subject to Design Review under Municipal Code Chapter 20.480: Design Review. In conducting its Design Review, the City shall apply the design guidelines established in Chapter 5: Design Guidelines and the development standards established in Chapter 2: Land Use Plan & Development Standards as the design guidelines and development standards applicable to development within the Specific Plan area, as well as the applicable design review criteria in Municipal Code Section 20.480.006: Design Review Criteria. Design review, including application of the design review criteria set forth in Municipal Code Section 20.480.006, shall be conducted in accordance with Section 6.2.2: Municipal Code and Section 6.2.3: Interpretation, as described above.

Review and Decision

Chief Planner's Review. The Chief Planner, or his/her designee, shall review the Precise Plan application, and shall consult with the staff of affected departments and offices of the City. Upon completion of review and any necessary consultations, the Chief Planner shall submit the Precise Plan application to the Design Review Board for review as described below. The Chief Planner shall then submit the Precise Plan application to the Planning Commission and shall recommend that the Planning Commission approve, conditionally approve, deny or suggest modifications to the Precise Plan application.

Review by Design Review Board. Each Precise Plan application shall be referred to the Design Review Board for design review as set forth in Municipal Code Chapter 20.480: Design Review, and as described in this Chapter 6: Implementation. It is anticipated that the Design Review process will be concurrent with Precise Plan review as described herein. The Design Review Board shall forward its recommendations to the Chief Planner and Planning Commission.

Review by the Planning Commission. The Planning Commission shall review the Precise Plan to ensure consistency with the approved Specific Plan and shall adhere to the standards set forth in this chapter, in furtherance of the general character and purposes of the Specific Plan and the implementing Southline Campus (S-C) District.

Planning Commission Decision. The Planning Commission shall approve, conditionally approve, deny, or suggest modifications to the Precise Plan, and any approved Conditional Use Permit (as applicable) or other approval

specified herein (e.g., Design Review, Sign Approval). Any conditions shall be designed to ensure attainment of the standards set forth in this chapter.

Mandatory Findings of Approval. The Planning Commission shall make the following findings before approving or conditionally approving Design Review:

a) The project proposed in the Precise Plan is consistent with applicable standards and requirements of Municipal Code Chapter 20.480: Design Review;

b) The project proposed in the Precise Plan is consistent with General Plan and any applicable specific plans the City Council has adopted;

c) The project proposed in the Precise Plan is consistent with any applicable design guidelines adopted by the City Council;

d) The project proposed in the Precise Plan is consistent with any approved tentative map, Use Permit, variance, or other planning or zoning approval that the project required; and

e) The project proposed in the Precise Plan is consistent with applicable design review criteria in Municipal Code Section 20.480.006: Design Review Criteria, which are set forth in full in Appendix D: Municipal Code Section 20.480.006 — Design Review Criteria.

The Planning Commission shall make the following additional findings before approving or conditionally approving any Precise Plan:

a) The project proposed in the Precise Plan is consistent with the General Plan.

b) The project proposed in the Precise Plan is compatible with the intent and purpose of the Southline Specific Plan.

c) The proposed Precise Plan is in substantial conformance with Chapter 2: Land Use Plan & Development Standards and does not materially conflict with the guidance in Chapter 3: Circulation & Mobility, Chapter 4: Infrastructure & Public Services and Chapter 5: Design Guidelines.

d) The development proposed in the Precise Plan is consistent with any applicable Development Agreement.

Effect of Approval. Following approval of Design Review and the Precise Plan, and any Use Permits (as applicable), no further permits or approval from the Planning Commission shall be required for development carried out in substantial conformity with the Southline Specific Plan, the approved Precise Plan, any approved Use Permit (as applicable) or other approval specified herein (e.g., Design Review, Sign Approval), and any conditions of approval, except that the Chief Planner shall, in a ministerial capacity, review building permit applications and perform final inspection to ensure substantial conformance with the Specific Plan and Precise Plan.

Changes After Approval. If major revisions to an approved Precise Plan are desired by the applicant, a revised Precise Plan shall be submitted and processed according to the procedures established herein for approval of the original Precise Plan. Any major changes to the phasing approved as

part of the Precise Plan shall be subject to approval by the Planning Commission.

Minor revisions to an approved Precise Plan shall be subject to approval by the Chief Planner. Without limitation, minor revisions may include deviations that do not result in any new or more severe significant impacts than those addressed in the EIR or related CEQA clearance document prepared for the Precise Plan, pursuant to the California Environmental Quality Act. Minor revisions may include, but are not limited to:

- Lot line adjustments.
- Changes in uses, subject to conformance with Table 2-2: Land Use Regulations.
- Reductions in density, intensity, scale or scope of the approved development.
- Minor additions to density, intensity, scale or scope of the approved development, assuming those changes to total square footage of construction are less than 5 percent.
- Minor alterations in vehicle circulation patterns or vehicle access points, and/or parking configuration or amount.
- Minor changes in pedestrian or bicycle facility alignments or provision of bicycle parking.
- Substitutions of comparable open space, landscaping, architectural materials, lighting, or signage for any such designs shown on any Precise Plan materials.
- Minor variations in the location of structures that do not substantially alter the design concepts of the project.
- Minor variations in the location or installation of utilities and other infrastructure connections or facilities that do not substantially alter the design concepts of the project or conflict with any applicable regulations.
- Minor adjustments to the project site diagram.

Notwithstanding the foregoing, the Chief Planner shall have sole discretion to determine whether a requested revision constitutes a major or minor revision.

Appeal Procedures. Appeals shall be processed in accordance with Government Code Sections 65453 - 65454 and Municipal Code Chapter 20.570: Appeals and Calls for Review.

Expiration of Approval. Unless a time extension is approved, any approved Precise Plan shall lapse and shall be deemed void: (a) two years after its effective date if a building permit has not been issued; or (b) after a longer duration as otherwise provided in an approved Development Agreement, as applicable. One-year extensions of the time may be granted by the Chief Planner upon request made prior to the expiration date of the permit; multiple successive extensions may be provided as determined by the Chief Planner. Projects are subject to the phasing, if any, established for the buildings within the approved Precise Plan.

6.3.2. Use Permits

Use Permits shall be required for the uses as indicated in Table 2-2: Land Use Regulations. Any such use permits shall be subject to the requirements as described in Municipal Code Chapter 20.490: Use Permits, and require separate findings, as described therein.

The Use Permit process applies to uses that are generally consistent with the purposes of the S-C district but require special consideration to ensure that they can be designed, located, and operated in a manner that will not interfere with the use and enjoyment of surrounding properties.

6.3.3. Other City Approvals

In addition to issuance of Design Review, Precise Plan approval, and any Conditional Use Permits (as applicable) as discussed above, development within the Specific Plan area may require approvals or permits from the City of South San Francisco, including, but not limited to:

- Preliminary and/or Final Transportation Demand Management Plan approval.
- Signage Approval (if not concurrent with Precise Plan Approval).
- Subdivision Map approval for reconfiguration of the parcels and dedicating public roadways and easements.
- Any additional actions or permits deemed necessary to implement this Specific Plan, including demolition, grading, foundation, and building permits, public encroachment permits, any permits or approvals required for extended construction hours, tree removal permits, and other additional ministerial actions, permits, or approvals from the City that may be required.

Transportation Demand Management Plan Approval

Development within the Specific Plan must be consistent with Municipal Code Chapter 20.400: Transportation Demand Management.

As discussed in Section 3.5: Transportation Demand, the Southline TDM Plan has been prepared and approved in connection with preparation of this Specific Plan, which establishes a 45 percent alternative mode requirement. The Southline TDM Plan serves as the Preliminary TDM Plan (as defined under Municipal Code Chapter 20.400: Transportation Demand Management) for the Phase 1 Precise Plan, the first Precise Plan to be prepared under the Specific Plan, establishing the required TDM components for Phase 1, and also includes conceptual TDM measures for the entire Southline Campus that may be further refined under subsequent Preliminary TDM Plan(s) established for future phases. The Southline TDM Plan identifies a number of program measures intended to achieve this alternative mode requirement.

As discussed in Section 2.6: Phasing, the Specific Plan may be implemented in phases over time and the Campus may be tenanted by multiple commercial tenants. As such, it is anticipated that multiple Preliminary and Final TDM Plans will be submitted in connection with implementation of the Specific Plan. The Final TDM Plan(s) will establish the specific TDM measures for that phase of development and will provide for monitoring and compliance with the alternative mode requirement. Any TDM Plan submitted in connection with development within the Specific Plan will be required to achieve the 45 percent alternative mode

requirement. As set forth in Municipal Code Section 20.400.006, a Final TDM Plan shall be submitted in prior to the approval of building permits for each phase of development.

Signage Approval

Development within the Specific Plan area is subject to Municipal Code Chapter 20.360: Signs. It is anticipated that implementation of signage within the Specific Plan area will occur through preparation of a Master Sign Program, which allows for an integrated design and placement of signs within a project with the overall development design to achieve a more unified appearance. At the discretion of the applicant, Master Sign Program applications may be processed concurrently with a Precise Plan application or may follow subsequent to Precise Plan approval.

Subdivision Map Approval

A Vesting Tentative Map for a phased development has been prepared and approved in connection with preparation of this Specific Plan. Unless otherwise provided in a separate agreement such as a Development Agreement, prior to issuance of any building permits for new construction within the Specific Plan area, a Final Map (or Phased Final Map(s) for the applicable area) shall be approved, together with a Subdivision Improvement Agreement, Encroachment and Maintenance Agreement and/or dedications as appropriate, and recorded. Subsequent subdivision approvals may be processed concurrent with or subsequent to Precise Plan approval in accordance with state law and Title 19 (Subdivisions) of the City's Municipal Code.

6.3.4. Other Relevant Agencies

In addition to the City of South San Francisco approvals and permits listed above, it is anticipated that approvals by other agencies and jurisdictions will be required for off-site improvements and infrastructure outside of the Specific Plan area.

City of San Bruno

As shown in Figure 1-1: Project Location, the Specific Plan area is adjacent to the City of San Bruno. Any off-site improvements within the City of San Bruno, including the proposed intersection improvements at Huntington Avenue, will require coordination with, and review and permit approval by the City of San Bruno.

Bay Area Rapid Transit (BART)

The Specific Plan area is adjacent to the San Bruno BART station, which includes the station, and associated parking structure and pedestrian circulation facilities. Proposed improvements related to implementation of the Specific Plan include various pedestrian, vehicular and transit improvements as described in Section 3.2.2 Off-Site Circulation Improvements, which may affect area within BART's jurisdiction. BART review and approval will be required for implementation of those improvements within its jurisdiction.

Peninsula Corridor Joint Powers Board

Off-site improvements will include improvements to the railroad road grade crossing at South Linden Avenue, which will require design review and permits from Peninsula

Corridor Joint Powers Board for implementation of those improvements within its jurisdiction.

SamTrans

Off-site improvements may require relocation or modification to existing SamTrans bus facilities, including a relocated bus stop, which may require review and approval by SamTrans for implementation of those improvements within its jurisdiction.

Federal Aviation Administration and ALUC Review

Preparation and approval of this Specific Plan and related approvals included review and determination by the ALUC regarding compatibility of the development proposed under the Specific Plan with the SFO Airport Land Use Compatibility Plan. Further compatibility review by the ALUC would be required for amendments to this Specific Plan resulting in a qualifying land use change subject to its jurisdiction. Compliance with FAA Part 77 Regulations (Notification of Proposed Construction) and ALUCP Critical Aeronautical Surfaces provisions is required for development within the Specific Plan area.

Additional review by either agency may be required for development within the Specific Plan area, as required by law.

Pursuant to Section 11010 of the Business and Professions Code and ALUCP Policy IP-1, disposition of land within the Specific Plan area requires real estate disclosures providing notification of the presence of all existing and planned airports within two miles of the property.

6.4. Severability

If any section, sub-section, sentence, clause, phrase, part or portion of this Specific Plan is held to be invalid or unconstitutional by a final judgment of a court of competent jurisdiction, such decision does not affect the validity of the remaining portions of this Specific Plan. This Specific Plan, and each section, sub-section, sentence, clause, phrase, part or portion thereof, would have been adopted or passed irrespective of the fact that any one or more sections, sub-sections, sentences, clauses, phrases, part, or portion is found to be invalid. If any provision of this Specific Plan is held invalid as applied to any person or circumstance, such invalidity does not affect any application of this Specific Plan that can be given effect without the invalid application.

6.5. Financing Construction and Maintenance of Public Improvements

In accordance with California Government Code Section 65451, this section provides information regarding the financing measures necessary to carry out the Specific Plan.

Implementation of the Specific Plan requires the applicants or their designee(s) of development within the Specific Plan area ensure that all on- and off-site infrastructure, facilities, and improvements necessitated by this Specific Plan are installed, constructed, and completed prior to or concurrent with demand for the same, unless otherwise provided in a Development Agreement or as otherwise required by law.

The improvements contemplated for the Specific Plan area may consist of facilities for use by the public, as well as for

exclusive use of the property owners and their tenants. Once constructed, long-term maintenance of improvements will be required, and the party responsible for maintaining those improvements may vary depending on whether they are dedicated for public use or privately owned within the Specific Plan area and other factors. The Specific Plan's implementation will be complemented by these improvements and directly serve and benefit not only the Specific Plan area, but also the greater community.

This section identifies potential financing methods that may be used individually, collectively, or in combination to fund implementation and maintenance of various improvements identified in this Specific Plan.

These financing mechanisms are important to ensure the timely financing of new improvements concurrent with Specific Plan development. The conceptual Specific Plan financing mechanisms may include but are not limited to:

- Development Impact Fees, Taxes, and Processing Fees;
- Community Facilities Districts (CFDs);
- Commercial Owners Association; and/or
- Other Private Financing

Specific Plan financing mechanisms may also include offers of dedication, fee dedications, and/or easements; state or federal block grants, exactions; and/or reimbursement agreements. In addition, the Specific Plan contemplates the possible use of emerging financing mechanisms, such as payment in lieu of tax ("PILOT") assessments or Property Assessed Clean Energy ("PACE") programs.

The financing mechanisms for implementation of this Specific Plan may be more fully set forth in any Development Agreements associated with this Specific Plan.

This summary of allowable financing mechanisms is provided as a guideline; actual implementation of specific financing mechanisms will be accomplished pursuant to established procedures, laws, and regulations applicable to such financing mechanism.

Appendix A

Conceptual Site Plan – Office Buildout

Conceptual Site Plan Office Buildout

Appendix B

Conceptual Site Plan — Life Sciences Buildout

Conceptual Site Plan – Life Sciences Buildout

Appendix C

Conceptual Site Plan — Office / Life Sciences Hybrid Buildout

Conceptual Site Plan – Office / Life Sciences Hybrid Buildout

Appendix D

Municipal Code Section 20.480.006 — Design Review Criteria

Criteria. When conducting design review, the Design Review Board, Chief Planner, Planning Commission, or City Council shall evaluate applications to ensure that they satisfy the following criteria, conform to the policies of the General Plan and any applicable specific plan, and are consistent with any other policies or guidelines the City Council may adopt for this purpose. In contrast to guidelines, which are intentionally generalized to encourage individual creativity, to obtain design review approval, projects must satisfy these criteria to the extent they apply.

1. The site subject to design review shall be graded and developed with due regard for the natural terrain, aesthetic quality, and landscaping so as not to impair the environmental quality, value, or stability of the site or the environmental quality or value of improved or unimproved property in the area.
2. A building, structure, or sign shall:
    a. Reasonably relate to its site and property in the immediate and adjacent areas;
    b. Not be of such poor quality of design as to adversely affect the environmental quality or desirability of the immediate areas or neighboring areas; and
    c. Not unreasonably interfere with the occupancy, environmental quality, or the stability and value of improved or unimproved real property or have an unreasonable detrimental effect on the health, safety, and general welfare of the community.
3. New additions to existing residential dwellings shall be architecturally compatible with the primary residential unit, with respect to style, massing, roof pitch, color and materials.
4. A site shall be developed to achieve a harmonious relationship with the area in which it is located and adjacent areas, allowing a reasonable similarity of style or originality, which does not impair the environmental quality or value of improved or unimproved property or prevent appropriate development and use of such areas or produce degeneration of properties in such areas with attendant deterioration of conditions affecting the health, safety, and general welfare of the City.
5. Parking areas shall be designed and developed to buffer surrounding land uses; compliment pedestrian-oriented development; enhance the environmental quality of the site, including minimizing stormwater run-off and the heat-island effect; and achieve a safe, efficient, and harmonious development.
6. Open space, pedestrian walks, signs, illumination, and landscaping (including irrigation) shall be designed and developed to enhance the environmental quality of the site, achieve a safe, efficient, and harmonious development, and accomplish the objectives set forth in the precise plan of design and design criteria.
7. Electrical and mechanical equipment or works and fixtures and trash storage areas shall be designed and constructed so as not to detract from the environmental quality of the site. Electrical and mechanical equipment or works and fixtures and trash storage areas shall be concealed by an appropriate architectural structure which uses colors and materials harmonious with the principal structure, unless a reasonable alternative is identified.
8. Components considered in design review shall include but not be limited to exterior design, materials, textures, colors, means of illumination, landscaping, irrigation, height, shadow patterns, parking, access, security, safety, and other usual on-site development elements.