Transportation Impact Analysis

Harbor Bay Hotels Project

Alameda, California

September 2020

Exhibit 4
Item 7-C, October 26, 2020
Planning Board Meeting

Transportation Impact Analysis

Harbor Bay Hotels Project TIA

Alameda, California

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Project No. 25448

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

Section 1
Introduction

INTRODUCTION

PROJECT DESCRIPTION

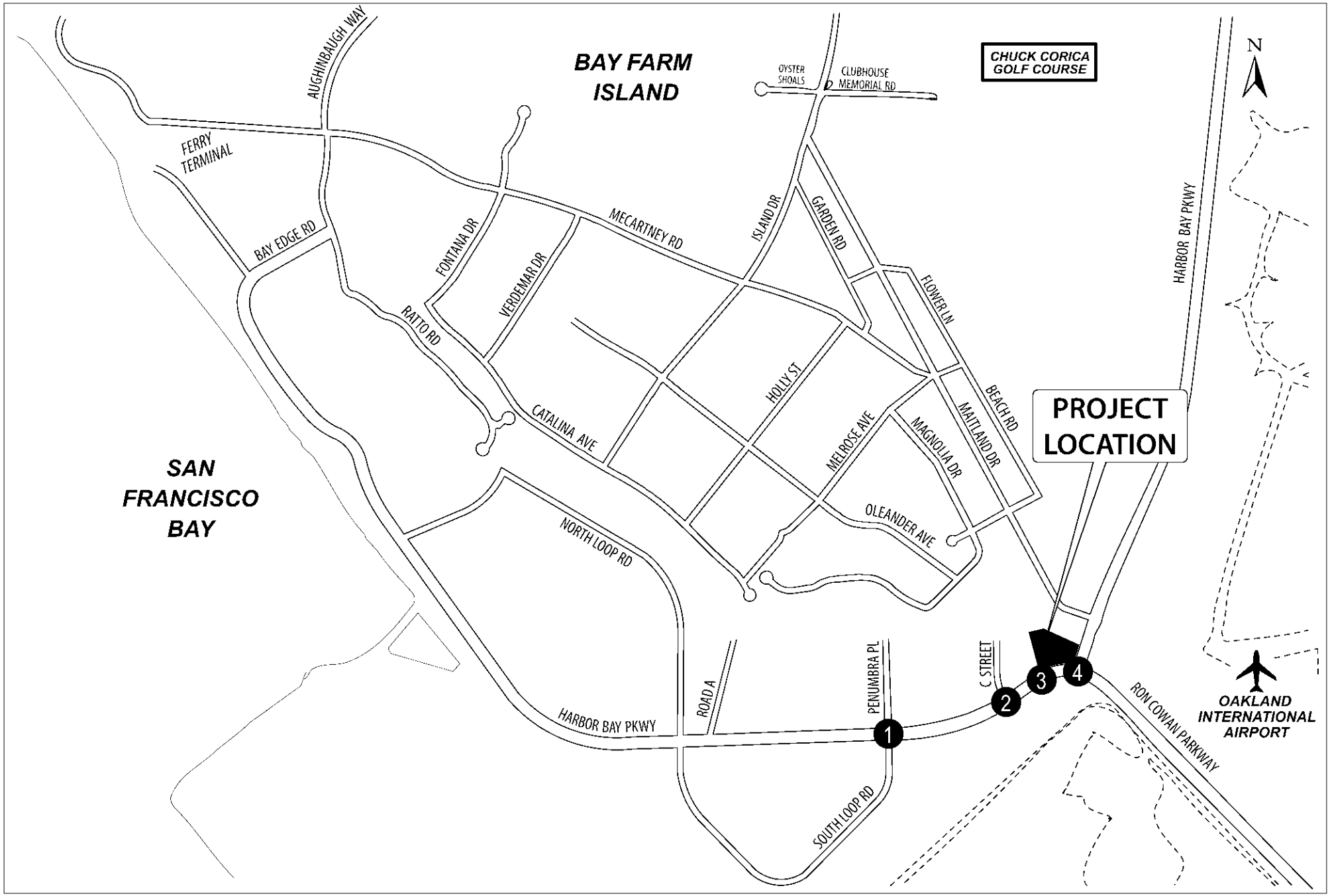
The proposed project (Project) involves construction of two hotels, a Hilton Garden Inn, and a Harbor Bay Suites. The two hotels would be housed in one five story building and would include a total of up to 236 hotel rooms. The Project would include typical business hotel amenities such a fitness room, a pool, and a food service area where complimentary breakfast and evening happy hours would be provided for hotel guests. The location of the Project is shown in Figure 1. The Project would have its main entrance via an existing driveway on the Harbor Bay Parkway located just west of its intersection with Ron Cowan Parkway. The Project is proposing to provide 185 parking spaces on-site in a surface parking lot. The site plan for the Project is presented in Figure 2. Pedestrian access to the Project would be via a sidewalk connection with Harbor Bay Parkway and a sidewalk connection to the neighboring businesses that would serve hotel guests working at these businesses as well as access to shared parking during peak hotel demand times.

SCOPE OF THE REPORT

The traffic analysis evaluated the Project's effect at four existing intersections including the driveway that would serve as the main entrance to the Project. The intersection locations are shown on Figure 1. Intersections #1, #2, and #3 are controlled with stop signs on the side street approaches and intersection #4 is controlled with a traffic signal. The study intersections are:

1. Harbor Bay Parkway and Penumbra Place/South Loop Roads
2. Harbor Bay Parkway and C Street
3. Harbor Bay Parkway and the Proposed Project Entrance
4. Harbor Bay Parkway and Ron Cowan Parkway

The traffic study evaluated the Project during AM and PM peak hours, using the Sixth Edition of Highway Capacity Manual Operations Method contained in the standard traffic analysis software Synchro 10. This methodology determines signalized intersection level of service (LOS) based on average control delay per vehicle for the overall intersection during peak-hour operating conditions. Evaluation of the non–signalized intersections was based on the HCM Sixth Edition Unsignalized Methodology which is based on the average control delay for the side street, also contained in Synchro 10.



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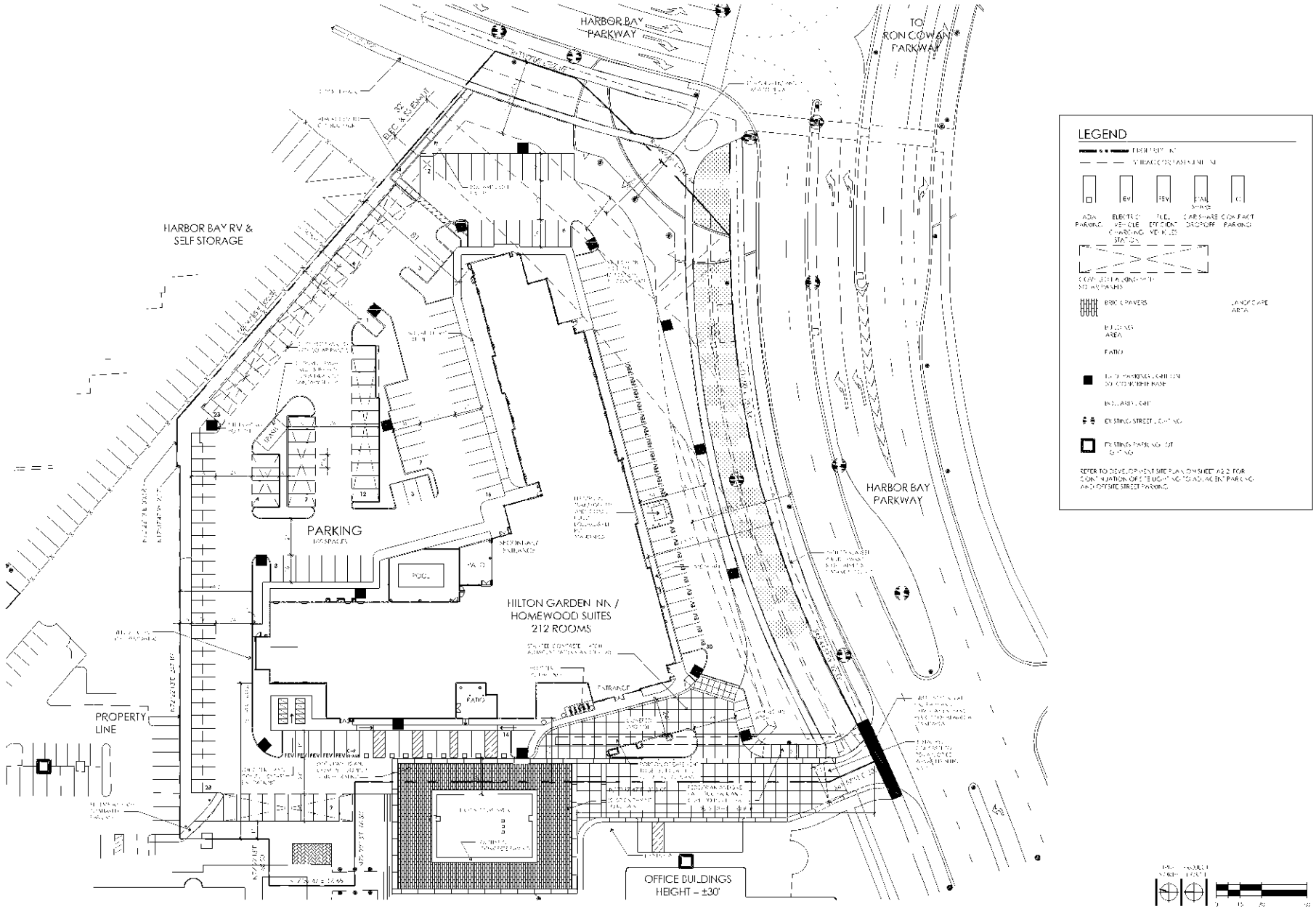
Project Location Map
City of Alameda, California

Figure
1



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Site Plan
City of Alameda, California

Figure
2

TRAFFIC ANALYSIS SCENARIOS

Six study scenarios or sets of traffic conditions have been addressed in the analysis of these intersections. As required by City standards, each of the four study intersections have been analyzed for the weekday AM peak hour (7:30 – 8:30 AM) and the weekday PM commute peak hour (5:00 to 6:00 PM). The six scenarios are as follows:

- **Existing Conditions** - This scenario evaluates the level-of-service for the intersections during the peak hour using traffic counts conducted in January 2018.
- **Existing Plus Project Conditions** - This scenario includes the existing traffic volumes with the addition of the trips generated by the project.
- **Baseline Conditions** - This scenario includes existing traffic plus traffic from reasonably foreseeable future projects that could affect the volumes at the study intersections.
- **Baseline Plus Project Conditions** - This scenario includes the baseline traffic described above with the addition of the trips generated by the project.
- **Cumulative Conditions (2040)** – For this scenario data from the Alameda County Traffic Model for the year 2040 was used to develop the future traffic volume forecasts.
- **Cumulative (2040) plus project conditions** – This scenario includes the estimates of cumulative (2040) traffic with the addition of the trips generated by the proposed project.

Section 2
Setting

SETTING

The setting for the transportation and circulation issues and the scope of the analysis are described below. This section also presents the analysis methodologies and a discussion of the existing conditions.

Traffic and transportation studies are generally required for all projects that generate over 30 peak hour trips or that add traffic to an existing substandard intersection. Based on trip generation estimates presented later, the Project would generate an increase of more than 30 peak hour trips. The primary basis of the analysis is the peak hour level of service calculations for the key intersections. The hours identified as the "peak" hours are between 7:30 AM and 8:30 AM and 5:00 PM and 6:00 PM for all the transportation facilities described. Throughout this report, these peak hours will be identified as the AM and PM peak hours, respectively.

EXISTING ROADWAY NETWORK

The City of Alameda is an island separated from the City of Oakland by the Oakland Estuary. Access to the City of Alameda is provided by a one-way couplet of under-Estuary tubes at Webster and Posey Streets (State Route 260) and draw bridges at Park Street/29th Avenue, Tilden Way/Fruitvale Avenue, and High Street. Doolittle Drive/Otis Drive (State Route 61) crosses San Leandro Channel, providing access from Bay Farm Island.

The Project site is located on the southern side of Alameda on Bay Farm Island within the Harbor Bay Business Park. Regional freeway access to the site is from Interstate 880 via Ron Cowan Parkway. The street network serving the project site is shown in Figure 1. Locally, the Project would be accessed via Harbor Bay Parkway.

- **Interstate 880 (I-880)** is a north/south eight-lane freeway (though oriented east/west in the study area) between I-80 near the Bay Bridge and San Jose. Traffic generated in Alameda uses I-880 to travel to/from eastern Alameda and Contra Costa County, San Francisco (via the Bay Bridge), the Tri-Valley (via State Route 238 and I-580), and the South Bay. The closest access to/from the project site is provided via circuitous routes to/from the 29th Avenue/Fruitvale Avenue, Hegenberger Rd., 98th Avenue interchanges.
- **Harbor Bay Parkway** is a north-south four-lane road that is located east of the Project. At the intersection with Ron Cowan Parkway, Harbor Bay Parkway curves to become an east-west roadway. It has a speed limit of 35 mph in the Project vicinity and provides the principal access to the Harbor Bay Business Park.
- **Ron Cowan Parkway** is a north-south four-lane road that serves as the principal access to the area from the south side at Oakland International Airport. It has a posted speed limit of 45 mph.
- **South Loop Road** is a two-lane road that provides access to the adjacent commercial land uses and has a speed limit of 25 mph.

BUS TRANSIT FACILITIES

Bus service in Alameda is provided by the Alameda-Contra Costa Transit District (AC Transit), which serves 13 cities and adjacent areas in Alameda and Contra Costa counties. At the current time the bus transit service in the area is provided by AC Transit and ferry service is provided by the Alameda Harbor Bay Ferry. AC Transit Routes 21 and OX serve Bay Farm Island.

Route OX is a Transbay line that runs from the Bay Farm Island Park-and-Ride to the Transbay Terminal in San Francisco. It runs westbound from 5:40 AM to 8:47 AM with about 20-minute headways and eastbound from 4:15 PM to 8:38 PM with about 20-minute headways.

Route 21 is a line that is very convenient for commuters because it provides service to the Oakland International Airport, the Ferry terminal, and the Fruitvale BART station. Route 21 runs eastbound approximately every 30 minutes between 6:27 AM and 10:08 PM and runs westbound just as often between 6:20 AM and 10:05 PM.

The Alameda Harbor Bay Ferry is a ferry that mainly transports commuters on weekdays to the Ferry Plaza in San Francisco. It stops at the Harbor Bay Terminal every hour from 6:30 AM to 8:30 AM in the mornings and 5:05 PM to 7:05 PM in the evenings. At the San Francisco Ferry Plaza, the ferry leaves once an hour from 7:00 AM to 8:00 AM in the morning and 4:35 PM to 7:35 PM in the evenings.

The Harbor Bay Business Park also operates a private shuttle service providing employees direct service to BART. The service operates on approximately ½ hour headways from about 6:00 AM to 9:00 AM and from about 3:30 to 6:30 PM.

PEDESTRIAN FACILITIES

Alameda, and especially Bay Farm Island, are very pedestrian-friendly areas. According to the Alameda Pedestrian Plan, there are approximately 260 miles of sidewalks in Alameda. Within the study area, all the streets are lined with sidewalks. The adjacent intersections of the Harbor Bay Parkway with the Ron Cowan Parkway and with South Loop Road include crosswalks. Along with the previously mentioned pedestrian facilities, there is a major trail, the Bay Trail, which lines the perimeter of Bay Farm Island and provides easy access to the Bay Farm Island Bicycle Bridge adjacent to the Bay Farm Island Bridge.

BICYCLE FACILITIES

There are several major bicycle routes designated in the Project Area vicinity, consisting of both Class I and Class II route types. Class I routes are separate bicycle paths that are also multi-use trails. One of these trails runs along Island Drive and Mecartney Road. Class II bicycle routes are separate bicycle lanes adjacent to the curb lane. In the Project Area there is a Class I bicycle path around Bay Farm Island, the Bay Trail, that runs adjacent to the Harbor Bay Parkway for much of its length.

INTERSECTION LEVEL OF SERVICE ANALYSIS METHODOLOGY

Study Intersections

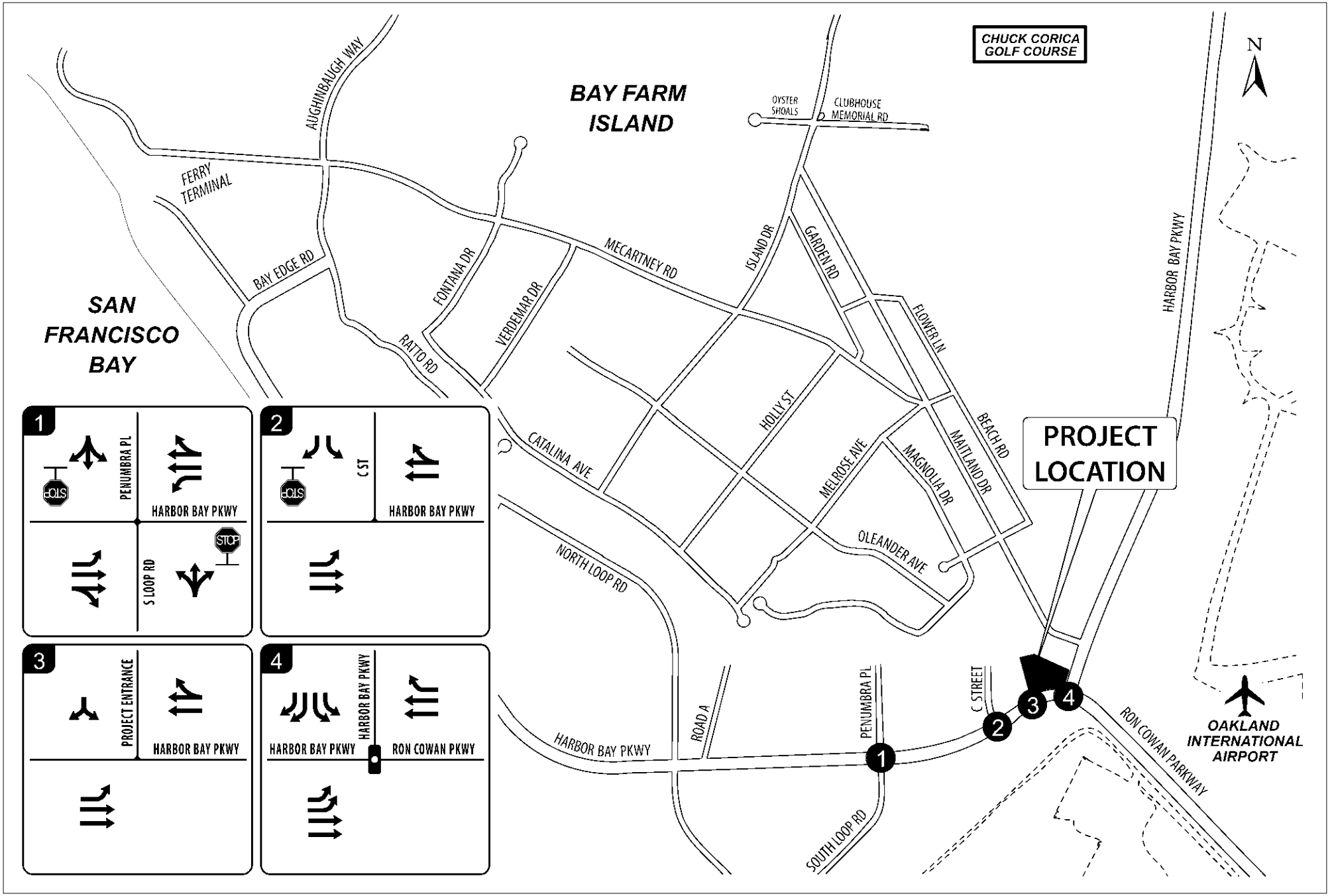
Intersections, rather than midblock roadway segments, are typically the critical capacity-controlling locations for vehicular travel on urban roadway networks and are the primary basis for determining traffic impacts. For this study, traffic operating conditions have been analyzed at four key local intersections in the Project area. Figure 3 illustrates the lane configurations of the study intersections as well as the existing traffic control devices for each.

Intersection Analysis Methodology

Existing operational conditions at the four study intersections have been evaluated with Synchro 10 software using the Sixth Edition of the Highway Capacity Manual (HCM) level of service methodology. Intersection Level of Service (LOS) is a qualitative description of the performance of an intersection based on the average delay per vehicle. The LOS rating ranges from LOS A, which indicates free flow or excellent conditions with short delays, to LOS F, which indicates congested or overcapacity conditions with extremely long delays.

For signalized intersections, the HCM methodology determines the capacity of each lane group approaching the intersection. The LOS is then based on average delay (in seconds per vehicle) for the various movements within the intersection. A combined weighted average delay and LOS are presented for the intersection. Table 1 summarizes the relationship between LOS and average delay at signalized intersections.

For unsignalized (all-way stop controlled and two-way stop controlled) intersections, the average delay and LOS operating conditions are calculated by approach (e.g., northbound) and movement (e.g., northbound left-turn) for those movements that are subject to delay. In general, the operating conditions for two-way unsignalized intersections are presented for the worst approach while all-way stop controlled intersections are based on the average control delay for the intersection. Table 2 summarizes the relationship between LOS and average vehicle delay at unsignalized intersections.



Existing Lane Configuration
City of Alameda, California

Figure
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Table 1: HCM 6 LOS Criteria for Signalized Intersections

Level of Service (LOS)	Average Delay (seconds/vehicle)	Description
A	≤ 10	Very Low Delay: This level of service occurs when progression is extremely favorable, and most vehicles arrive during a green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	> 10 and ≤ 20	Minimal Delays: This level of service generally occurs with good progression, short cycle lengths, or both. More vehicles stop than at LOS A, causing higher levels of average delay.
C	> 20 and ≤ 35	Acceptable Delay: Delay increases due to fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level of service. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.
D	> 35 and ≤ 55	Approaching Unstable Operation/Significant Delays: The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume / capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	> 55 and ≤ 80	Unstable Operation/Substantial Delays: These high delay values generally indicate poor progression, long cycle lengths, and high volume / capacity ratios. Individual cycle failures are frequent occurrences.
F	> 80	Excessive Delays: This level, considered unacceptable to most drivers, often occurs with oversaturation (that is, when arrival traffic volumes exceed the capacity of the intersection). It may also occur at high volume / capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.
Source: *Highway Capacity Manual 6th Edition* (HCM 6)		

Table 2: HCM 6 LOS Criteria for Unsignalized Intersections

Level of Service (LOS)	Average Delay (seconds/vehicle)	Description
A	≤ 10	Very Low Delay
B	> 10 and ≤ 15	Minimal Delays
C	> 15 and ≤ 25	Acceptable Delay
D	> 25 and ≤ 35	Approaching Unstable Operation and/or Significant Delays
E	> 35 and ≤ 50	Unstable Operation and/or Substantial Delays
F	> 50	Excessive Delays
Source: *Highway Capacity Manual 6th Edition* (HCM 6)		

Existing Intersection Capacity Conditions

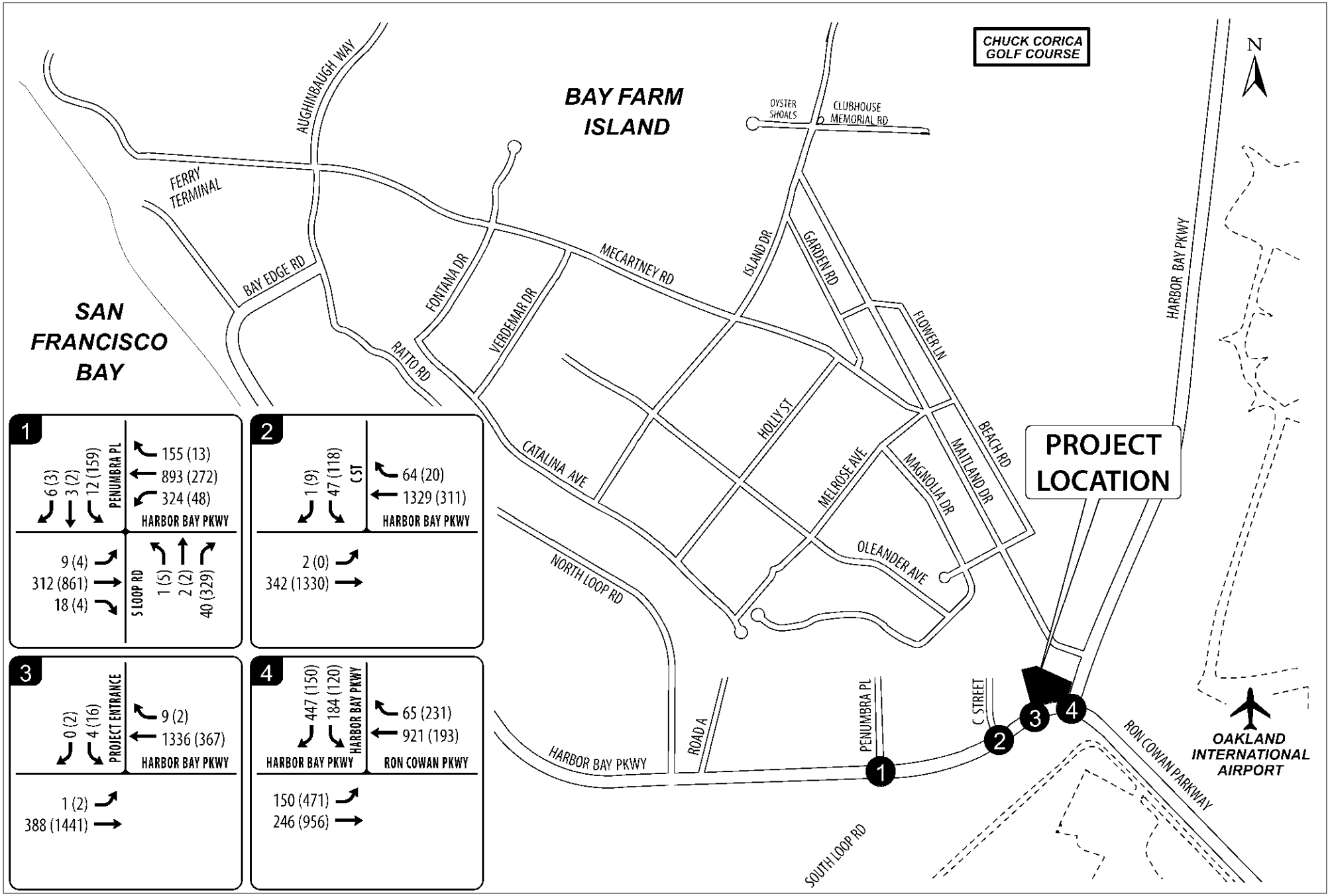
Existing traffic counts were obtained from a combination of old reports, new data collection, and spot counts[1]. The existing volumes used in the analysis at the project study intersections are shown in Figure 4. Table 3 summarizes the associated LOS computation results for the existing weekday AM and PM peak hour conditions at these intersections. As shown in Table 3, two intersections meet the City's LOS standard in both the AM and PM peak hours. However, intersections 1 and 2 are estimated to not meet the City's LOS standard during one of more of the peak hours.

Table 3: Existing Intersection Level of Service Conditions

	Intersection	Control	Peak Hour	Delay	LOS
1	Penumbra Place & Harbor Bay Parkway	Two-Way Stop	AM	70.0	F
			PM	86.3	F
2	C Street & Harbor Bay Parkway	Side Street Stop	AM	48.7	E
			PM	30.1	D
3	Project Entrance & Harbor Bay Parkway	Side Street Stop	AM	32.6	D
			PM	19.7	C
4	Ron Cowan Parkway & Harbor Bay Parkway	Signalized	AM	13.5	B
			PM	8.3	A

Source: Kittelson & Associates, Inc., 2020
Note: Intersection LOS is based on delay which is presented in terms of seconds per vehicle
Grey shading indicates intersection operates below the City's LOS D standard.

[1] South Loop Road and Harbor Bay Parkway intersection is based on a count from February 2018. The intersection of Ron Cowan Parkway and Harbor Bay Parkway is based on the Harbor Bay Athletic Club TIA with a 4% growth factor to account for change in volume since the study was completed in 2014. The remaining two intersections at C Street and the Project Driveway were based on spot counts performed by Abrams Associates. Kittelson reviewed these counts and the intersection balancing and concluded the counts appeared reasonable. Traffic volume data provided to Kittelson by Abrams Associates is included in Appendix 1.



Existing AM(PM) Peak Hour Traffic Volumes
City of Alameda, California

Figure
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Section 3
Regulatory Framework

REGULATORY FRAMEWORK

RESPONSIBLE AGENCIES

The management of transportation systems in the study area is the responsibility of several different agencies. The California Department of Transportation (Caltrans) is responsible for freeways and State Routes in the area including SR 61. The Alameda County Congestion Management Agency is responsible for verifying compliance with the County's growth management policies and maintains the County's traffic model. The City of Alameda is responsible for ensuring adequate operations after project implementation, particularly on roadways within the City limits. These agencies have statutory authority and are Responsible Agencies under CEQA. Further, since the City of Alameda would have direct entitlement authority for the proposed project, it also serves as the Lead Agency for the project.

SIGNIFICANCE CRITERIA

According to CEQA guidelines, a project would have a significant impact if it would:

- Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.
- Conflict or be inconsistent with CEQA Guideline section 15064.3, subdivision (b).
- Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
- Result in inadequate emergency access.

The City of Alameda also requires a local transportation analysis outside of CEQA. According to the City of Alameda[2], a project would cause operational deficiencies if it would:

- Signalized Intersections: Project-related operational deficiencies on signalized intersections would be considered adverse if project-related traffic would cause the LOS rating to deteriorate from LOS D or better to LOS E or F, or from LOS E to LOS F. In addition, a project would have an adverse effect at intersections that operate at LOS E or F under existing conditions, depending upon the magnitude of the project's contribution to the worsening of delay. In Alameda, it is considered an adverse effect if a project would increase traffic volumes by more than 3 percent at a signalized intersection operating at LOS E or F. In addition, a project would have an adverse effect if it would cause major traffic hazards or would contribute considerably to the cumulative traffic increases that would cause the deterioration in levels of service to unacceptable levels. For signalized intersections, an adverse effect would occur if project-generated traffic would cause

[2] Guide for Preparation of Traffic Studies and Reports, City of Alameda Public Works Department, Alameda, CA, November, 28, 2005.

intersection operations to deteriorate from an acceptable level, which is defined as LOS D or better.

- Unsignalized Intersections: Project-related operational adverse effects on unsignalized intersections are considered significant if project-generated traffic would cause the worst-case movement (or average of all movements for all-way stop-controlled intersections and roundabouts) to deteriorate from an acceptable level of service. In addition, a project would be considered to have an adverse effect if it would increase traffic volumes by more than 3 percent at an unsignalized intersection operating at LOS E or F.
- Parking: Project-related parking would be considered to have an adverse effect on parking if a project would have inadequate parking capacity under City parking standards.
- Transit: A project would have an adverse effect on transit if it would cause a substantial increase in transit demand that could not be accommodated by adjacent transit capacity.
- Pedestrian System: A project would have an adverse effect if it would result in substantial overcrowding on sidewalks, create potentially hazardous conditions for pedestrians, or otherwise interfere with pedestrian accessibility to the site and adjoining areas.
- Bicycle System: A project would have an adverse effect on the environment if it would create potentially hazardous conditions for bicyclists or otherwise substantially interfere with bicycle accessibility to the site and adjoining areas.

The City of Alameda Transportation Commission recommends additional criteria in a document entitled Thresholds of Significance and Procedures for Ranking Modes Where Multiple Priorities are Identified[3]. According to this document, a project would cause an adverse transportation effect if the project has one or more of the following effects:

- Transit – If travel speed degrades by 10 percent or more along a street segment. A segment would be defined as the impacted bus stop location, plus the two previous stops and the two subsequent stops. A segment that crosses a City boundary shall also include five bus stops, but the last stop shall be the first bus stop outside of the City of Alameda (Transit LOS for an arterial segment would be calculated using the Highway Capacity Manual's methodology for Urban Street (arterial) LOS).
- Automobile (intersections) – Causes an intersection to degrade below LOS D. If an intersection were already at LOS E or worse, it would be considered an adverse effect if there is a 3 percent or greater increase in the traffic volume. (Automobile LOS at intersections is calculated using the Highway Capacity Manual's methodology for determining the average vehicle delay at an intersection.)
- Automobile (arterial segments) – Causes an arterial segment to degrade below LOS D. If an arterial were already at LOS E or worse, it would be considered an adverse effect if the Average Travel Speed of a segment decreases by 10 percent or more. (Automobile LOS for an arterial

[3] Threshold of Significance and Procedures for Ranking Modes Where Multiple Priorities are Identified, Attachment I, Item 9-C, Planning Board Meeting, 10/11/10.

segment would be calculated using the Highway Capacity Manual's methodology for Urban Street (arterial) LOS).

- Bicycle – Causes the Bicycle segment LOS to degrade below LOS B. If a street segment were already below LOS B, it would be considered an adverse effect if the LOS score increases by 10 percent or more in value. If a segment has an existing adjacent Class I facility and has not been recommended for a future bicycle lane, the degradation of the Bicycle LOS to E would not be considered an adverse effect. (As per the City's approved thresholds of significance, the Florida Department of Transportation methodology for street segments will be used for the bicycle LOS analysis).
- Pedestrian – Causes the Pedestrian LOS to degrade below LOS B at a signalized intersection. If the intersection were already below LOS B, it would be considered an adverse effect if the delay for a crosswalk increases by 1- percent. (Pedestrian LOS would be determined using the Highway Capacity Manual methodology for determining the average delay for pedestrians at a signalized intersection.)

Section 4
Vehicular Traffic Impact Analysis

VEHICULAR TRAFFIC IMPACT ANALYSIS

PROJECT TRIP GENERATION

A "trip" is defined in ITE's Trip Generation publication as a single or one-directional vehicular movement with either the origin or destination at the project site. As a result, a trip can be either "to" or "from" the site. Consequently, a single visit to a site is counted as two trips (i.e., one to and one from the site). For purposes of determining the reasonable worst-case impacts of traffic on the surrounding street network from a proposed project in this area, the trips generated by a proposed development are typically estimated between the hours of 7:30 to 8:30 a.m. and 5:00 to 6:00 p.m. While the project itself may generate more traffic during some other times of the day, such as around noon, the peak of "adjacent street traffic" represents the time period when the uses generally contribute to the greatest amount of congestion due to commute traffic.

As noted previously, the Project involves construction of two hotels (Hilton Garden Inn and the Harbor Bay Suites) that would be housed in a single five story building and would include up to 236 hotel rooms. There is no restaurant planned as part of the project but there would be some typical business hotel amenities such as a breakfast area, a fitness room, and a pool. Trip generation for development projects, such as the proposed project, are typically calculated based on rates contained in the ITE publication, Trip Generation 10th Edition. Trip Generation is a standard reference used by jurisdictions throughout the country for the estimation of potential vehicular trips from proposed new developments.

For this project, the ITE trip generation category of "Business Hotel" was used (ITE Land Use Code 312). A summary of the Project's trip generation rates and the resulting trips are presented in Table 4. Based on the trip generation forecasts the project would generate about 93 new vehicle trips during the AM peak hour and 76 trips during the PM peak hour. The trips generated by this proposed development are estimated for the peak commute hours which represent the peak hour of adjacent street traffic.

Table 4: Project Trip Generation

				AM Peak Hour			PM Peak Hour		
Land Use	ITE Code	Size	ADT	In	Out	Total	In	Out	Total
ITE Business Hotel Rates - Trips per Room	312		4.02	42%	58%	0.39	55%	45%	0.32
Project Trip Generation		236	949	39	54	93	42	34	76
Source: Trip Generation, 10th Edition, Institute of Transportation Engineers, Washington D.C., 2018.									

TRIP DISTRIBUTION

Trip distribution is a process that determines what proportion of vehicles would be expected to travel between a project site and various destinations outside the project study area. Trip distribution assumptions for the Project were developed by Abrams Associates based on previous traffic impact studies conducted in the study area and consultation with City transportation staff. For this project, approximately 43 percent of project traffic would be expected to travel to and from the Ron Cowan Parkway, 34 percent via Harbor Bay Parkway to the east, and 23 percent via Harbor Bay Parkway to the west. Figure 5 shows the resulting project trips added at each of the study intersections.

EXISTING PLUS PROJECT INTERSECTION OPERATIONS

Figure 6 shows the existing plus project AM and PM peak hour traffic volumes. Using this data, the intersection delay was calculated for each intersection. Table 5 summarizes the Level of Service (LOS) computation results for the existing plus project weekday AM and PM peak hour conditions (the corresponding LOS analysis calculation sheets are presented in Appendix 2).

As shown in Table 5, the intersections of Penumbra Place and C Street with Harbor Bay Parkway operate below the LOS D standard with and without the project in at least one of the peak hours. However, the Project does not increase intersection volume at these two locations by more than three percent[4]. Therefore, it is not considered to have an adverse effect on these two locations under existing plus project conditions.

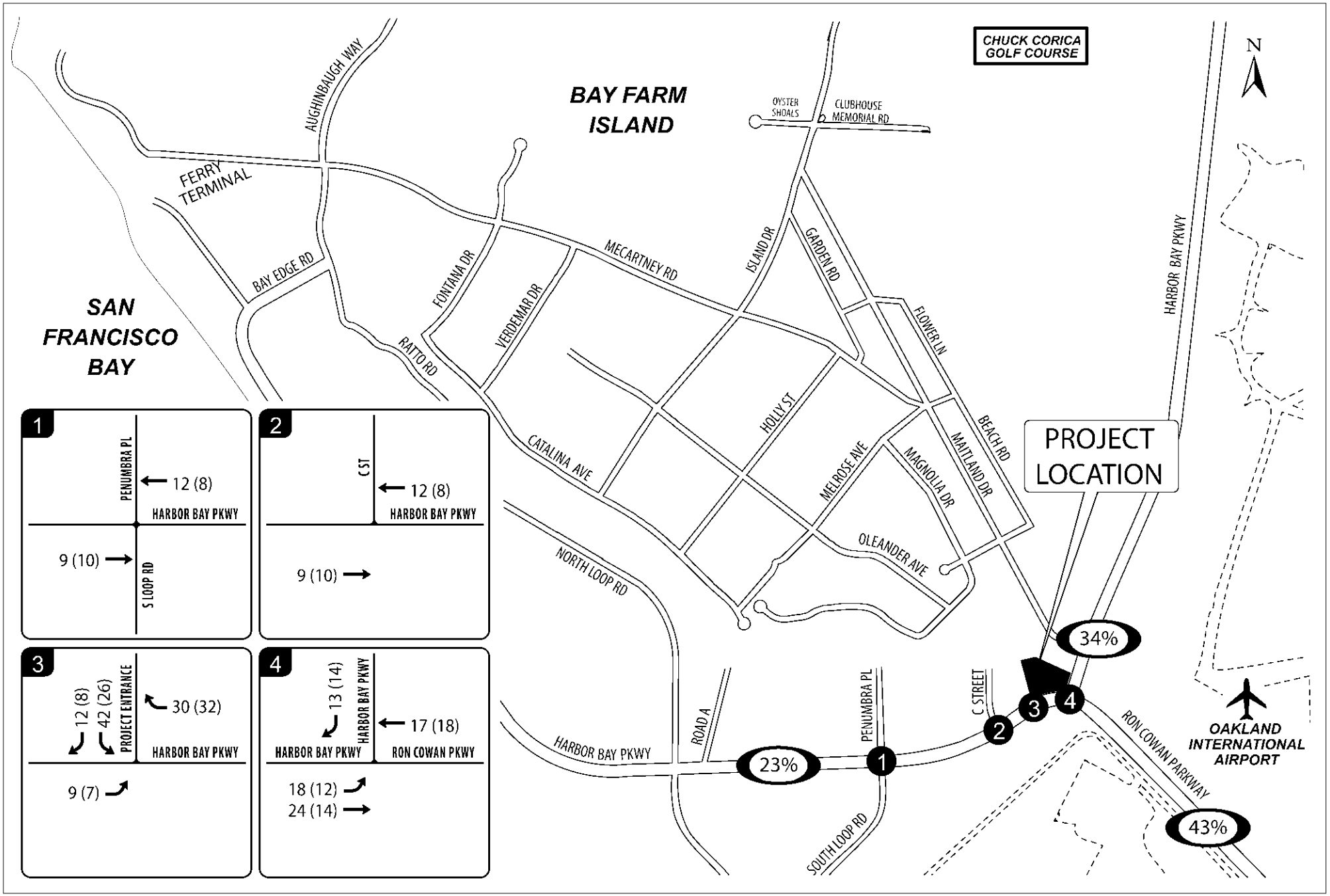
The Project Entrance and Harbor Bay Parkway intersection is adversely affected by the project since it causes the LOS to change from LOS D to LOS E. However, this LOS is related only to vehicles exiting the project and there is minimal effect on vehicles traveling on Harbor Bay Parkway. Additionally, the 95th percentile queue is two vehicles as will be discussed later in this report and the side street volumes are less than 100 which is not high enough to qualify for a signal based on the Caltrans peak hour signal warrant. Given there is minimal queueing, the delay only affects traffic exiting the project, and there is insufficient volume to justify the installation of a signal, no intersection modifications are recommended.

[4] Table of percent increase in total entering volume before and after the Project is included in the appendix.

Table 5: Existing Plus Project Intersection Level of Service Conditions

	Intersection	Control	Peak Hour	Existing		Existing Plus Project	
				Delay	LOS	Delay	LOS
1	Penumbra Place & Harbor Bay Parkway	Two-Way Stop	AM	70.0	F	71.2	F
			PM	86.3	F	89.7	F
2	C Street & Harbor Bay Parkway	Side Street Stop	AM	48.7	E	49.8	E
			PM	30.1	D	30.6	D
3	Project Entrance & Harbor Bay Parkway	Side Street Stop	AM	32.6	D	48.7	E
			PM	19.7	C	22.2	C
4	Ron Cowan Parkway & Harbor Bay Parkway	Signalized	AM	13.5	B	23.4	C
			PM	8.3	A	11.1	B

Source: Kittelson & Associates, Inc., 2020
Note: Intersection LOS is based on delay which is presented in terms of seconds per vehicle
Grey highlight indicates intersection operates below the LOS D standard



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Project Distribution & AM(PM) Peak Hour Trips
City of Alameda, California

Figure
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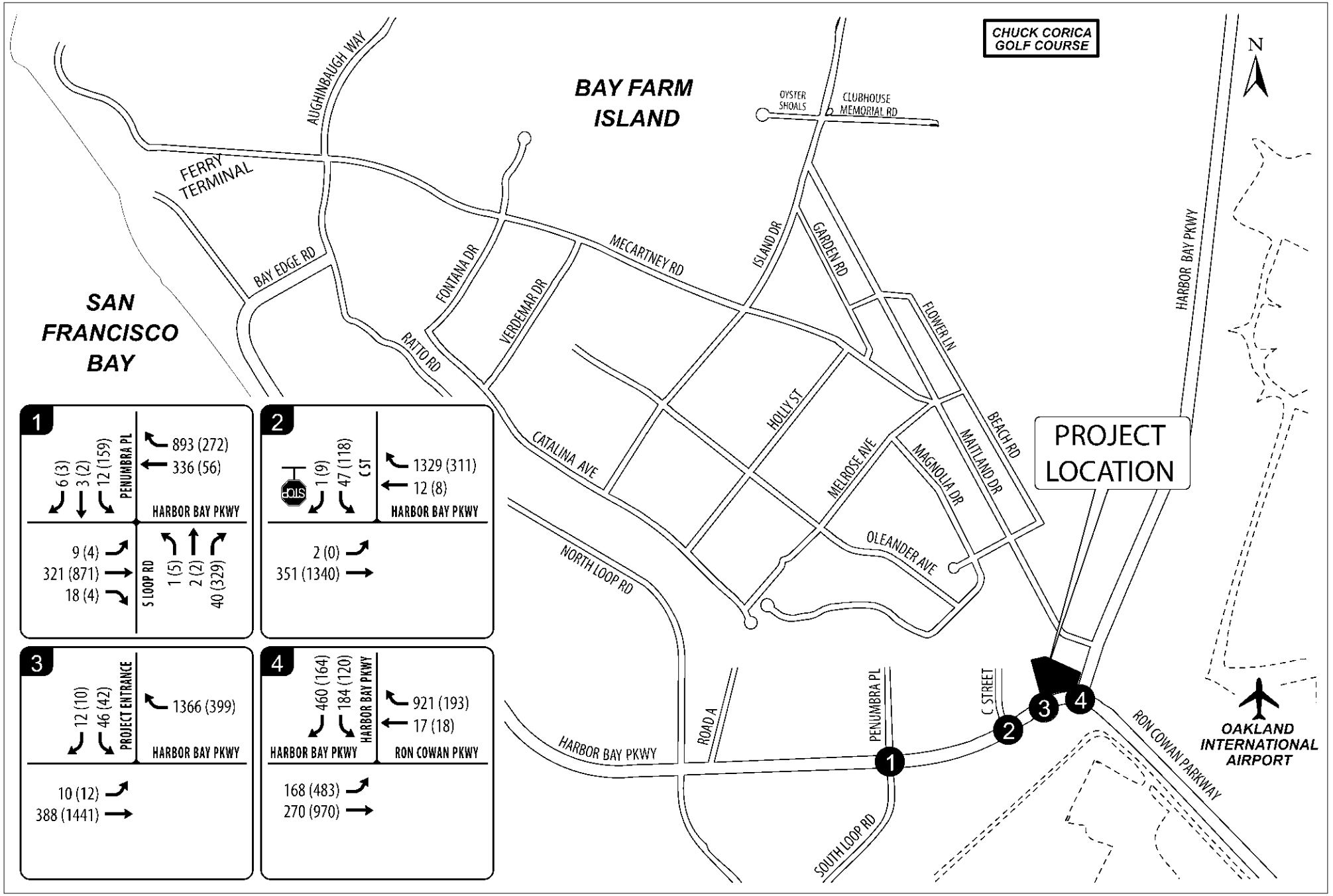

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Existing Plus Project AM(PM) Peak Hour Traffic Volumes
City of Alameda, California

Figure
6

BASELINE TRAFFIC VOLUMES

The baseline scenario evaluates the background level-of-service at the studied intersections for the existing conditions with the addition of traffic from reasonably foreseeable projects in the area. This scenario includes traffic from the development of the approved North Loop Center 3 project, which includes a total of 187,000 square feet of office space which has not yet been constructed and occupied. This scenario also includes background traffic growth of 1 percent per year to the year 2020. In addition to the incorporation of approved project vehicle trips, the baseline scenario also includes a change to the intersection control at the intersection of Harbor Bay Parkway and South Loop Road. This intersection is currently under construction and is anticipated to be operating when the Project is complete. Figure 7 shows the baseline AM and PM peak hour traffic volumes while Figure 8 shows the same information for the plus project condition.

BASELINE INTERSECTION OPERATIONS

The projected intersection level of service computations for baseline conditions at the project study intersections (during the weekday AM and PM peak hours) with and without the proposed project are shown in Table 6. Both the unsignalized intersections (#2 and #3) would exceed the City's LOS standards during the AM peak hour while the intersection of C Street and Harbor Bay Parkway also exceeds the standard in the PM peak hour. The Project is not considered to have an adverse effect on the intersection of C Street and Harbor Bay Parkway because it does not cause the total entering intersection volume to increase by more than 3% as shown in the appendix.

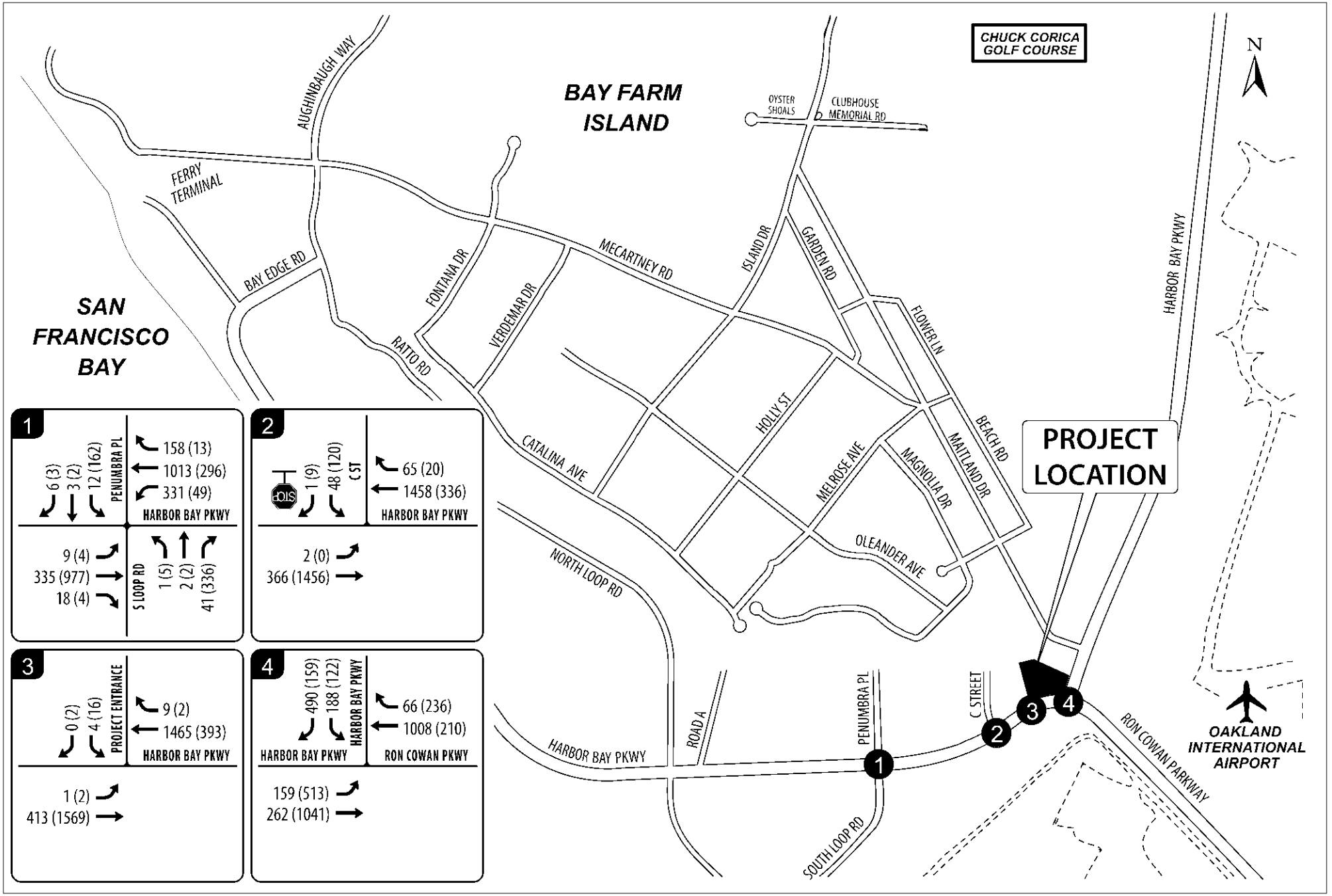
The Project Driveway and Harbor Bay Parkway intersection is considered an adverse effect because the Project increases the volume entering the intersection by more than 3% (4.9% in the AM and 3.5% in the PM). Similar to existing conditions, the Project does not add enough traffic that the intersection would meet the Caltrans peak hour signal warrant and the 9th percentile queue for vehicles exiting the Project driveway is three vehicles or less. Since the intersection would not meet the peak hour signal warrant and the queues are minimal, intersection improvements are not recommended at this location.

The detailed LOS calculations for each study intersection are presented in Appendix 3. Appendix 8 contains peak hour signal warrant worksheets for the unsignalized intersections under baseline + project conditions.

Table 6: Baseline Intersection Level of Service Conditions

	Intersection	Control	Peak Hour	Existing		Existing Plus Project	
				Delay	LOS	Delay	LOS
1	Penumbra Place & Harbor Bay Parkway	Signalized	AM	10.1	B	10.1	B
			PM	18.5	B	18.7	B
2	C Street & Harbor Bay Parkway	Side Street Stop	AM	65.7	F	66.7	F
			PM	36.3	E	36.8	E
3	Project Entrance & Harbor Bay Parkway	Side Street Stop	AM	38.2	E	64.2	F
			PM	21.3	C	24.2	C
4	Ron Cowan Parkway & Harbor Bay Parkway	Signalized	AM	24.6	C	25.1	C
			PM	11.1	B	11.3	B

Source: Kittelson & Associates, Inc., 2020
Note: Intersection LOS is based on delay which is presented in terms of seconds per vehicle
Grey highlight indicates intersection operates below the LOS D standard



Baseline AM(PM) Peak Hour Traffic Volumes
City of Alameda, California

Figure
7

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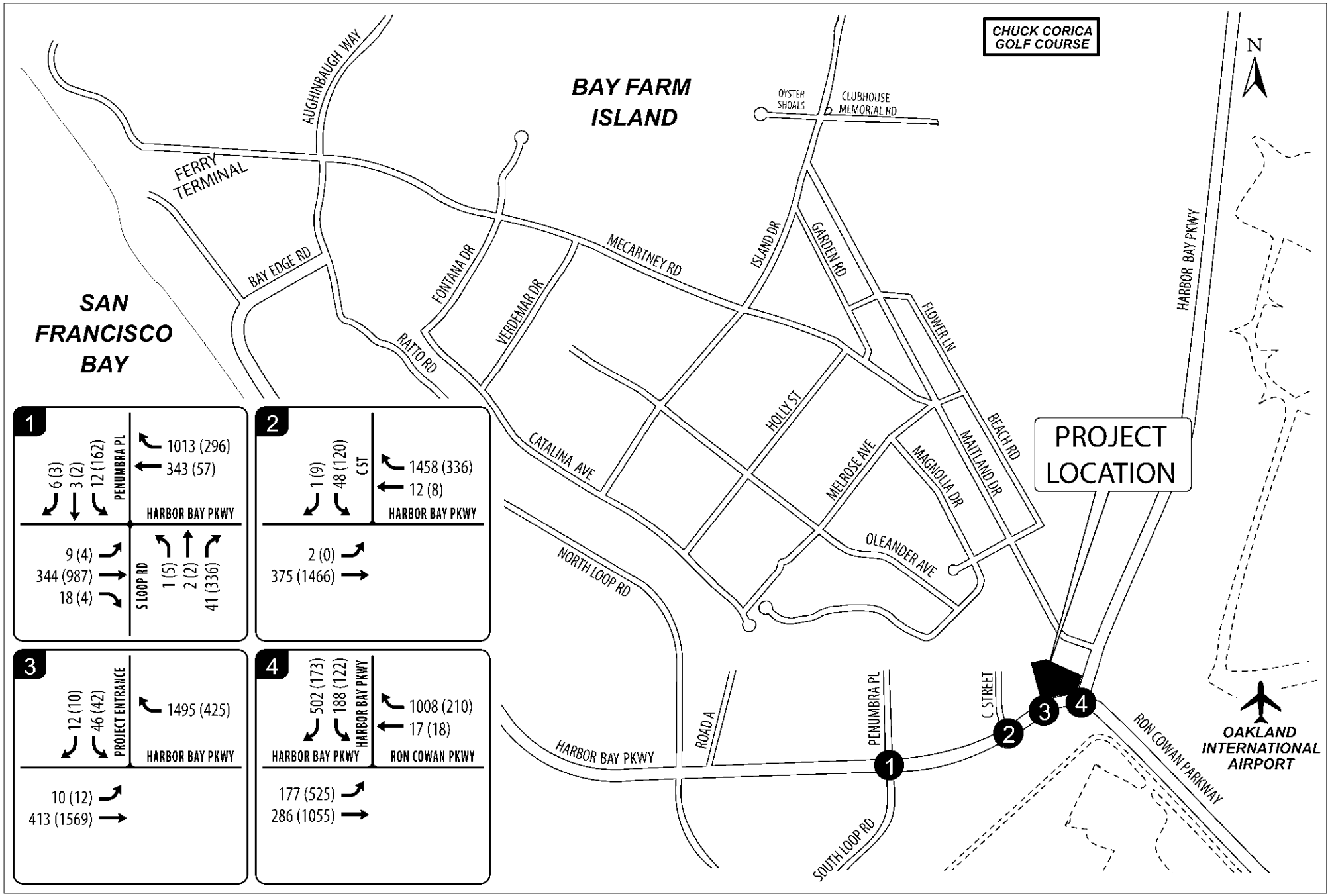

Baseline Plus Project AM(PM) Peak Hour Traffic Volumes
City of Alameda, California

Figure
8

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CUMULATIVE (2040) TRAFFIC VOLUMES

The 2040 cumulative traffic volumes were based on the latest travel demand model from the Alameda County Transportation Commission. The only planned transportation network improvements assumed for the area was the installation of the traffic signal at South Loop Road/Penumbra Place which was also assumed in the baseline analysis. Figure 9 shows the cumulative AM and PM peak hour traffic volumes while Figure 10 shows the same for cumulative plus project conditions.

CUMULATIVE (2040) INTERSECTION OPERATIONS

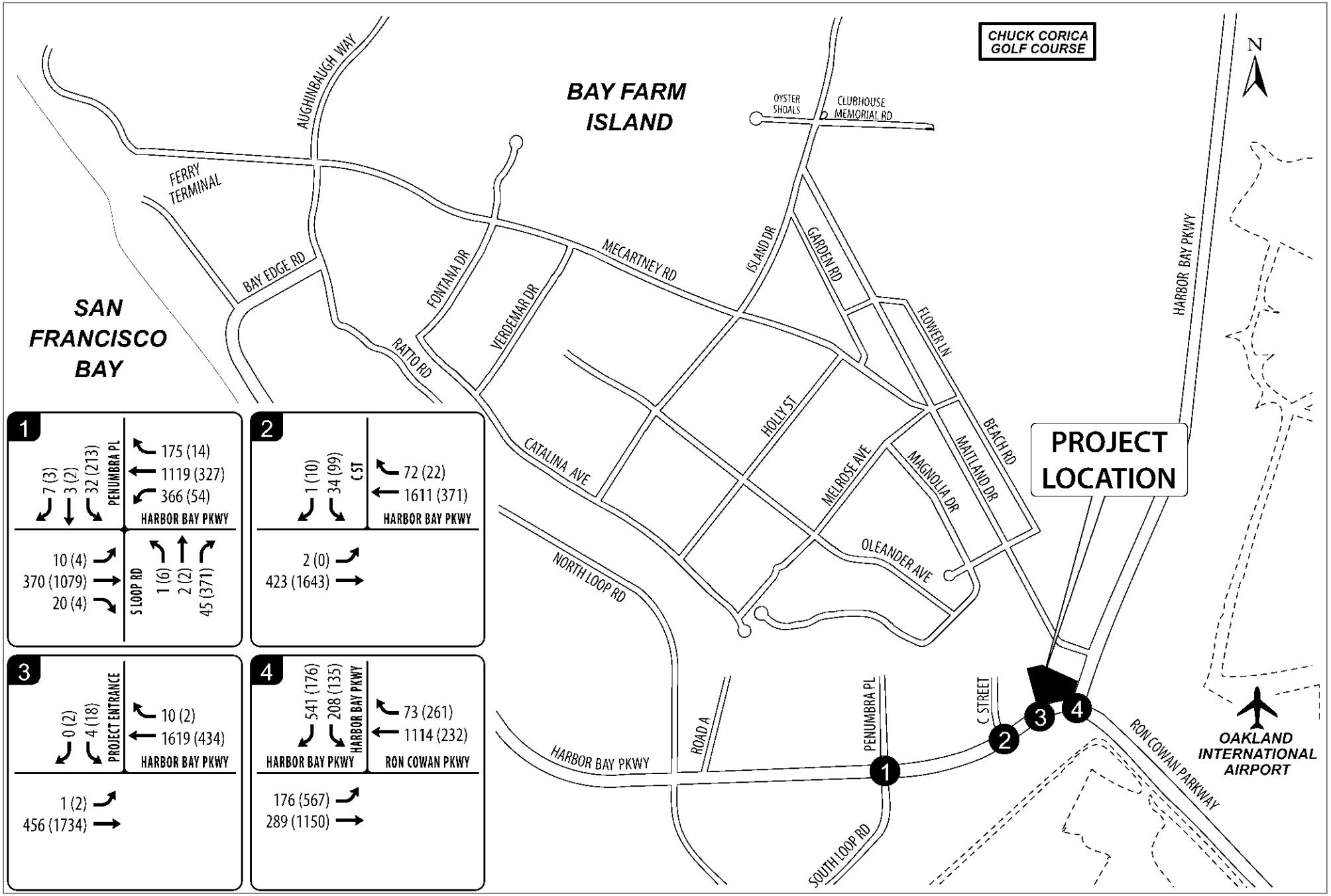
The projected intersection level of service computations for cumulative (Year 2040) and cumulative plus project conditions at the project study intersections (during the weekday AM and PM peak hours) are shown in Table 7. Similar to baseline conditions, the two unsignalized intersections (#2 and #3) operate below the LOS standard for the City during the AM peak hour while the C Street and Harbor Bay Parkway intersection (#2) also operates below the standard in the PM peak hour. The Project is not considered to have an adverse effect on the intersection of C Street and Harbor Bay Parkway because it does not increase the volume using the intersection by more than 3% as documented in Appendix 9.

The Project Driveway and Harbor Bay Parkway intersection is considered adversely affected by the Project since the volume increases by more than 3% (4.4% in the AM peak hour and 3.1% in the PM peak hour.) However, the volume exiting this driveway is not high enough to trigger the Caltrans peak hour warrant and the queues are four vehicles or less as shown in the queue section of this report. Since the intersection does not meet the signal warrant, the delay is only for vehicles exiting the project, and the vehicles queues are minimal, no intersection improvements are recommended. Appendix 4 contains the detail LOS worksheets for cumulative conditions.

Table 7: Cumulative Intersection Level of Service Conditions

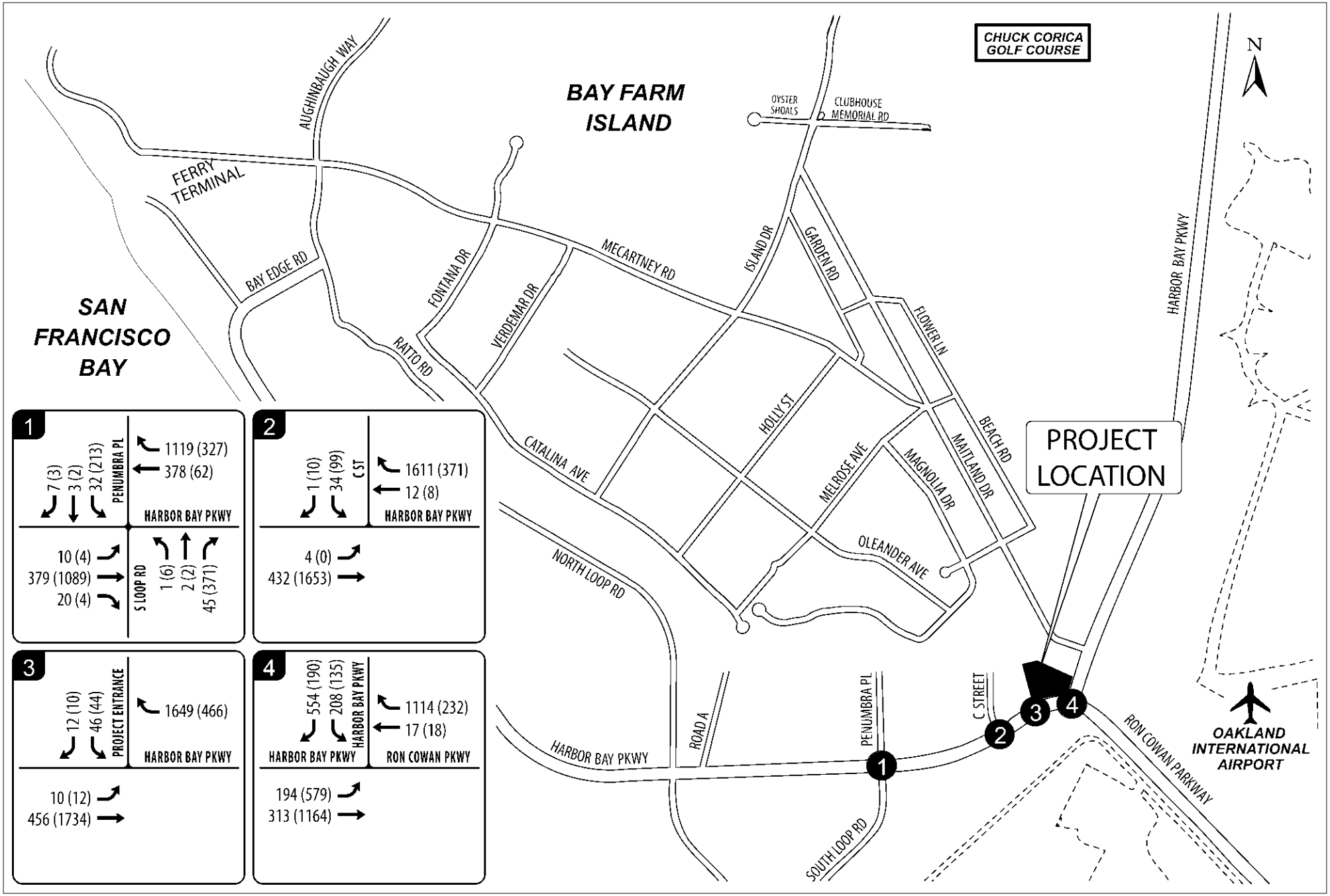
	Intersection	Control	Peak Hour	Existing		Existing Plus Project	
				Delay	LOS	Delay	LOS
1	Penumbra Place & Harbor Bay Parkway	Two-Way Stop	AM	11.3	B	11.5	B
			PM	27.8	C	28.4	C
2	C Street & Harbor Bay Parkway	Side Street Stop	AM	72.7	F	75.1	F
			PM	37.8	E	38.5	E
3	Project Entrance & Harbor Bay Parkway	Side Street Stop	AM	46.6	E	93.6	F
			PM	24.1	C	28.1	D
4	Ron Cowan Parkway & Harbor Bay Parkway	Signalized	AM	27.3	C	28.0	C
			PM	11.6	B	11.8	B

Source: Kittelson & Associates, Inc., 2020
Note: Intersection LOS is based on delay which is presented in terms of seconds per vehicle
Grey highlight indicates intersection operates below the LOS D standard



Cumulative AM(PM) Peak Hour Traffic Volumes
City of Alameda, California

Figure
9



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Cumulative Plus Project AM(PM) Peak Hour Traffic Volumes
City of Alameda, California

Figure **10**

ARTERIAL OPERATIONS ANALYSIS

In addition to the intersection operations analysis, an arterial roadway operations analysis was completed for Harbor Bay Parkway and Ron Cowan Parkway under Cumulative Plus Project conditions. Kittelson used the peak hour service volume table for arterial roadways (Exhibit 46) from the Planning and Preliminary Engineering Guide to the Highway Capacity Manual (HCM) which is incorporated into Volume 4 of the HCM 6th Edition. Based on a speed limit of 35 mph, signal spacing of 1,320 feet, and a cycle length of 120 seconds, the LOS for each direction on an arterial can be estimated. Table 8 and Table 9 show the resulting peak hour LOS for each direction during the AM and PM peak hours under cumulative plus project conditions, respectively. As shown, all directions are anticipated to operate at LOS C or better.

Table 8: AM Peak Hour Arterial Operations

	Harbor Bay Parkway		Ron Cowan Parkway	
	EB	WB	EB	WB
Veh/hr	507	1,685	521	1,204
# of Lanes	2	2	2	2
Veh/hr/ln	254	843	261	602
LOS	B	C	B	B

Source: Kittelson & Associates, Inc., 2020
Note: LOS based on Exhibit 46 from Planning and Preliminary Engineering Guide to the HCM

Table 9: PM Peak Hour Arterial Operations

	Harbor Bay Parkway		Ron Cowan Parkway	
	EB	WB	EB	WB
Veh/hr	1,741	437	1,298	509
# of Lanes	2	2	2	2
Veh/hr/ln	871	219	649	255
LOS	C	B	B	B

Source: Kittelson & Associates, Inc., 2020
Note: LOS based on Exhibit 46 from Planning and Preliminary Engineering Guide to the HCM

ANALYSIS OF COLLISION HISTORY

Between January 1, 2015 and December 31, 2019, there were a total of 23 collisions recorded via police report in the study area. About 61% of these collisions were property damage only, 4% resulted in complaints of pain, and 35% resulted in visible but not severe injury. Speeding was cited most often as the cause of a collision accounting for about 26% of these collisions. Most collisions (43%) involved a

collision of one vehicle with an object (parked car, tree, etc.) while 35% were vehicle to vehicle collisions and 22% were vehicle/bicycle collisions.

While the vehicle to vehicle collision types are not unusual for how Harbor Bay Parkway is constructed in the area, there do appear to be a high number of fixed object collisions and bicycle collisions as a proportion of the total recorded during the 5-year period. The Project is not anticipated to result in additional collisions since it would be required to design the access point to the latest standards for accommodating pedestrians and bicyclists. The Project driveway would also be required to provide adequate sight distance to reduce the potential for vehicle to vehicle collisions.

Appendix 6 contains a summary of the collision data along with the detailed collision data provided by the California Highway Patrol.

INTERNAL CIRCULATION AND ACCESS

The Project's site plan (Figure 2) was reviewed to determine potential recommendations for improving the site plan to better meet the circulation needs of pedestrians, bicyclists, vehicles, and trucks. Based on this review, the following improvements are recommended:

- The right-of-way in front of the project has both a shared use path and a sidewalk. The sidewalk is located almost 50 feet from the roadway which may make it difficult for turning drivers to see pedestrians using the sidewalk and there is no crosswalk treatment proposed like there is for the multiuse path which is using green striping per City standards.
    - Recommendation: The Project should install crosswalk markings across the driveway for the sidewalk along Harbor Bay Parkway to notify vehicles entering and exiting the driveway of the pedestrian crossing. A stop bar should also be installed in the driveway to indicate where vehicles should stop prior to crossing the multi-use path.
- The site plans indicate a raised sidewalk is proposed connecting the multiuse pathway with the Project entrance. We agree with raising the sidewalk to better protect pedestrians entering the site compared to the existing at-grade stamped concrete. However, the site plan does not show curb ramps for the multiuse pathway, sidewalk running along Harbor Bay Parkway, or the crosswalk near the covered drop-off area.
    - Recommendation: Install curb ramps for the multiuse pathway and sidewalk along Harbor Bay Parkway where they cross the Project driveway. A second curb ramp should also be installed for the crosswalk near the covered drop-off area.
- Many of the sidewalks surrounding the building appear to be about 4 feet in width. While this is normally sufficient to accommodate ADA requirements, the overall width may be impacted by parked vehicles overhanging the sidewalk.
    - Recommendation: Wheel stops should be required for all parking stalls adjacent to the building to prevent the front of a vehicle from overhanging the sidewalks restricting the sidewalk width to less than 4 feet.

- The long-term bicycle parkin area located in the northwest corner of the building does not have a curb ramp to allow access to the main drive aisles for bicyclists. The nearest access point is the ADA parking area 50 feet to the south.
    - Recommendation: The long-term bicycle parking area should be provided with a curb ramp and sidewalk that provides unobstructed access to the Project drive aisles.
- There is a sidewalk in the northwest corner of the property connecting the Project to the nearby office complex. This sidewalk can also be used for pedestrian paths of travel for shared parking. However, a complete sidewalk connection from the main entrance is not included.
    - Recommendation: A sidewalk and crosswalk should be constructed to connect the sidewalk near the bicycle parking area with the sidewalk into the neighboring vehicle parking area. This sidewalk connection could also serve as the bicyclists' connection into the long-term bicycle parking area from the drive aisles.

The site plan was also analyzed to determine if the site provides adequate circulation to meet the needs of emergency vehicles, garbage trucks, and delivery trucks. A standard fire truck was assumed to be representative of the largest vehicle that would need to fully circulate the site. The AutoCAD truck turning template for a fire truck is included in Appendix 5. As shown in these exhibits, the site plan does not pose a challenge for truck circulation.

QUEUE ANALYSIS

A queue analysis was performed for the turn lanes and side street access points for the four study intersections in both the AM and PM peak hours. The 95th percentile queue lengths in vehicles are shown in Table 10 and Table 11 for the AM and PM peak hours, respectively. The intersection of Penumbra Place and Harbor Bay Parkway is anticipated to have a NB queue exceeding the available storage in the PM peak hour under existing conditions, but the Project is not anticipated to increase this queue length. The westbound left turn lane is also anticipated to have a queue greater than the available storage once the signal is installed at this location for the baseline and cumulative conditions but the Project is not anticipated to increase the queue length in either of these scenarios.

The only other intersection where the 95th percentile queue is anticipated to exceed the available storage is the eastbound left turn at Ron Cowan Parkway and Harbor Bay Parkway. The queue for this movement is anticipated to exceed the storage under all scenarios. The Project increases the queue length by about 13 feet which is sufficient to cause the queue to round up to the next whole vehicle in both existing and cumulative conditions. This increase is not anticipated to cause a significant safety hazard since the queue already exceeds the available storage.

The largest queue for vehicles exiting the Project is during the AM peak hour under cumulative plus project conditions when the queue is estimated to be about four vehicles. All other scenarios have queues of less than four vehicles indicating the intersection has sufficient capacity to meet the anticipated trip generation.

Table 10: 95th Percentile Vehicle Queue for the AM Peak Hour

	Penumbra Place & Harbor Bay Parkway				C Street & Harbor Bay Parkway				Project Entrance & Harbor Bay Parkway		Ron Cowan Parkway & Harbor Bay Parkway			
	NB	SB	EBL	WBL	SBL	SBR	EBL	WBL	SB	EBL	SBL	SBR	EBL	WBR
Storage	11	10	6	6	12	12	8	8	6	7	8	20	10	7
Existing	1	2	1	2	2	0	0	0	1	0	4	6	5	1
Existing + Project	1	2	1	2	2	0	0	0	2	1	4	6	5	1
Baseline	1	1	1	14	3	0	0	0	1	0	4	7	5	1
Baseline + Project	1	1	1	14	3	0	0	0	3	1	4	7	6	1
Cumulative	1	2	1	16	2	0	0	0	1	0	4	7	6	1
Cumulative+ Project	1	2	1	16	2	0	0	0	4	1	4	8	6	1

Kittelson & Associates, Inc. 2020
NA = Volume exceeds capacity, 95th percentile queue estimate not provided
Queue length calculated assuming 25 feet per queued vehicle and rounded up to nearest whole number
Grey shading indicates queue exceeds available storage

Table 11: 95th Percentile Vehicle Queue for the PM Peak Hour

	Penumbra Place & Harbor Bay Parkway				C Street & Harbor Bay Parkway				Project Entrance & Harbor Bay Parkway		Ron Cowan Parkway & Harbor Bay Parkway			
	NB	SB	EBL	WBL	SBL	SBR	EBL	WBL	SB	EBL	SBL	SBR	EBL	WBR
Storage	11	10	6	6	12	12	8	8	6	7	8	20	10	7
Existing	14	NA	0	1	3	0	0	0	1	0	2	2	14	3
Existing + Project	14	NA	0	1	3	0	0	0	1	0	2	3	15	3
Baseline	8	5	1	3	4	0	0	0	1	0	2	3	16	3
Baseline + Project	8	5	1	3	4	0	0	0	1	0	2	3	16	3
Cumulative	9	8	1	4	3	1	0	0	1	0	3	3	18	4
Cumulative+ Project	9	9	1	4	4	1	0	0	2	0	3	3	19	4

Kittelson & Associates, Inc. 2020
NA = Volume exceeds capacity, 95th percentile queue estimate not provided
Queue length calculated assuming 25 feet per queued vehicle and rounded up to nearest whole number
Grey shading indicates queue exceeds available storage

PARKING

This section discusses the City of Alameda's zoning requirements and the estimated parking demand for the Project. The City's municipal code specifies that the off-street parking for hotels not located within a community commercial district is 1.25 spaces per hotel room. The Project is proposing up to 236 rooms which equates to a minimum requirement of 295 off-street parking spaces. The current site plan shows a total of 185 off-street parking spaces or about 0.78 parking spaces per room. Eight of the 185 parking spaces are accessible meeting ADA requirements for parking facilities of up to 400 parking spaces.

The Project is also proposing construction of 10 long-term bicycle parking spaces and 10 short term spaces. This meets the City of Alameda Municipal Code because it provides at least one long term space per 25 hotel rooms (236/25 = 10 spaces) and provides short term bicycle parking that meets 2% of the daily maximum attendance which is estimated to be 424 (424*.02 = 9).

Vehicle Parking Demand Based on ITE Parking Generation Rates

In addition to reviewing the City of Alameda municipal code, a parking demand estimate was completed using the Institute of Transportation Engineer's Parking Generation Manual 5th Edition (ITE Parking Manual). Table 12 provides a summary of the parking demand results for the average peak parking demand of business hotels (ITE Land Use Code 312) based on the 11 sites contained in the ITE manual. As shown in Table 12, the parking supply provided by the Project (185 parking spaces) is sufficient to meet the average demand from the ITE Parking Manual. It is important to note these ITE Parking Manual estimates are based on surveys of parking demand at suburban locations and do not account for the Project's urban location with good transit access and private shuttle service to the airport. Therefore, the average parking demand at this hotel would likely be lower than the 0.72 average parking ratio from the ITE Parking Manual.

Table 12: Estimated Parking Demand from the Institute of Transportation Engineers

Land Use	Size		Parking Ratio	Estimated Demand
Business Hotel (ITE Code 312)	236	rooms	0.72	170
Source: Kittelson & Associates, Inc. 2020 & ITE Parking Generation Manual 5th Edition				

Vehicle Parking Demand Based on Survey of Similar Hotels

To provide additional information on the potential parking demand for hotels in the project area, available parking studies for the area were reviewed and additional parking surveys were conducted at the two other hotels located in the Harbor Bay Business Park. Afternoon and evening surveys of hotel parking occupancy were conducted at the Extended Stay America on South Loop Road and the Hampton Inn and Suites on the Harbor Bay Parkway. The surveys were conducted between 1:00 and 3:00 pm and between 6:00 and 8:00 PM on Tuesday April 10, 2018 and Friday April 13, 2018.

The Extended Stay America at 1260 South Loop Road has 88 rooms and 112 parking spaces. The peak demand was recorded on Friday night when 68 vehicles were recorded in the hotel parking lot, which equates to a peak parking demand of 0.77 vehicles per room. However, based on data on average hotel occupancy per month it is estimated the peak parking demand during the summer months is about 11% higher than the average occupancy during the month of April when the surveys were conducted[5]. Therefore, it is estimated that the peak parking demand during summer months is about 0.86 vehicles per room.

The Hampton Inn and Suites at 1700 Harbor Bay Parkway has 105 rooms and 135 parking spaces. The peak demand there was also recorded on a Friday night in April 2018 when there were 76 vehicles recorded in the hotel parking lot, which equates to a peak parking demand of 0.72 vehicles per room. Applying the same 11% growth factor to account for peak demand in July resulted in an estimated demand of 0.80 vehicles per room.

Analysis of the Potential for Shared Parking with Surrounding Office Buildings

Reciprocal access and parking are allowed for the property under Easement A recorded as part of the parcel map number 3940 dated December 13, 1982. Therefore, to provide additional information on the parking demand, this section provides information on the potential for shared parking with adjacent land uses. Data on parking occupancy by time of day indicates that office buildings tend to have their peak parking in the early afternoon (typically around 2:00 PM)[6]. During this same time period, the shared parking data indicates a typical business hotel reaches about 60% of its peak parking demand currently. Data on parking occupancy for hotels indicates they tend to have their peak parking in the late evening and early morning (typically after 10:00 PM and before 7:00 AM). During this same time period, the shared parking data indicates a typical office building only has about 10% of its peak parking demand in the late evening and early morning. Therefore, the data on shared parking further supports that even if a parking shortage were ever to occur at the hotel, this would occur in the evening when there would be sufficient parking in the lots of the nearby office buildings which could be used per the easement agreement.

Summary of Findings on Parking

Table 13 provides a summary of the vehicle parking findings. The Project is proposing a total of 185 on-site parking spaces to accommodate parking demand. Based on the average demand from the ITE Parking Manual, the 185 parking spaces is sufficient to meet the anticipated demand. Recent parking demand studies at the nearby Hampton Inn and Extended Stay hotels have estimated a maximum parking demand that would require 189 and 203 parking spaces, respectively. This is between 4 and 18 parking spaces

[5] Redefining Weekday Hotel Business, STR Analytics, Hendersonville, TN, April 27, 2015.

[6] Shared Parking, Second Edition, Urban Land Institute, Washington D.C., 2005.

more than provided onsite. The City of Alameda municipal code requires a total of 295 parking spaces or about 110 more than provided.

In addition to the 185 on-site parking spaces, the property has an easement for access and parking in adjacent land uses. These adjacent land uses include office buildings which have opposite parking patterns compared to a hotel making shared parking a viable option for the hotel when it approaches peak demand. Assuming peak demands similar to nearby hotels (Extended Stay and Hampton Inn), it is reasonable to assume an additional 18 parking spaces would be available in the adjacent office buildings to meet the days with high demand. This reciprocal parking would also help meet the City code requirement since there are more than 110 parking spaces available in the nearby lot.

Table 13: Vehicle Parking Summary

	Parking Ratio	Parking Demand	Provided Parking	Difference
ITE Average	0.72	170	185	-15
Hampton Inn	0.80	189		4
Extended Stay	0.86	203		18
Code Requirement	1.25	295		110
Source: Kittelson & Associates, Inc. 2020				

The Project is proposing a total of eight accessible spaces which meets current ADA requirements. It is also providing 10 short term and 10 long term bicycle parking spaces meeting or exceeding City code requirements.

In analyzing parking for the Project, it is also important to note the availability of transit in the area. Bus transit service is provided by AC Transit and ferry service is provided by the Alameda Harbor Bay Ferry. Local bus routes provide connections to the Oakland International Airport, the Ferry terminal, and the Fruitvale BART station. The Alameda Harbor Bay Ferry is a ferry that mainly transports commuters on weekdays to the Ferry Plaza in San Francisco. However, the Harbor Bay Business Park also operates a private shuttle service providing direct service to BART. In addition, with the rising popularity of ride-sharing services it is expected that some hotel patrons would arrive via Uber and Lyft, especially for those working at nearby businesses in the Harbor Bay Business Park. Finally, the Project is proposing to provide a private shuttle service for hotel guests to the Oakland Airport and other locations within a three-mile vicinity further reducing the need to rent a vehicle at the airport.

VEHICLE MILES TRAVELED

Senate Bill 743 (SB 743) was signed into law in September 2013. Senate Bill 743 (Steinberg, 2013) required changes to the CEQA Guidelines regarding the analysis of transportation impacts. Historically, CEQA transportation analyses of individual projects determined impacts in the circulation system in terms of roadway delay and/or capacity at specific locations. SB 743 changes include the elimination of auto delay, level of service (LOS), and other similar measures of vehicular capacity or traffic congestion as a basis for

determining significant impacts. Since the bill has gone into effect, automobile delay, as measured by "level of service" and other similar metrics, no longer constitutes a significant environmental effect under CEQA. Auto-mobility (often expressed as "level of service") may continue to be a measure for planning purposes.[7]

In December 2018, the California Governor's Office of Planning and Research (OPR) and the State Natural Resources Agency submitted updated CEQA Guidelines to the Office of Administrative Law for final approval to implement SB 743. The Office of Administrative Law approved the updated CEQA Guidelines, thus implementing SB 743 and making vehicle miles traveled (VMT) the primary metric used to analyze transportation impacts. The final text, final statement of reasons, and related materials are posted at http://resources.ca.gov/ceqa. The changes have been approved by the Office of the Administrative Law and are now in effect. For land use and transportation projects, SB 743-compliant CEQA analysis became mandatory on July 1, 2020.

The City of Alameda has not adopted official metrics and thresholds related to VMT and the OPR CEQA Guidelines have not identified a proposed method for analyzing hotel projects. Since a methodology, metrics, and thresholds have not been formally adopted, this VMT analysis will consider the Project to have a significant impact if the Project would cause the total VMT to increase over the no project conditions. This is similar to a threshold established by the City of San Jose for hotels. To determine whether the Project would increase total VMT, the following methodology was used:

- It was assumed that if the Project were not constructed, the hotel guests would be staying at similar name brand hotels in the area. These similar hotels include:
    - Hampton Inn & Suites (1700 Harbor Bay Pkwy, Alameda, CA 94502)
    - Home 2 Suites (1660 Harbor Bay Pkwy, Alameda, CA 94502)
    - Hilton (1 Hegenberger Rd, Oakland, CA 94621)
    - Spring Hill Suites (195 Hegenberger Rd, Oakland, CA 94621)
    - Courtyard (350 Hegenberger Rd, Oakland, CA 94621)
    - Hilton Garden Inn (510 Lewelling Blvd, San Leandro, CA 94579)
    - Radisson Hotel (8400 Edes Ave, Oakland, CA 94621)
- The distance between these hotels and three typical origin destinations were estimated using Google Maps. The three origins/destinations include:
    - Downtown Oakland (representing a shopping, dining, or business locations)
    - Airport
    - Harbor Bay Business Park (representing those staying in the area to visit/work out of the nearby businesses).
- To estimate the average trip length for each hotel, hotel guests were assumed to include two airport trips, four business trips, and four food trips per stay. Therefore, 20% of trips were

[7] Governor's Office of Planning and Research, 2016. Technical Advisory on Evaluating Transportation Impacts in CEQA, Implementing Senate Bill 743 (Steinberg, 2013)

assumed to be airport related, 40% were assumed to be to and from the Harbor Bay Business Park and surrounding area, and 40% of trips were assumed to be to and from downtown Oakland.

Based on this methodology, the average trip length for each hotel is shown in Table 14. As shown in this table, the Project is estimated to have the lowest average trip length of any of the similar hotels in the area. Since the average trip length is lower than the other potential locations for travelers to stay, building the Project would likely decrease overall VMT in the area. Therefore, the Project would not result in a significant impact related to VMT.

Table 14: Average Trip Length

Hotel	Address	Distances			Guest Trips			Average Trip Length
		Downtown	Airport	Business Park	Downtown	Airport	Business Park	
Hampton Inn & Suites	1700 Harbor Bay Pkwy, Alameda, CA 94502	9.2	3.0	0.2	40%	20%	40%	4.4
Home 2 Suites	1660 Harbor Bay Pkwy, Alameda, CA 94502	9.2	3.0	0.2	40%	20%	40%	4.4
Hilton	1 Hegenberger Rd, Oakland, CA 94621	8.2	1.5	2.8	40%	20%	40%	4.7
Spring Hill Suites	195 Hegenberger Rd, Oakland, CA 94621	8.0	1.9	3.1	40%	20%	40%	4.8
Courtyard	350 Hegenberger Rd, Oakland, CA 94621	7.7	2.2	3.4	40%	20%	40%	4.9
Hilton Garden Inn	510 Lewelling Blvd, San Leandro, CA 94579	12.7	7.2	8.4	40%	20%	40%	9.9
Radisson Hotel	8400 Edes Ave, Oakland, CA 94621	7.2	3.0	4.8	40%	20%	40%	5.4
Project Hotel	1051 Harbor Bay Parkway, Alameda, CA 94502	8.5	2.3	0.5	40%	20%	40%	4.1

In addition to the Project being located such that it reduces average trip lengths, the Project is also proposing to provide several transportation demand management (TDM) measures that would reduce the number of Project trips and/or encourage the use of other modes. These measures include:

1. The Project will provide on-demand shuttle service. The shuttle service shall operate between the hours of 4:00 a.m. to 1:00 a.m. daily, and transport hotel guests to and from South Shore Center, the Park Street business district, Harbor Bay Ferry terminal, the Air BART station near the Oakland Airport, and any other destination within a three-mile radius of the hotel
2. The Project will provide funding for a crosswalk across Harbor Bay Parkway to facilitate safe pedestrian access to the site from the other businesses in the Business Park
3. The hotel will provide ten complimentary bicycles for use by hotel guests
4. The hotel will join the City's Transportation Management Association which includes bus passes for employees
5. The project would provide a drop off area for car share services
6. The project will install two benches at the two AC Transit stops near the corner of Maitland Drive and Harbor Bay Parkway

Section 5
Summary of Findings

SUMMARY OF FINDINGS

This section provides a summary of the Project's effect on the local transportation system. The summary is divided between findings related to CEQA findings related to local transportation analyses.

CEQA FINDINGS

According to CEQA guidelines, a project would have a significant impact if it would:

- Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.
    - **Finding:** The Project is proposing construction of up to 236 hotel rooms and is not proposing modifications to existing transportation facilities in the area. Since the Project is not modifying existing transportation facilities and would not interfere with future improvements in the area, it would not cause a significant impact.
    - **Mitigation**: None required
- Conflict or be inconsistent with CEQA Guideline section 15064.3, subdivision (b).
    - **Finding**: The Project was assessed to determine if it would cause the total vehicle miles traveled (VMT) in the area to increase. Based on this assessment, the Project is anticipated to have a shorter average trip length per guest than other hotels in the area. Therefore, the total VMT is anticipated to decrease and the Project is not anticipated to cause a significant impact.
    - **Mitigation**: None Required.
- Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
    - **Finding**: The Project is proposing to construct a hotel with up to 236 rooms near the Harbor Bay Business Park which is allowed under the current zoning regulations and therefore, not an incompatible use. The Project is also not anticipated to substantially increase hazards due to a geometric design feature because it is not making off-site improvements and the site plan will be required to meet the latest City of Alameda requirements for design prior to receiving permits to begin construction. Since the Project is not an incompatible use in the area and the site plan would be designed to the latest City of Alameda standards, it would not cause a significant impact.
    - **Mitigation**: None Required
- Result in inadequate emergency access.
    - **Finding**: Sufficient emergency access is determined by factors such as number of access points, roadway width, and proximity to fire stations. The site plan for the Project would have both a primary and secondary entrance onto Harbor Bay Parkway. Emergency vehicle circulation within the site was also reviewed using truck turning templates which showed emergency vehicles can freely circulate the site. Therefore, the Project is not expected to significantly impact emergency vehicle access.
    - **Mitigation**: None Required

LOCAL TRANSPORTATION ANALYSIS FINDINGS

The City of Alameda also requires a local transportation analysis in addition to CEQA. According to the City of Alameda[8], a project would cause operational deficiencies if it would:

- Signalized Intersections: Project-related operational deficiencies on signalized intersections would be considered adverse if project-related traffic would cause the LOS rating to deteriorate from LOS D or better to LOS E or F, or from LOS E to LOS F. In addition, a project would have an adverse effect at intersections that operate at LOS E or F under existing conditions, depending upon the magnitude of the project's contribution to the worsening of delay. In Alameda, it is considered an adverse effect if a project would increase traffic volumes by more than 3 percent at a signalized intersection operating at LOS E or F. In addition, a project would have an adverse effect if it would cause major traffic hazards or would contribute considerably to the cumulative traffic increases that would cause the deterioration in levels of service to unacceptable levels. For signalized intersections, an adverse effect would occur if project-generated traffic would cause intersection operations to deteriorate from an acceptable level, which is defined as LOS D or better.
    - **Finding**: Two signalized intersections were analyzed as part of this traffic impact study. Both intersections were calculated to operate at LOS C or better with the Project under cumulative conditions. Since the Project does not result in either of these intersections operating below the LOS D standard, the Project does not have an adverse effect on signalized intersections.
    - **Recommended Improvement**: None Required
- Unsignalized Intersections: Project-related operational adverse effects on unsignalized intersections are considered significant if project-generated traffic would cause the worst-case movement (or average of all movements for all-way stop-controlled intersections and roundabouts) to deteriorate from an acceptable level of service. In addition, a project would be considered to have an adverse effect if it would increase traffic volumes by more than 3 percent at an unsignalized intersection operating at LOS E or F.
    - **Finding**: The intersection of C Street and Harbor Bay Parkway was found to operate below the City's LOS D standard under no project conditions for the existing, baseline, and cumulative conditions. Since the Project does not increase the volume at this intersection by more than 3%, the Project does not result in an adverse effect at this location.

      The Project does have an adverse effect at the Project Entrance & Harbor Bay Parkway intersection because it either causes the LOS to deteriorate below the LOS D standard or if it was below the standard without the Project, it increases the intersection volume by more than 3%.

[8] Guide for Preparation of Traffic Studies and Reports, City of Alameda Public Works Department, Alameda, CA, November 28, 2005.

- **Recommended Improvement**: While the Project does have an adverse effect on the Project Entrance and Harbor Bay Parkway intersection, the intersection does not meet the Caltrans peak hour signal warrant. Additionally, the 95th percentile queue for this driveway is not estimated to exceed four vehicles. Since the intersections does not meeting the peak hour signal warrant, the 95th percentile queue is minimal, and vehicles on Harbor Bay Parkway at this intersection are not affected my increased delay from Project vehicles, no mitigation measure is recommended.

- Parking: Project-related parking would be considered to have an adverse effect on parking if a project would have inadequate parking capacity under City parking standards.
  - **Finding**: The Project is proposing a hotel with up to 236 rooms which would require 295 parking spaces based on City parking standards. The site plan shows 185 parking spaces; therefore, the Project is considered to have an adverse effect on parking.
  - **Recommended Improvement**: A review of parking demand from the ITE Parking Manual and two studies at nearby hotels show that the peak parking demand would require 203 parking spaces or less resulting in the hotel being about 18 parking spaces short on peak demand days. The property has a reciprocal access and parking easement so that shared parking is allowed between the various businesses. Since the neighboring businesses are all offices, the peak parking demand is during the day while the Project peak demand is at night. With the ability to share parking through an easement and the Project and the neighboring businesses having opposite peak parking demand, the Project should have sufficient parking to meet peak demand and no additional recommendations are needed.
- Transit: A project would have an adverse effect on transit if it would cause a substantial increase in transit demand that could not be accommodated by adjacent transit capacity.
  - **Finding**: The Project has the potential to increase patronage on bus lines in the area, but the overall project trip generation is minimal and would not create a substantial increase in transit demand. The Project also does not significantly affect intersection delay for the movements that are utilized by transit. Therefore, the project contribution to key roadway segments in the area would not result in any significant changes to travel speeds of transit vehicles. As a result, the Project would not be expected to result in any adverse effects to transit service in the area.
  - **Recommended Improvement**: None Required
- Pedestrian System: A project would have an adverse effect if it would result in substantial overcrowding on sidewalks, create potentially hazardous conditions for pedestrians, or otherwise interfere with pedestrian accessibility to the site and adjoining areas.
  - **Finding**: With up to 236 hotel rooms, the Project is not anticipated to generate a substantial amount of pedestrian activity in the area. The area also has low pedestrian activity today and the combination of the Project and existing pedestrian activity would not create overcrowding on sidewalks or create hazardous conditions. The Project would provide pedestrian connectivity to neighboring businesses and Harbor Bay Parkway via sidewalks and crosswalks which would improve pedestrian accessibility to the site and adjoining areas.
  - **Recommended Improvement**: None Required

- Bicycle System: A project would have an adverse effect on the environment if it would create potentially hazardous conditions for bicyclists or otherwise substantially interfere with bicycle accessibility to the site and adjoining areas.
    - **Finding**: Although the Project would increase vehicle and pedestrian traffic in the project vicinity, it is not expected to significantly impact or change the design of any existing bicycle facilities or create any new safety problems for bicyclists in the area. The addition of project trips to the peak-hour volumes on the roadways in the study area would not cause the bicycle LOS score to increase by more than 10% which is the threshold considered to result in an adverse effect per the Transportation Element of the City's General Plan.
    - **Recommended Improvement**: None Required

SITE PLAN RECOMMENDATIONS

Finally, the following recommendations are made to improve the site plan to meet the needs of all users:

- Recommendation: The Project should install crosswalk markings across the driveway for the sidewalk along Harbor Bay Parkway to notify vehicles entering and exiting the driveway of the pedestrian crossing. A stop bar should also be installed in the driveway to indicate where vehicles should stop prior to crossing the multi-use path.
- Recommendation: Install curb ramps for the multiuse pathway and sidewalk along Harbor Bay Parkway where they cross the Project driveway. A second curb ramp should also be installed for the crosswalk near the covered drop-off area.
- Recommendation: Wheel stops should be required for all parking stalls adjacent to the building to prevent the front of a vehicle from overhanging the sidewalks restricting the sidewalk width to less than 4 feet.
- Recommendation: The long-term bicycle parking area should be provided with a curb ramp and sidewalk that provides unobstructed access to the Project drive aisles.
- Recommendation: A sidewalk and crosswalk should be constructed to connect the sidewalk near the bicycle parking area with the sidewalk into the neighboring vehicle parking area. This sidewalk connection could also serve as the bicyclists' connection into the long-term bicycle parking area from the drive aisles.

Appendix 1 Traffic Count Data

Note on Traffic Volume Data: Traffic volume data for this report for existing, baseline, and cumulative no project conditions were developed by Abrams Associates in consultation with City of Alameda staff. Kittelson reviewed these counts and the volume balance between the intersections concluded the counts appeared reasonable. The volumes provided in this appendix are the existing traffic counts data provided by Abrams Associates.

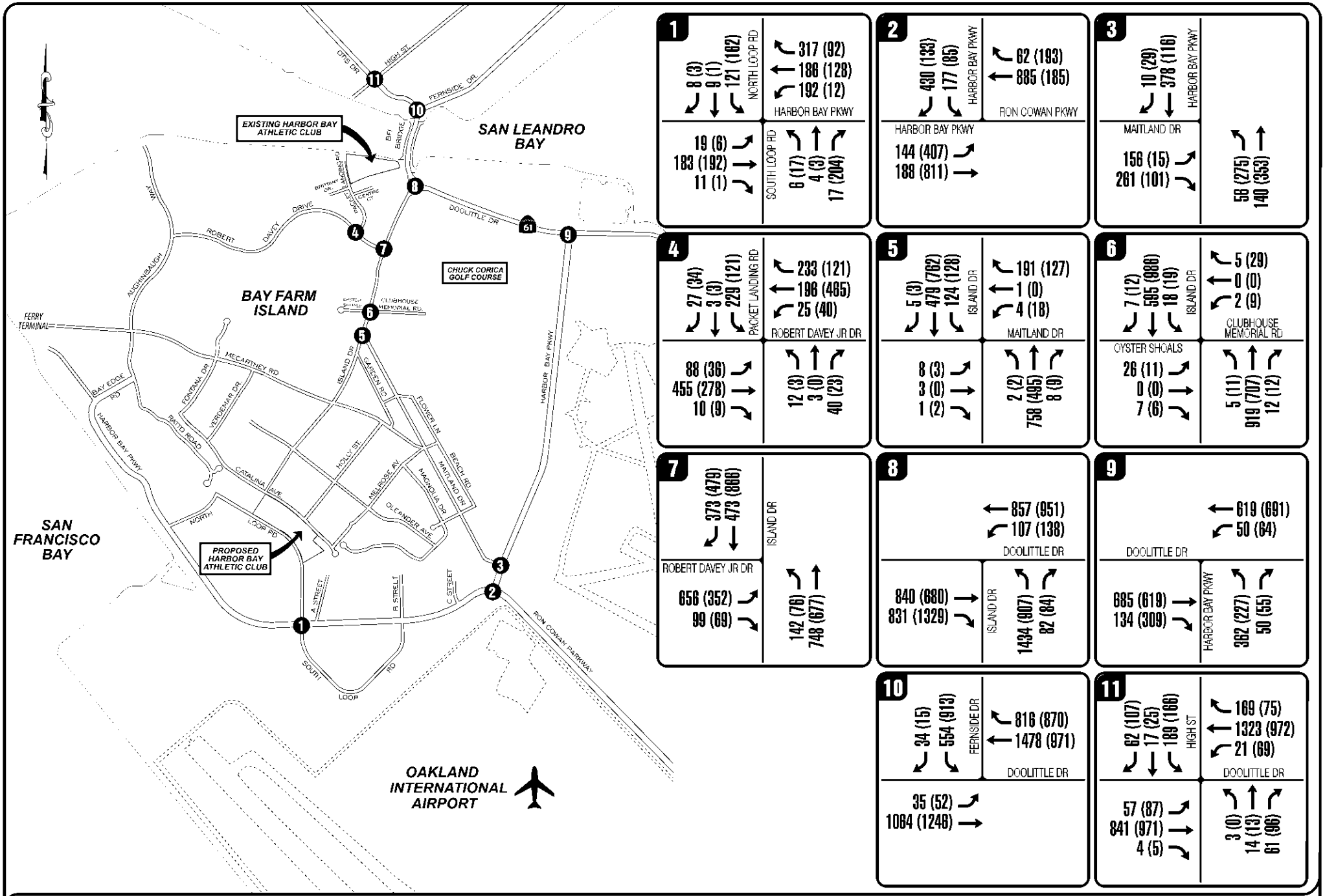


FIGURE 4 | EXISTING AM (PM) PEAK HOUR TRAFFIC VOLUMES

TRANSPORTATION IMPACT ANALYSIS

Harbor Bay Athletic Club

City of Alameda

Abrams Associates
TRAFFIC ENGINEERING, INC.

Intersection No: 1
Location: Pneumbra Pl at Harbor Bay Pkwy
AM Start Time 7:00 AM
PM Start Time 4:00 PM
Date: Thursday, February 8, 2018
Collected By: Laura Walker

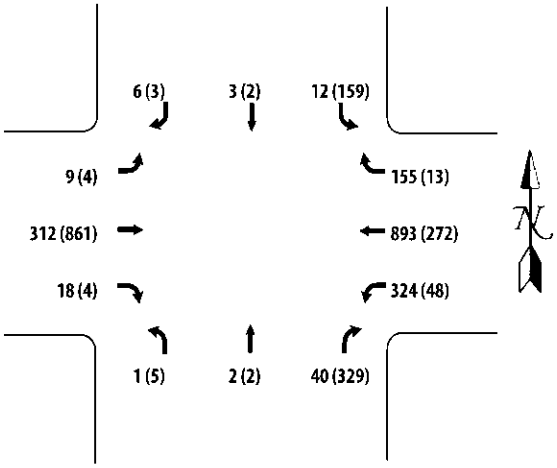
PNEUMBRA PL AT HARBOR BAY PKWY INTERSECTION TURNING MOVEMENT SUMMARY

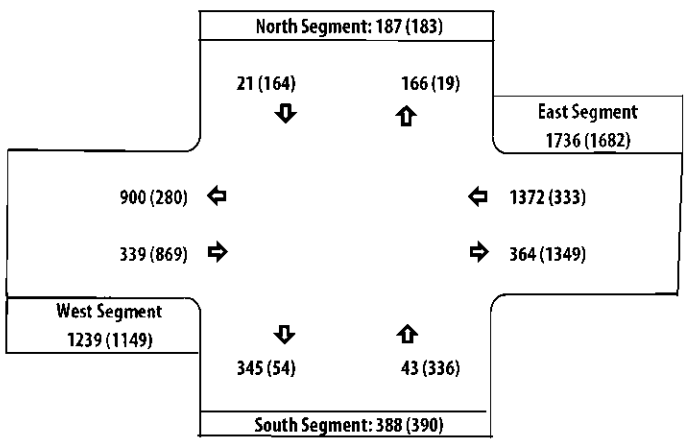
1	Pneumbra Pl			Pneumbra Pl			Harbor Bay Pkwy			Harbor Bay Pkwy			AM
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Total
7:00 AM	0	0	16	5	0	1	2	42	1	49	139	34	289
7:15 AM	0	1	7	2	0	0	3	68	1	39	153	44	318
7:30 AM	1	0	10	8	0	2	1	59	1	51	177	29	339
7:45 AM	0	0	10	2	0	1	1	45	0	76	210	31	376
8:00 AM	0	1	9	4	3	4	2	75	3	69	200	39	409
8:15 AM	1	0	3	4	0	2	2	84	5	91	265	43	500
8:30 AM	0	0	9	3	0	0	5	94	5	71	233	41	461
8:45 AM	0	1	19	1	0	0	0	59	5	93	195	32	405
Total	2	3	83	29	3	10	16	526	21	539	1572	293	3097

1	Pneumbra Pl			Pneumbra Pl			Harbor Bay Pkwy			Harbor Bay Pkwy			PM
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Total
4:00 PM	1	1	50	58	0	2	1	160	1	12	51	11	348
4:15 PM	3	0	58	50	0	1	1	176	2	8	61	5	365
4:30 PM	0	0	56	40	1	4	0	177	0	14	73	6	371
4:45 PM	2	0	67	29	1	0	0	153	1	18	65	4	340
5:00 PM	1	0	108	53	0	0	2	279	0	7	80	4	534
5:15 PM	2	1	84	42	1	0	2	217	2	13	71	3	438
5:30 PM	0	1	70	35	0	3	0	212	1	10	56	2	390
5:45 PM	0	2	45	23	1	1	0	118	1	9	67	5	272
Total	9	5	538	330	4	11	6	1492	8	91	524	40	3058

AM PEAK HOUR VOLUMES													
1	Pneumbra Pl			Pneumbra Pl			Harbor Bay Pkwy			Harbor Bay Pkwy			AM
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Total
8:00 AM	0	1	9	4	3	4	2	75	3	69	200	39	409
8:15 AM	1	0	3	4	0	2	2	84	5	91	265	43	500
8:30 AM	0	0	9	3	0	0	5	94	5	71	233	41	461
8:45 AM	0	1	19	1	0	0	0	59	5	93	195	32	405
Total	1	2	40	12	3	6	9	312	18	324	893	155	1775

PM PEAK HOUR VOLUMES													
1	Pneumbra Pl			Pneumbra Pl			Harbor Bay Pkwy			Harbor Bay Pkwy			PM
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Total
4:45 PM	2	0	67	29	1	0	0	153	1	18	65	4	340
5:00 PM	1	0	108	53	0	0	2	279	0	7	80	4	534
5:15 PM	2	1	84	42	1	0	2	217	2	13	71	3	438
5:30 PM	0	1	70	35	0	3	0	212	1	10	56	2	390
Total	5	2	329	159	2	3	4	861	4	48	272	13	1702





Appendix 2 Existing Conditions Level-of-Service Worksheets

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	312	18	324	893	155	1	2	40	12	3	6
Future Vol, veh/h	9	312	18	324	893	155	1	2	40	12	3	6
Conflicting Peds, #/hr	30	0	30	30	0	30	30	0	30	30	0	30
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	115	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	351	20	364	1003	174	1	2	45	13	3	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1207	0	0	401	0	0	1672	2346	246	2075	2269	649
Stage 1	-	-	-	-	-	-	411	411	-	1848	1848	-
Stage 2	-	-	-	-	-	-	1261	1935	-	227	421	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	574	-	-	1154	-	-	63	36	754	31	40	412
Stage 1	-	-	-	-	-	-	589	593	-	77	123	-
Stage 2	-	-	-	-	-	-	180	111	-	755	587	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	558	-	-	1121	-	-	41	23	712	20	25	389
Mov Cap-2 Maneuver	-	-	-	-	-	-	87	55	-	59	61	-
Stage 1	-	-	-	-	-	-	562	566	-	73	81	-
Stage 2	-	-	-	-	-	-	111	73	-	672	560	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	2.3	14.9	70
HCM LOS			B	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	413	558	-	-	1121	-	-	78
HCM Lane V/C Ratio	0.117	0.018	-	-	0.325	-	-	0.303
HCM Control Delay (s)	14.9	11.6	-	-	9.7	-	-	70
HCM Lane LOS	B	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	0.4	0.1	-	-	1.4	-	-	1.1

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	342	0	1329	64	47	1
Future Vol, veh/h	2	342	0	1329	64	47	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	384	0	1493	72	53	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1595	0	384	-	0	1785	843
Stage 1	-	-	-	-	-	1559	-
Stage 2	-	-	-	-	-	226	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	407	-	820	-	-	73	307
Stage 1	-	-	-	-	-	159	-
Stage 2	-	-	-	-	-	790	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	395	-	820	-	-	68	290
Mov Cap-2 Maneuver	-	-	-	-	-	132	-
Stage 1	-	-	-	-	-	154	-
Stage 2	-	-	-	-	-	767	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	48.7
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	395	-	820	-	-	132	290
HCM Lane V/C Ratio	0.006	-	-	-	-	0.4	0.004
HCM Control Delay (s)	14.2	-	0	-	-	49.4	17.5
HCM Lane LOS	B	-	A	-	-	E	C
HCM 95th %tile Q(veh)	0	-	0	-	-	1.7	0

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	388	1336	9	4	0
Future Vol, veh/h	1	388	1336	9	4	0
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	436	1501	10	4	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1541	0	-	0	1786	816
Stage 1	-	-	-	-	1536	-
Stage 2	-	-	-	-	250	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	427	-	-	-	73	320
Stage 1	-	-	-	-	164	-
Stage 2	-	-	-	-	768	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	415	-	-	-	69	302
Mov Cap-2 Maneuver	-	-	-	-	135	-
Stage 1	-	-	-	-	159	-
Stage 2	-	-	-	-	746	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	32.6
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	415	-	-	-	135
HCM Lane V/C Ratio	0.003	-	-	-	0.033
HCM Control Delay (s)	13.7	-	-	-	32.6
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	246	0	0	921	65	0	0	0	184	0	447
Future Volume (vph)	150	246	0	0	921	65	0	0	0	184	0	447
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.97				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1543				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1543				3433		2787
Peak-hour factor, PHF	0.89	0.89	0.92	0.92	0.89	0.89	0.92	0.92	0.92	0.89	0.92	0.89
Adj. Flow (vph)	169	276	0	0	1035	73	0	0	0	207	0	502
RTOR Reduction (vph)	0	0	0	0	0	19	0	0	0	0	0	0
Lane Group Flow (vph)	169	276	0	0	1035	54	0	0	0	207	0	502
Confl. Peds. (#/hr)						30						
Confl. Bikes (#/hr)						15						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	10.3	81.4			42.5	71.2				28.7		28.3
Effective Green, g (s)	10.3	81.4			42.5	71.2				28.7		28.3
Actuated g/C Ratio	0.11	0.84			0.44	0.73				0.30		0.29
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	364	2972			1552	1218				1016		813
v/s Ratio Prot	0.05	0.08			c0.29	0.01				c0.06		c0.18
v/s Ratio Perm						0.02						
v/c Ratio	0.46	0.09			0.67	0.04				0.20		0.62
Uniform Delay, d1	40.7	1.3			21.6	3.5				25.5		29.6
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	0.7	0.0			1.1	0.0				0.1		1.4
Delay (s)	41.4	1.4			22.7	3.5				25.6		31.1
Level of Service	D	A			C	A				C		C
Approach Delay (s)		16.6			21.4			0.0			29.5	
Approach LOS		B			C			A			C	

Intersection Summary

HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	96.9	Sum of lost time (s)	20.7
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Intersection												
Int Delay, s/veh	17.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	861	4	48	272	13	5	2	329	159	2	3
Future Vol, veh/h	4	861	4	48	272	13	5	2	329	159	2	3
Conflicting Peds, #/hr	30	0	30	30	0	30	30	0	30	30	0	30
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	115	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	1076	5	60	340	16	6	3	411	199	3	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	386	0	0	1111	0	0	1441	1625	601	1078	1619	238
Stage 1	-	-	-	-	-	-	1119	1119	-	498	498	-
Stage 2	-	-	-	-	-	-	322	506	-	580	1121	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1169	-	-	624	-	-	93	101	443	~ 173	102	763
Stage 1	-	-	-	-	-	-	220	280	-	523	543	-
Stage 2	-	-	-	-	-	-	664	538	-	467	280	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1136	-	-	606	-	-	80	85	418	~ 2	86	720
Mov Cap-2 Maneuver	-	-	-	-	-	-	169	192	-	~ -55	165	-
Stage 1	-	-	-	-	-	-	213	271	-	506	475	-
Stage 2	-	-	-	-	-	-	575	471	-	~ 7	271	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.7	86.3	
HCM LOS			F	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	406	1136	-	-	606	-	-	+
HCM Lane V/C Ratio	1.034	0.004	-	-	0.099	-	-	-
HCM Control Delay (s)	86.3	8.2	-	-	11.6	-	-	-
HCM Lane LOS	F	A	-	-	B	-	-	-
HCM 95th %tile Q(veh)	13.5	0	-	-	0.3	-	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1330	0	311	20	118	9
Future Vol, veh/h	0	1330	0	311	20	118	9
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	1622	0	379	24	144	11

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	433	0	1622	-	0	1262	262
Stage 1	-	-	-	-	-	421	-
Stage 2	-	-	-	-	-	841	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1123	-	131	-	-	162	737
Stage 1	-	-	-	-	-	630	-
Stage 2	-	-	-	-	-	383	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1091	-	131	-	-	153	695
Mov Cap-2 Maneuver	-	-	-	-	-	275	-
Stage 1	-	-	-	-	-	612	-
Stage 2	-	-	-	-	-	372	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	30.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1091	-	131	-	-	275	695
HCM Lane V/C Ratio	-	-	-	-	-	0.523	0.016
HCM Control Delay (s)	0	-	0	-	-	31.6	10.3
HCM Lane LOS	A	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0	-	0	-	-	2.8	0

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	1441	367	2	16	2
Future Vol, veh/h	2	1441	367	2	16	2
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	1757	448	2	20	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	480	0	-	0	1392	285
Stage 1	-	-	-	-	479	-
Stage 2	-	-	-	-	913	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1079	-	-	-	133	712
Stage 1	-	-	-	-	589	-
Stage 2	-	-	-	-	352	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1048	-	-	-	125	672
Mov Cap-2 Maneuver	-	-	-	-	247	-
Stage 1	-	-	-	-	571	-
Stage 2	-	-	-	-	342	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	19.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1048	-	-	-	266
HCM Lane V/C Ratio	0.002	-	-	-	0.083
HCM Control Delay (s)	8.4	-	-	-	19.7
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	471	956	0	0	193	231	0	0	0	120	0	150
Future Volume (vph)	471	956	0	0	193	231	0	0	0	120	0	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.99				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1564				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1564				3433		2787
Peak-hour factor, PHF	0.83	0.83	0.92	0.92	0.83	0.83	0.92	0.92	0.92	0.83	0.92	0.83
Adj. Flow (vph)	567	1152	0	0	233	278	0	0	0	145	0	181
RTOR Reduction (vph)	0	0	0	0	0	9	0	0	0	0	0	0
Lane Group Flow (vph)	567	1152	0	0	233	269	0	0	0	145	0	181
Confl. Peds. (#/hr)						30						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	20.5	53.4			13.1	31.9				18.8		29.7
Effective Green, g (s)	20.5	53.4			13.1	31.9				18.8		29.7
Actuated g/C Ratio	0.30	0.79			0.19	0.47				0.28		0.44
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	1038	2787			683	858				951		1220
v/s Ratio Prot	c0.17	c0.33			0.07	c0.09				0.04		0.06
v/s Ratio Perm						0.09						
v/c Ratio	0.55	0.41			0.34	0.31				0.15		0.15
Uniform Delay, d1	19.8	2.3			23.6	11.1				18.5		11.4
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	0.5	0.1			0.3	0.2				0.1		0.1
Delay (s)	20.2	2.4			23.9	11.4				18.6		11.5
Level of Service	C	A			C	B				B		B
Approach Delay (s)		8.3			17.1			0.0			14.6	
Approach LOS		A			B			A			B	

Intersection Summary

HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	67.8	Sum of lost time (s)	20.7
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	321	18	324	905	155	1	2	40	12	3	6
Future Vol, veh/h	9	321	18	324	905	155	1	2	40	12	3	6
Conflicting Peds, #/hr	30	0	30	30	0	30	30	0	30	30	0	30
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	115	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	361	20	364	1017	174	1	2	45	13	3	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1221	0	0	411	0	0	1689	2370	251	2094	2293	656
Stage 1	-	-	-	-	-	-	421	421	-	1862	1862	-
Stage 2	-	-	-	-	-	-	1268	1949	-	232	431	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	567	-	-	1144	-	-	61	34	749	30	39	408
Stage 1	-	-	-	-	-	-	581	587	-	75	121	-
Stage 2	-	-	-	-	-	-	178	110	-	750	581	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	551	-	-	1111	-	-	40	21	707	19	24	385
Mov Cap-2 Maneuver	-	-	-	-	-	-	85	54	-	58	60	-
Stage 1	-	-	-	-	-	-	554	560	-	72	79	-
Stage 2	-	-	-	-	-	-	109	72	-	667	554	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	2.3	15	71.2
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	408	551	-	-	1111	-	-	77
HCM Lane V/C Ratio	0.118	0.018	-	-	0.328	-	-	0.306
HCM Control Delay (s)	15	11.7	-	-	9.8	-	-	71.2
HCM Lane LOS	C	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	0.4	0.1	-	-	1.4	-	-	1.1

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	351	0	1341	64	47	1
Future Vol, veh/h	2	351	0	1341	64	47	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	394	0	1507	72	53	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1609	0	394	-	0	1804	850
Stage 1	-	-	-	-	-	1573	-
Stage 2	-	-	-	-	-	231	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	402	-	808	-	-	71	304
Stage 1	-	-	-	-	-	156	-
Stage 2	-	-	-	-	-	785	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	391	-	808	-	-	67	287
Mov Cap-2 Maneuver	-	-	-	-	-	130	-
Stage 1	-	-	-	-	-	151	-
Stage 2	-	-	-	-	-	762	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	49.8
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	391	-	808	-	-	130	287
HCM Lane V/C Ratio	0.006	-	-	-	-	0.406	0.004
HCM Control Delay (s)	14.3	-	0	-	-	50.5	17.6
HCM Lane LOS	B	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	1.7	0

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	388	1336	39	46	12
Future Vol, veh/h	10	388	1336	39	46	12
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	436	1501	44	52	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1575	0	-	0	1823	833
Stage 1	-	-	-	-	1553	-
Stage 2	-	-	-	-	270	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	414	-	-	-	69	312
Stage 1	-	-	-	-	160	-
Stage 2	-	-	-	-	751	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	402	-	-	-	63	294
Mov Cap-2 Maneuver	-	-	-	-	128	-
Stage 1	-	-	-	-	151	-
Stage 2	-	-	-	-	729	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	48.7
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	402	-	-	-	145
HCM Lane V/C Ratio	0.028	-	-	-	0.449
HCM Control Delay (s)	14.2	-	-	-	48.7
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	-	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	168	270	0	0	938	65	0	0	0	184	0	460
Future Volume (vph)	168	270	0	0	938	65	0	0	0	184	0	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.97				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1543				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1543				3433		2787
Peak-hour factor, PHF	0.89	0.89	0.92	0.92	0.89	0.89	0.92	0.92	0.92	0.89	0.92	0.89
Adj. Flow (vph)	189	303	0	0	1054	73	0	0	0	207	0	517
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	0	0
Lane Group Flow (vph)	189	303	0	0	1054	53	0	0	0	207	0	517
Confl. Peds. (#/hr)						30						
Confl. Bikes (#/hr)						15						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	10.7	82.1			42.4	71.5				29.1		29.1
Effective Green, g (s)	10.7	82.1			42.4	71.5				29.1		29.1
Actuated g/C Ratio	0.11	0.84			0.43	0.73				0.30		0.30
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	376	2976			1537	1214				1023		830
v/s Ratio Prot	0.06	0.09			c0.30	0.01				c0.06		c0.19
v/s Ratio Perm						0.02						
v/c Ratio	0.50	0.10			0.69	0.04				0.20		0.62
Uniform Delay, d1	40.9	1.3			22.2	3.6				25.6		29.5
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	0.8	0.0			1.3	0.0				0.1		1.5
Delay (s)	41.7	1.4			23.5	3.6				25.7		31.0
Level of Service	D	A			C	A				C		C
Approach Delay (s)		16.9			22.2			0.0			29.5	
Approach LOS		B			C			A			C	

Intersection Summary

HCM 2000 Control Delay	23.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	97.6	Sum of lost time (s)	20.7
Intersection Capacity Utilization	51.8%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Intersection												
Int Delay, s/veh	17.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	870	4	48	279	13	5	2	329	159	2	3
Future Vol, veh/h	4	870	4	48	279	13	5	2	329	159	2	3
Conflicting Peds, #/hr	30	0	30	30	0	30	30	0	30	30	0	30
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	115	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	1088	5	60	349	16	6	3	411	199	3	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	395	0	0	1123	0	0	1457	1646	607	1093	1640	243
Stage 1	-	-	-	-	-	-	1131	1131	-	507	507	-
Stage 2	-	-	-	-	-	-	326	515	-	586	1133	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1160	-	-	618	-	-	91	98	439	~ 169	99	758
Stage 1	-	-	-	-	-	-	217	277	-	516	538	-
Stage 2	-	-	-	-	-	-	661	533	-	463	276	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1127	-	-	600	-	-	78	83	414	~ 1	84	715
Mov Cap-2 Maneuver	-	-	-	-	-	-	166	189	-	~ -59	162	-
Stage 1	-	-	-	-	-	-	210	268	-	499	470	-
Stage 2	-	-	-	-	-	-	572	466	-	~ 3	267	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.6	89.7	
HCM LOS			F	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	402	1127	-	-	600	-	-	+
HCM Lane V/C Ratio	1.045	0.004	-	-	0.1	-	-	-
HCM Control Delay (s)	89.7	8.2	-	-	11.7	-	-	-
HCM Lane LOS	F	A	-	-	B	-	-	-
HCM 95th %tile Q(veh)	13.7	0	-	-	0.3	-	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1339	0	318	20	118	9
Future Vol, veh/h	0	1339	0	318	20	118	9
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	1633	0	388	24	144	11

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	442	0	1633	-	0	1277	266
Stage 1	-	-	-	-	-	430	-
Stage 2	-	-	-	-	-	847	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1114	-	129	-	-	158	732
Stage 1	-	-	-	-	-	624	-
Stage 2	-	-	-	-	-	381	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1082	-	129	-	-	149	691
Mov Cap-2 Maneuver	-	-	-	-	-	272	-
Stage 1	-	-	-	-	-	606	-
Stage 2	-	-	-	-	-	370	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	30.6
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1082	-	129	-	-	272	691
HCM Lane V/C Ratio	-	-	-	-	-	0.529	0.016
HCM Control Delay (s)	0	-	0	-	-	32.2	10.3
HCM Lane LOS	A	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0	-	0	-	-	2.9	0

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	1441	367	31	40	9
Future Vol, veh/h	11	1441	367	31	40	9
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	1757	448	38	49	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	516	0	-	0	1432	303
Stage 1	-	-	-	-	497	-
Stage 2	-	-	-	-	935	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1046	-	-	-	125	693
Stage 1	-	-	-	-	577	-
Stage 2	-	-	-	-	342	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1016	-	-	-	116	654
Mov Cap-2 Maneuver	-	-	-	-	238	-
Stage 1	-	-	-	-	553	-
Stage 2	-	-	-	-	332	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	22.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1016	-	-	-	269
HCM Lane V/C Ratio	0.013	-	-	-	0.222
HCM Control Delay (s)	8.6	-	-	-	22.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	482	969	0	0	209	231	0	0	0	120	0	163
Future Volume (vph)	482	969	0	0	209	231	0	0	0	120	0	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.99				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1564				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1564				3433		2787
Peak-hour factor, PHF	0.83	0.83	0.92	0.92	0.83	0.83	0.92	0.92	0.92	0.83	0.92	0.83
Adj. Flow (vph)	581	1167	0	0	252	278	0	0	0	145	0	196
RTOR Reduction (vph)	0	0	0	0	0	9	0	0	0	0	0	0
Lane Group Flow (vph)	581	1167	0	0	252	269	0	0	0	145	0	196
Confl. Peds. (#/hr)						30						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	20.5	53.7			13.3	32.2				18.9		29.8
Effective Green, g (s)	20.5	53.7			13.3	32.2				18.9		29.8
Actuated g/C Ratio	0.30	0.79			0.20	0.47				0.28		0.44
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	1033	2790			691	861				952		1219
v/s Ratio Prot	c0.17	c0.33			0.07	c0.09				0.04		0.07
v/s Ratio Perm						0.09						
v/c Ratio	0.56	0.42			0.36	0.31				0.15		0.16
Uniform Delay, d1	20.0	2.3			23.7	11.1				18.6		11.6
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	0.6	0.1			0.4	0.2				0.1		0.1
Delay (s)	20.6	2.4			24.1	11.3				18.6		11.7
Level of Service	C	A			C	B				B		B
Approach Delay (s)		8.4			17.4			0.0			14.6	
Approach LOS		A			B			A			B	

Intersection Summary

HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	68.1	Sum of lost time (s)	20.7
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Appendix 3 Baseline Conditions Level-of-Service Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	335	18	331	1013	158	1	2	41	12	3	6
Future Volume (vph)	9	335	18	331	1013	158	1	2	41	12	3	6
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	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			0.96			0.99	
Flpb, ped/bikes	1.00	1.00		0.98	1.00			1.00			0.99	
Frt	1.00	0.99		1.00	0.98			0.87			0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1761	3501		1735	3437			1560			1702	
Flt Permitted	0.16	1.00		0.52	1.00			1.00			0.86	
Satd. Flow (perm)	304	3501		947	3437			1555			1500	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	10	376	20	372	1138	178	1	2	46	13	3	7
RTOR Reduction (vph)	0	3	0	0	10	0	0	37	0	0	6	0
Lane Group Flow (vph)	10	393	0	372	1306	0	0	12	0	0	17	0
Confl. Peds. (#/hr)	30		30	30		30	30		30	30		30
Confl. Bikes (#/hr)			15			15			15			15
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)	35.0	35.0		35.0	35.0			10.2			10.2	
Effective Green, g (s)	35.0	35.0		35.0	35.0			10.2			10.2	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.19			0.19	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	196	2260		611	2219			292			282	
v/s Ratio Prot		0.11			0.38							
v/s Ratio Perm	0.03			c0.39				0.01			c0.01	
v/c Ratio	0.05	0.17		0.61	0.59			0.04			0.06	
Uniform Delay, d1	3.5	3.8		5.6	5.5			18.0			18.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	0.0		1.7	0.4			0.1			0.1	
Delay (s)	3.6	3.9		7.3	5.9			18.1			18.2	
Level of Service	A	A		A	A			B			B	
Approach Delay (s)		3.9			6.2			18.1			18.2	
Approach LOS		A			A			B			B	

Intersection Summary

HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	54.2	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	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	335	18	331	1013	158	1	2	41	12	3	6
Future Volume (veh/h)	9	335	18	331	1013	158	1	2	41	12	3	6
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	0.99		0.94	0.97		0.95	0.97		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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	10	376	20	372	1138	178	1	2	46	13	3	7
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	246	1948	103	619	1739	271	61	25	406	301	78	126
Arrive On Green	0.57	0.57	0.57	0.57	0.57	0.57	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	417	3421	181	975	3053	475	5	87	1423	736	275	442
Grp Volume(v), veh/h	10	194	202	372	660	656	49	0	0	23	0	0
Grp Sat Flow(s),veh/h/ln	417	1777	1825	975	1777	1752	1516	0	0	1453	0	0
Q Serve(g_s), s	1.0	3.3	3.3	18.5	15.8	16.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	17.0	3.3	3.3	21.8	15.8	16.0	1.5	0.0	0.0	0.6	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.27	0.02		0.94	0.57		0.30
Lane Grp Cap(c), veh/h	246	1012	1040	619	1012	998	492	0	0	506	0	0
V/C Ratio(X)	0.04	0.19	0.19	0.60	0.65	0.66	0.10	0.00	0.00	0.05	0.00	0.00
Avail Cap(c_a), veh/h	308	1275	1309	763	1275	1257	949	0	0	938	0	0
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	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.0	6.5	6.5	11.7	9.1	9.2	16.4	0.0	0.0	16.1	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.1	0.9	0.8	0.9	0.1	0.0	0.0	0.0	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	0.1	1.0	1.0	3.3	4.8	4.8	0.5	0.0	0.0	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.1	6.5	6.6	12.7	10.0	10.0	16.5	0.0	0.0	16.1	0.0	0.0
LnGrp LOS	B	A	A	B	A	B	B	A	A	B	A	A
Approach Vol, veh/h		406			1688			49			23	
Approach Delay, s/veh		6.8			10.6			16.5			16.1	
Approach LOS		A			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.2		39.8		22.2		39.8				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		36.5		44.5		36.5		44.5				
Max Q Clear Time (g_c+I1), s		3.5		19.0		2.6		23.8				
Green Ext Time (p_c), s		0.3		2.4		0.1		11.5				
Intersection Summary												
HCM 6th Ctrl Delay			10.1									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	366	0	1458	65	48	1
Future Vol, veh/h	2	366	0	1458	65	48	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	411	0	1638	73	54	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1741	0	411	-	0	1945	916
Stage 1	-	-	-	-	-	1705	-
Stage 2	-	-	-	-	-	240	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	357	-	788	-	-	57	275
Stage 1	-	-	-	-	-	132	-
Stage 2	-	-	-	-	-	777	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	347	-	788	-	-	~ 53	260
Mov Cap-2 Maneuver	-	-	-	-	-	109	-
Stage 1	-	-	-	-	-	127	-
Stage 2	-	-	-	-	-	754	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	65.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	347	-	788	-	-	109	260
HCM Lane V/C Ratio	0.006	-	-	-	-	0.495	0.004
HCM Control Delay (s)	15.4	-	0	-	-	66.7	18.9
HCM Lane LOS	C	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	2.2	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	413	1465	9	4	0
Future Vol, veh/h	1	413	1465	9	4	0
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	464	1646	10	4	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1686	0	-	0	1945	888
Stage 1	-	-	-	-	1681	-
Stage 2	-	-	-	-	264	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	375	-	-	-	57	287
Stage 1	-	-	-	-	136	-
Stage 2	-	-	-	-	756	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	364	-	-	-	54	271
Mov Cap-2 Maneuver	-	-	-	-	113	-
Stage 1	-	-	-	-	132	-
Stage 2	-	-	-	-	734	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	38.2
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	364	-	-	-	113
HCM Lane V/C Ratio	0.003	-	-	-	0.04
HCM Control Delay (s)	14.9	-	-	-	38.2
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	159	262	0	0	1008	66	0	0	0	188	0	490
Future Volume (vph)	159	262	0	0	1008	66	0	0	0	188	0	490
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.98				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1544				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1544				3433		2787
Peak-hour factor, PHF	0.89	0.89	0.92	0.92	0.89	0.89	0.92	0.92	0.92	0.89	0.92	0.89
Adj. Flow (vph)	179	294	0	0	1133	74	0	0	0	211	0	551
RTOR Reduction (vph)	0	0	0	0	0	19	0	0	0	0	0	0
Lane Group Flow (vph)	179	294	0	0	1133	55	0	0	0	211	0	551
Confl. Peds. (#/hr)						30						
Confl. Bikes (#/hr)						15						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	10.6	83.4			42.3	72.9				30.6		30.5
Effective Green, g (s)	10.6	83.4			42.3	72.9				30.6		30.5
Actuated g/C Ratio	0.11	0.84			0.43	0.74				0.31		0.31
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	367	2984			1513	1220				1062		859
v/s Ratio Prot	0.05	0.08			c0.32	0.01				c0.06		c0.20
v/s Ratio Perm						0.02						
v/c Ratio	0.49	0.10			0.75	0.04				0.20		0.64
Uniform Delay, d1	41.6	1.3			23.8	3.5				25.1		29.5
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	0.7	0.0			2.1	0.0				0.1		1.7
Delay (s)	42.3	1.3			25.9	3.6				25.2		31.2
Level of Service	D	A			C	A				C		C
Approach Delay (s)		16.9			24.6			0.0			29.5	
Approach LOS		B			C			A			C	

Intersection Summary

HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	98.9	Sum of lost time (s)	20.7
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
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)	4	977	4	49	296	13	5	2	336	162	2	3
Future Volume (vph)	4	977	4	49	296	13	5	2	336	162	2	3
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	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.97			1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00			1.00			0.99	
Frt	1.00	1.00		1.00	0.99			0.87			1.00	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.95	
Satd. Flow (prot)	1729	3536		1761	3507			1561			1759	
Flt Permitted	0.52	1.00		0.15	1.00			1.00			0.39	
Satd. Flow (perm)	953	3536		281	3507			1556			719	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	5	1221	5	61	370	16	6	2	420	202	2	4
RTOR Reduction (vph)	0	1	0	0	4	0	0	8	0	0	1	0
Lane Group Flow (vph)	5	1225	0	61	382	0	0	421	0	0	209	0
Confl. Peds. (#/hr)	30		30	30		30	30		30	30		30
Confl. Bikes (#/hr)			15			15			15			15
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)	26.4	26.4		26.4	26.4			21.8			21.8	
Effective Green, g (s)	26.4	26.4		26.4	26.4			21.8			21.8	
Actuated g/C Ratio	0.46	0.46		0.46	0.46			0.38			0.38	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	439	1632		129	1618			593			274	
v/s Ratio Prot		c0.35			0.11							
v/s Ratio Perm	0.01			0.22				0.27			c0.29	
v/c Ratio	0.01	0.75		0.47	0.24			0.71			0.76	
Uniform Delay, d1	8.3	12.7		10.6	9.3			15.0			15.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	2.0		2.7	0.1			3.9			11.8	
Delay (s)	8.3	14.7		13.3	9.4			18.9			27.3	
Level of Service	A	B		B	A			B			C	
Approach Delay (s)		14.7			9.9			18.9			27.3	
Approach LOS		B			A			B			C	

Intersection Summary

HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	57.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	96.4%	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)	4	977	4	49	296	13	5	2	336	162	2	3
Future Volume (veh/h)	4	977	4	49	296	13	5	2	336	162	2	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.93	1.00		0.93	0.99		0.96	0.99		0.96
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	1221	5	61	370	16	6	2	420	202	2	4
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	468	1585	6	175	1511	65	56	10	644	401	5	6
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	981	3628	15	454	3459	149	6	23	1497	688	11	14
Grp Volume(v), veh/h	5	598	628	61	189	197	428	0	0	208	0	0
Grp Sat Flow(s),veh/h/ln	981	1777	1866	454	1777	1831	1525	0	0	712	0	0
Q Serve(g_s), s	0.2	19.3	19.3	8.9	4.5	4.6	0.0	0.0	0.0	5.3	0.0	0.0
Cycle Q Clear(g_c), s	4.8	19.3	19.3	28.2	4.5	4.6	15.0	0.0	0.0	20.3	0.0	0.0
Prop In Lane	1.00		0.01	1.00		0.08	0.01		0.98	0.97		0.02
Lane Grp Cap(c), veh/h	468	776	815	175	776	800	710	0	0	411	0	0
V/C Ratio(X)	0.01	0.77	0.77	0.35	0.24	0.25	0.60	0.00	0.00	0.51	0.00	0.00
Avail Cap(c_a), veh/h	468	776	815	175	776	800	878	0	0	518	0	0
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	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.5	16.1	16.1	28.1	12.0	12.0	15.2	0.0	0.0	18.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	4.8	4.5	1.2	0.2	0.2	0.8	0.0	0.0	1.0	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	0.0	7.8	8.1	1.0	1.6	1.7	4.8	0.0	0.0	2.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.5	20.9	20.7	29.3	12.2	12.2	16.1	0.0	0.0	19.1	0.0	0.0
LnGrp LOS	B	C	C	C	B	B	B	A	A	B	A	A
Approach Vol, veh/h		1231			447			428			208	
Approach Delay, s/veh		20.8			14.5			16.1			19.1	
Approach LOS		C			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		33.5		34.0		33.5		34.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		36.5		29.5		36.5		29.5				
Max Q Clear Time (g_c+I1), s		17.0		21.3		22.3		30.2				
Green Ext Time (p_c), s		3.0		4.7		1.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			18.5									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1456	0	336	20	120	9
Future Vol, veh/h	0	1456	0	336	20	120	9
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	1776	0	410	24	146	11

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	464	0	1776	-	0	1370	277
Stage 1	-	-	-	-	-	452	-
Stage 2	-	-	-	-	-	918	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1094	-	104	-	-	~ 137	720
Stage 1	-	-	-	-	-	608	-
Stage 2	-	-	-	-	-	349	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1063	-	104	-	-	~ 129	679
Mov Cap-2 Maneuver	-	-	-	-	-	249	-
Stage 1	-	-	-	-	-	590	-
Stage 2	-	-	-	-	-	339	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	36.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1063	-	104	-	-	249	679
HCM Lane V/C Ratio	-	-	-	-	-	0.588	0.016
HCM Control Delay (s)	0	-	0	-	-	38.2	10.4
HCM Lane LOS	A	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0	-	0	-	-	3.4	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	1569	393	2	16	2
Future Vol, veh/h	2	1569	393	2	16	2
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	1913	479	2	20	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	511	0	-	0	1501	301
Stage 1	-	-	-	-	510	-
Stage 2	-	-	-	-	991	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1050	-	-	-	113	695
Stage 1	-	-	-	-	568	-
Stage 2	-	-	-	-	320	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1020	-	-	-	106	656
Mov Cap-2 Maneuver	-	-	-	-	225	-
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	311	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	21.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1020	-	-	-	243
HCM Lane V/C Ratio	0.002	-	-	-	0.09
HCM Control Delay (s)	8.5	-	-	-	21.3
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	513	1041	0	0	210	236	0	0	0	122	0	159
Future Volume (vph)	513	1041	0	0	210	236	0	0	0	122	0	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.99				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1564				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1564				3433		2787
Peak-hour factor, PHF	0.83	0.83	0.92	0.92	0.83	0.83	0.92	0.92	0.92	0.83	0.92	0.83
Adj. Flow (vph)	618	1254	0	0	253	284	0	0	0	147	0	192
RTOR Reduction (vph)	0	0	0	0	0	9	0	0	0	0	0	0
Lane Group Flow (vph)	618	1254	0	0	253	275	0	0	0	147	0	192
Confl. Peds. (#/hr)						30						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	20.5	53.7			13.3	32.2				18.9		29.8
Effective Green, g (s)	20.5	53.7			13.3	32.2				18.9		29.8
Actuated g/C Ratio	0.30	0.79			0.20	0.47				0.28		0.44
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	1033	2790			691	861				952		1219
v/s Ratio Prot	c0.18	c0.35			0.07	c0.09				0.04		0.07
v/s Ratio Perm						0.09						
v/c Ratio	0.60	0.45			0.37	0.32				0.15		0.16
Uniform Delay, d1	20.3	2.4			23.7	11.1				18.6		11.6
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	0.8	0.1			0.4	0.2				0.1		0.1
Delay (s)	21.1	2.5			24.1	11.4				18.6		11.6
Level of Service	C	A			C	B				B		B
Approach Delay (s)		8.6			17.4			0.0			14.7	
Approach LOS		A			B			A			B	

Intersection Summary

HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	68.1	Sum of lost time (s)	20.7
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
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)	9	344	18	331	1025	158	1	2	41	12	3	6
Future Volume (vph)	9	344	18	331	1025	158	1	2	41	12	3	6
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	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			0.96			0.99	
Flpb, ped/bikes	1.00	1.00		0.98	1.00			1.00			0.99	
Frt	1.00	0.99		1.00	0.98			0.87			0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1761	3502		1735	3438			1559			1702	
Flt Permitted	0.16	1.00		0.51	1.00			1.00			0.86	
Satd. Flow (perm)	299	3502		937	3438			1554			1499	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	10	387	20	372	1152	178	1	2	46	13	3	7
RTOR Reduction (vph)	0	3	0	0	9	0	0	37	0	0	6	0
Lane Group Flow (vph)	10	404	0	372	1321	0	0	12	0	0	17	0
Confl. Peds. (#/hr)	30		30	30		30	30		30	30		30
Confl. Bikes (#/hr)			15			15			15			15
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)	35.5	35.5		35.5	35.5			10.2			10.2	
Effective Green, g (s)	35.5	35.5		35.5	35.5			10.2			10.2	
Actuated g/C Ratio	0.65	0.65		0.65	0.65			0.19			0.19	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	194	2272		608	2231			289			279	
v/s Ratio Prot		0.12			0.38							
v/s Ratio Perm	0.03			c0.40				0.01			c0.01	
v/c Ratio	0.05	0.18		0.61	0.59			0.04			0.06	
Uniform Delay, d1	3.5	3.8		5.6	5.5			18.2			18.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	0.0		1.8	0.4			0.1			0.1	
Delay (s)	3.6	3.8		7.4	5.9			18.3			18.4	
Level of Service	A	A		A	A			B			B	
Approach Delay (s)		3.8			6.2			18.3			18.4	
Approach LOS		A			A			B			B	

Intersection Summary

HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	54.7	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.3%	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)	9	344	18	331	1025	158	1	2	41	12	3	6
Future Volume (veh/h)	9	344	18	331	1025	158	1	2	41	12	3	6
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	0.99		0.94	0.97		0.95	0.97		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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	10	387	20	372	1152	178	1	2	46	13	3	7
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	243	1961	101	615	1750	269	60	25	404	299	78	126
Arrive On Green	0.57	0.57	0.57	0.57	0.57	0.57	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	411	3427	176	966	3060	470	5	87	1423	736	274	442
Grp Volume(v), veh/h	10	200	207	372	667	663	49	0	0	23	0	0
Grp Sat Flow(s),veh/h/ln	411	1777	1826	966	1777	1753	1516	0	0	1453	0	0
Q Serve(g_s), s	1.1	3.4	3.4	18.9	16.1	16.3	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	17.4	3.4	3.4	22.4	16.1	16.3	1.5	0.0	0.0	0.6	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.27	0.02		0.94	0.57		0.30
Lane Grp Cap(c), veh/h	243	1017	1045	615	1017	1003	489	0	0	503	0	0
V/C Ratio(X)	0.04	0.20	0.20	0.61	0.66	0.66	0.10	0.00	0.00	0.05	0.00	0.00
Avail Cap(c_a), veh/h	300	1263	1298	748	1263	1246	940	0	0	929	0	0
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	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.2	6.5	6.5	11.9	9.2	9.2	16.6	0.0	0.0	16.3	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.1	1.0	0.9	0.9	0.1	0.0	0.0	0.0	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	0.1	1.0	1.0	3.4	4.9	4.9	0.5	0.0	0.0	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.3	6.6	6.6	12.8	10.0	10.2	16.7	0.0	0.0	16.3	0.0	0.0
LnGrp LOS	B	A	A	B	B	B	B	A	A	B	A	A
Approach Vol, veh/h		417			1702			49			23	
Approach Delay, s/veh		6.8			10.7			16.7			16.3	
Approach LOS		A			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.3		40.3		22.3		40.3				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		36.5		44.5		36.5		44.5				
Max Q Clear Time (g_c+I1), s		3.5		19.4		2.6		24.4				
Green Ext Time (p_c), s		0.3		2.5		0.1		11.5				
Intersection Summary												
HCM 6th Ctrl Delay			10.1									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	375	0	1470	65	48	1
Future Vol, veh/h	2	375	0	1470	65	48	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	421	0	1652	73	54	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1755	0	421	-	0	1964	923
Stage 1	-	-	-	-	-	1719	-
Stage 2	-	-	-	-	-	245	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	353	-	777	-	-	55	272
Stage 1	-	-	-	-	-	130	-
Stage 2	-	-	-	-	-	773	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	343	-	777	-	-	~ 52	257
Mov Cap-2 Maneuver	-	-	-	-	-	108	-
Stage 1	-	-	-	-	-	125	-
Stage 2	-	-	-	-	-	751	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	66.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	343	-	777	-	-	108	257
HCM Lane V/C Ratio	0.007	-	-	-	-	0.499	0.004
HCM Control Delay (s)	15.6	-	0	-	-	67.7	19.1
HCM Lane LOS	C	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	2.2	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	413	1465	39	46	12
Future Vol, veh/h	10	413	1465	39	46	12
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	464	1646	44	52	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1720	0	-	0	1982	905
Stage 1	-	-	-	-	1698	-
Stage 2	-	-	-	-	284	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	364	-	-	-	54	279
Stage 1	-	-	-	-	133	-
Stage 2	-	-	-	-	739	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	354	-	-	-	~ 49	263
Mov Cap-2 Maneuver	-	-	-	-	107	-
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	718	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	64.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	354	-	-	-	122
HCM Lane V/C Ratio	0.032	-	-	-	0.534
HCM Control Delay (s)	15.5	-	-	-	64.2
HCM Lane LOS	C	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	2.5

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	177	286	0	0	1025	66	0	0	0	188	0	503
Future Volume (vph)	177	286	0	0	1025	66	0	0	0	188	0	503
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.98				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1544				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1544				3433		2787
Peak-hour factor, PHF	0.89	0.89	0.92	0.92	0.89	0.89	0.92	0.92	0.92	0.89	0.92	0.89
Adj. Flow (vph)	199	321	0	0	1152	74	0	0	0	211	0	565
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	0	0
Lane Group Flow (vph)	199	321	0	0	1152	54	0	0	0	211	0	565
Confl. Peds. (#/hr)						30						
Confl. Bikes (#/hr)						15						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	11.1	84.4			42.4	73.4				31.0		31.4
Effective Green, g (s)	11.1	84.4			42.4	73.4				31.0		31.4
Actuated g/C Ratio	0.11	0.84			0.42	0.73				0.31		0.31
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	381	2989			1502	1216				1065		875
v/s Ratio Prot	0.06	0.09			c0.33	0.01				c0.06		c0.20
v/s Ratio Perm						0.02						
v/c Ratio	0.52	0.11			0.77	0.04				0.20		0.65
Uniform Delay, d1	41.9	1.3			24.5	3.6				25.3		29.5
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	1.0	0.0			2.4	0.0				0.1		1.7
Delay (s)	42.9	1.3			27.0	3.7				25.4		31.1
Level of Service	D	A			C	A				C		C
Approach Delay (s)		17.2			25.6			0.0			29.6	
Approach LOS		B			C			A			C	

Intersection Summary

HCM 2000 Control Delay	25.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	99.9	Sum of lost time (s)	20.7
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
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)	4	986	4	49	303	13	5	2	336	162	2	3
Future Volume (vph)	4	986	4	49	303	13	5	2	336	162	2	3
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	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.97			1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00			1.00			0.99	
Frt	1.00	1.00		1.00	0.99			0.87			1.00	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.95	
Satd. Flow (prot)	1730	3536		1761	3508			1560			1759	
Flt Permitted	0.52	1.00		0.15	1.00			1.00			0.39	
Satd. Flow (perm)	945	3536		279	3508			1556			718	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	5	1232	5	61	379	16	6	2	420	202	2	4
RTOR Reduction (vph)	0	1	0	0	4	0	0	7	0	0	1	0
Lane Group Flow (vph)	5	1237	0	61	391	0	0	422	0	0	209	0
Confl. Peds. (#/hr)	30		30	30		30	30		30	30		30
Confl. Bikes (#/hr)			15			15			15			15
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)	26.6	26.6		26.6	26.6			21.9			21.9	
Effective Green, g (s)	26.6	26.6		26.6	26.6			21.9			21.9	
Actuated g/C Ratio	0.46	0.46		0.46	0.46			0.38			0.38	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	437	1635		129	1622			592			273	
v/s Ratio Prot		c0.35			0.11							
v/s Ratio Perm	0.01			0.22				0.27			c0.29	
v/c Ratio	0.01	0.76		0.47	0.24			0.71			0.76	
Uniform Delay, d1	8.3	12.8		10.6	9.3			15.1			15.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	2.1		2.7	0.1			4.0			12.0	
Delay (s)	8.4	14.8		13.4	9.4			19.2			27.6	
Level of Service	A	B		B	A			B			C	
Approach Delay (s)		14.8			9.9			19.2			27.6	
Approach LOS		B			A			B			C	

Intersection Summary

HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	57.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	96.7%	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)	4	986	4	49	303	13	5	2	336	162	2	3
Future Volume (veh/h)	4	986	4	49	303	13	5	2	336	162	2	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.93	1.00		0.93	0.99		0.96	0.99		0.96
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	1232	5	61	379	16	6	2	420	202	2	4
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	464	1585	6	173	1513	64	56	10	644	401	5	6
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	973	3629	15	449	3463	146	6	23	1497	688	11	14
Grp Volume(v), veh/h	5	603	634	61	194	201	428	0	0	208	0	0
Grp Sat Flow(s),veh/h/ln	973	1777	1866	449	1777	1832	1525	0	0	712	0	0
Q Serve(g_s), s	0.2	19.6	19.6	9.1	4.7	4.7	0.0	0.0	0.0	5.3	0.0	0.0
Cycle Q Clear(g_c), s	4.9	19.6	19.6	28.6	4.7	4.7	15.0	0.0	0.0	20.3	0.0	0.0
Prop In Lane	1.00		0.01	1.00		0.08	0.01		0.98	0.97		0.02
Lane Grp Cap(c), veh/h	464	776	815	173	776	800	710	0	0	411	0	0
V/C Ratio(X)	0.01	0.78	0.78	0.35	0.25	0.25	0.60	0.00	0.00	0.51	0.00	0.00
Avail Cap(c_a), veh/h	464	776	815	173	776	800	878	0	0	518	0	0
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	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.6	16.2	16.2	28.4	12.0	12.0	15.2	0.0	0.0	18.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	5.0	4.8	1.2	0.2	0.2	0.8	0.0	0.0	1.0	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	0.0	7.9	8.3	1.0	1.7	1.7	4.8	0.0	0.0	2.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.6	21.2	21.0	29.6	12.2	12.2	16.1	0.0	0.0	19.1	0.0	0.0
LnGrp LOS	B	C	C	C	B	B	B	A	A	B	A	A
Approach Vol, veh/h		1242			456			428			208	
Approach Delay, s/veh		21.1			14.5			16.1			19.1	
Approach LOS		C			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		33.5		34.0		33.5		34.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		36.5		29.5		36.5		29.5				
Max Q Clear Time (g_c+I1), s		17.0		21.6		22.3		30.6				
Green Ext Time (p_c), s		3.0		4.6		1.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			18.7									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1465	0	343	20	120	9
Future Vol, veh/h	0	1465	0	343	20	120	9
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	1787	0	418	24	146	11

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	472	0	1787	-	0	1384	281
Stage 1	-	-	-	-	-	460	-
Stage 2	-	-	-	-	-	924	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1086	-	102	-	-	~ 135	716
Stage 1	-	-	-	-	-	602	-
Stage 2	-	-	-	-	-	347	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1055	-	102	-	-	~ 127	676
Mov Cap-2 Maneuver	-	-	-	-	-	247	-
Stage 1	-	-	-	-	-	585	-
Stage 2	-	-	-	-	-	337	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	36.8
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1055	-	102	-	-	247	676
HCM Lane V/C Ratio	-	-	-	-	-	0.592	0.016
HCM Control Delay (s)	0	-	0	-	-	38.8	10.4
HCM Lane LOS	A	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0	-	0	-	-	3.4	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	1569	393	31	40	9
Future Vol, veh/h	11	1569	393	31	40	9
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	1913	479	38	49	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	547	0	-	0	1541	319
Stage 1	-	-	-	-	528	-
Stage 2	-	-	-	-	1013	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1018	-	-	-	106	677
Stage 1	-	-	-	-	556	-
Stage 2	-	-	-	-	312	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	989	-	-	-	99	639
Mov Cap-2 Maneuver	-	-	-	-	217	-
Stage 1	-	-	-	-	533	-
Stage 2	-	-	-	-	303	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	24.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	989	-	-	-	247
HCM Lane V/C Ratio	0.014	-	-	-	0.242
HCM Control Delay (s)	8.7	-	-	-	24.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	524	1054	0	0	226	236	0	0	0	122	0	172
Future Volume (vph)	524	1054	0	0	226	236	0	0	0	122	0	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.99				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1563				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1563				3433		2787
Peak-hour factor, PHF	0.83	0.83	0.92	0.92	0.83	0.83	0.92	0.92	0.92	0.83	0.92	0.83
Adj. Flow (vph)	631	1270	0	0	272	284	0	0	0	147	0	207
RTOR Reduction (vph)	0	0	0	0	0	9	0	0	0	0	0	0
Lane Group Flow (vph)	631	1270	0	0	272	275	0	0	0	147	0	207
Confl. Peds. (#/hr)						30						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	20.5	54.0			13.5	32.5				19.0		29.9
Effective Green, g (s)	20.5	54.0			13.5	32.5				19.0		29.9
Actuated g/C Ratio	0.30	0.79			0.20	0.48				0.28		0.44
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	1028	2793			698	863				953		1218
v/s Ratio Prot	c0.18	c0.36			0.08	c0.09				0.04		0.07
v/s Ratio Perm						0.09						
v/c Ratio	0.61	0.45			0.39	0.32				0.15		0.17
Uniform Delay, d1	20.6	2.4			23.9	11.1				18.6		11.7
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	0.9	0.1			0.4	0.2				0.1		0.1
Delay (s)	21.5	2.5			24.3	11.3				18.7		11.8
Level of Service	C	A			C	B				B		B
Approach Delay (s)		8.8			17.7			0.0			14.7	
Approach LOS		A			B			A			B	

Intersection Summary

HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	68.4	Sum of lost time (s)	20.7
Intersection Capacity Utilization	50.4%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Appendix 4 Cumulative Conditions Level-of-Service Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	370	20	366	1119	175	1	2	45	32	3	7
Future Volume (vph)	10	370	20	366	1119	175	1	2	45	32	3	7
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	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			0.96			0.99	
Flpb, ped/bikes	1.00	1.00		0.98	1.00			1.00			0.99	
Frt	1.00	0.99		1.00	0.98			0.87			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.96	
Satd. Flow (prot)	1762	3501		1731	3434			1552			1719	
Flt Permitted	0.14	1.00		0.50	1.00			1.00			0.77	
Satd. Flow (perm)	259	3501		907	3434			1547			1374	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	11	416	22	411	1257	197	1	2	51	36	3	8
RTOR Reduction (vph)	0	2	0	0	8	0	0	42	0	0	7	0
Lane Group Flow (vph)	11	436	0	411	1446	0	0	12	0	0	40	0
Confl. Peds. (#/hr)	30		30	30		30	30		30	30		30
Confl. Bikes (#/hr)			15			15			15			15
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)	44.4	44.4		44.4	44.4			11.0			11.0	
Effective Green, g (s)	44.4	44.4		44.4	44.4			11.0			11.0	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.17			0.17	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	178	2413		625	2367			264			234	
v/s Ratio Prot		0.12			0.42							
v/s Ratio Perm	0.04			c0.45				0.01			c0.03	
v/c Ratio	0.06	0.18		0.66	0.61			0.04			0.17	
Uniform Delay, d1	3.2	3.5		5.7	5.4			22.3			22.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	0.0		2.5	0.5			0.1			0.4	
Delay (s)	3.4	3.6		8.2	5.8			22.4			23.2	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		3.6			6.4			22.4			23.2	
Approach LOS		A			A			C			C	

Intersection Summary

HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	64.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	74.7%	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)	10	370	20	366	1119	175	1	2	45	32	3	7
Future Volume (veh/h)	10	370	20	366	1119	175	1	2	45	32	3	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	0.99		0.95	0.97		0.94	0.97		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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	416	22	411	1257	197	1	2	51	36	3	8
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	218	2030	107	611	1812	282	55	22	391	377	37	66
Arrive On Green	0.59	0.59	0.59	0.59	0.59	0.59	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	366	3422	180	940	3055	475	5	79	1428	1032	135	239
Grp Volume(v), veh/h	11	215	223	411	726	728	54	0	0	47	0	0
Grp Sat Flow(s),veh/h/ln	366	1777	1826	940	1777	1753	1512	0	0	1406	0	0
Q Serve(g_s), s	1.5	3.8	3.8	24.4	19.1	19.6	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	21.0	3.8	3.8	28.2	19.1	19.6	1.8	0.0	0.0	1.3	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.27	0.02		0.94	0.77		0.17
Lane Grp Cap(c), veh/h	218	1054	1083	611	1054	1040	468	0	0	479	0	0
V/C Ratio(X)	0.05	0.20	0.21	0.67	0.69	0.70	0.12	0.00	0.00	0.10	0.00	0.00
Avail Cap(c_a), veh/h	241	1166	1199	670	1166	1151	866	0	0	841	0	0
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	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.9	6.4	6.4	12.9	9.5	9.6	18.5	0.0	0.0	18.3	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.1	2.4	1.5	1.7	0.1	0.0	0.0	0.1	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	0.1	1.1	1.2	4.5	6.0	6.1	0.6	0.0	0.0	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.0	6.5	6.5	15.3	11.0	11.3	18.6	0.0	0.0	18.4	0.0	0.0
LnGrp LOS	B	A	A	B	B	B	B	A	A	B	A	A
Approach Vol, veh/h		449			1865			54			47	
Approach Delay, s/veh		6.7			12.1			18.6			18.4	
Approach LOS		A			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		23.1		44.7		23.1		44.7				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		36.5		44.5		36.5		44.5				
Max Q Clear Time (g_c+I1), s		3.8		23.0		3.3		30.2				
Green Ext Time (p_c), s		0.3		2.6		0.2		10.0				
Intersection Summary												
HCM 6th Ctrl Delay			11.3									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	423	0	1611	72	34	1
Future Vol, veh/h	2	423	0	1611	72	34	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	475	0	1810	81	38	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1921	0	475	-	0	2153	1006
Stage 1	-	-	-	-	-	1881	-
Stage 2	-	-	-	-	-	272	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	304	-	718	-	-	41	239
Stage 1	-	-	-	-	-	106	-
Stage 2	-	-	-	-	-	749	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	295	-	718	-	-	~ 38	226
Mov Cap-2 Maneuver	-	-	-	-	-	88	-
Stage 1	-	-	-	-	-	102	-
Stage 2	-	-	-	-	-	727	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	72.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	295	-	718	-	-	88	226
HCM Lane V/C Ratio	0.008	-	-	-	-	0.434	0.005
HCM Control Delay (s)	17.3	-	0	-	-	74.2	21
HCM Lane LOS	C	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	1.8	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	456	1619	10	4	0
Future Vol, veh/h	1	456	1619	10	4	0
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	512	1819	11	4	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1860	0	-	0	2143	975
Stage 1	-	-	-	-	1855	-
Stage 2	-	-	-	-	288	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	321	-	-	-	42	251
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	735	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	312	-	-	-	39	237
Mov Cap-2 Maneuver	-	-	-	-	91	-
Stage 1	-	-	-	-	106	-
Stage 2	-	-	-	-	714	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	46.6
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	312	-	-	-	91
HCM Lane V/C Ratio	0.004	-	-	-	0.049
HCM Control Delay (s)	16.6	-	-	-	46.6
HCM Lane LOS	C	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	176	289	0	0	1114	73	0	0	0	208	0	541
Future Volume (vph)	176	289	0	0	1114	73	0	0	0	208	0	541
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.98				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1544				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1544				3433		2787
Peak-hour factor, PHF	0.89	0.89	0.92	0.92	0.89	0.89	0.92	0.92	0.92	0.89	0.92	0.89
Adj. Flow (vph)	198	325	0	0	1252	82	0	0	0	234	0	608
RTOR Reduction (vph)	0	0	0	0	0	22	0	0	0	0	0	0
Lane Group Flow (vph)	198	325	0	0	1252	60	0	0	0	234	0	608
Confl. Peds. (#/hr)						30						
Confl. Bikes (#/hr)						15						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	11.2	85.7			42.3	74.7				32.4		32.8
Effective Green, g (s)	11.2	85.7			42.3	74.7				32.4		32.8
Actuated g/C Ratio	0.11	0.85			0.42	0.74				0.32		0.32
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	379	2994			1477	1219				1098		902
v/s Ratio Prot	0.06	0.09			c0.35	0.02				c0.07		c0.22
v/s Ratio Perm						0.02						
v/c Ratio	0.52	0.11			0.85	0.05				0.21		0.67
Uniform Delay, d1	42.5	1.3			26.6	3.6				25.1		29.6
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	1.0	0.0			4.8	0.0				0.1		2.0
Delay (s)	43.5	1.3			31.4	3.6				25.3		31.7
Level of Service	D	A			C	A				C		C
Approach Delay (s)		17.3			29.7			0.0			29.9	
Approach LOS		B			C			A			C	

Intersection Summary

HCM 2000 Control Delay	27.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	101.3	Sum of lost time (s)	20.7
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
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)	4	1079	4	54	327	14	6	2	371	213	2	3
Future Volume (vph)	4	1079	4	54	327	14	6	2	371	213	2	3
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	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.96			1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00			1.00			0.99	
Frt	1.00	1.00		1.00	0.99			0.87			1.00	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.95	
Satd. Flow (prot)	1726	3536		1763	3505			1559			1759	
Flt Permitted	0.49	1.00		0.14	1.00			0.99			0.37	
Satd. Flow (perm)	886	3536		254	3505			1552			685	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	5	1349	5	68	409	18	8	2	464	266	2	4
RTOR Reduction (vph)	0	1	0	0	4	0	0	5	0	0	1	0
Lane Group Flow (vph)	5	1353	0	68	423	0	0	470	0	0	272	0
Confl. Peds. (#/hr)	30		30	30		30	30		30	30		30
Confl. Bikes (#/hr)			15			15			15			15
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)	29.2	29.2		29.2	29.2			28.8			28.8	
Effective Green, g (s)	29.2	29.2		29.2	29.2			28.8			28.8	
Actuated g/C Ratio	0.44	0.44		0.44	0.44			0.43			0.43	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	386	1541		110	1527			667			294	
v/s Ratio Prot		c0.38			0.12							
v/s Ratio Perm	0.01			0.27				0.30			c0.40	
v/c Ratio	0.01	0.88		0.62	0.28			0.71			0.93	
Uniform Delay, d1	10.7	17.3		14.6	12.1			15.6			18.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	6.0		9.9	0.1			3.4			33.5	
Delay (s)	10.7	23.3		24.5	12.2			19.0			51.6	
Level of Service	B	C		C	B			B			D	
Approach Delay (s)		23.2			13.9			19.0			51.6	
Approach LOS		C			B			B			D	

Intersection Summary

HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	67.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	101.1%	ICU Level of Service	G
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)	4	1079	4	54	327	14	6	2	371	213	2	3
Future Volume (veh/h)	4	1079	4	54	327	14	6	2	371	213	2	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.93	1.00		0.93	0.99		0.96	0.99		0.96
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	1349	5	68	409	18	8	2	464	266	2	4
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	408	1475	5	121	1404	62	54	12	729	403	3	5
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	945	3630	13	403	3455	152	9	25	1552	650	7	10
Grp Volume(v), veh/h	5	660	694	68	210	217	474	0	0	272	0	0
Grp Sat Flow(s),veh/h/ln	945	1777	1867	403	1777	1830	1586	0	0	667	0	0
Q Serve(g_s), s	0.3	25.5	25.5	4.0	5.8	5.8	0.0	0.0	0.0	12.3	0.0	0.0
Cycle Q Clear(g_c), s	6.1	25.5	25.5	29.5	5.8	5.8	17.3	0.0	0.0	29.5	0.0	0.0
Prop In Lane	1.00		0.01	1.00		0.08	0.02		0.98	0.98		0.01
Lane Grp Cap(c), veh/h	408	722	759	121	722	744	795	0	0	411	0	0
V/C Ratio(X)	0.01	0.91	0.91	0.56	0.29	0.29	0.60	0.00	0.00	0.66	0.00	0.00
Avail Cap(c_a), veh/h	408	722	759	121	722	744	846	0	0	442	0	0
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	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.6	20.3	20.4	35.6	14.5	14.5	14.8	0.0	0.0	20.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	16.2	15.6	5.7	0.2	0.2	1.0	0.0	0.0	3.3	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	0.1	12.5	13.1	1.3	2.1	2.2	5.6	0.0	0.0	4.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.6	36.6	36.0	41.3	14.7	14.7	15.8	0.0	0.0	24.1	0.0	0.0
LnGrp LOS	B	D	D	D	B	B	B	A	A	C	A	A
Approach Vol, veh/h		1359			495			474			272	
Approach Delay, s/veh		36.2			18.4			15.8			24.1	
Approach LOS		D			B			B			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		38.6		34.0		38.6		34.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		36.5		29.5		36.5		29.5				
Max Q Clear Time (g_c+I1), s		19.3		27.5		31.5		31.5				
Green Ext Time (p_c), s		3.2		1.5		0.9		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			27.8									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1643	0	371	22	99	10
Future Vol, veh/h	0	1643	0	371	22	99	10
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	2004	0	452	27	121	12

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	509	0	2004	-	0	1528	300
Stage 1	-	-	-	-	-	496	-
Stage 2	-	-	-	-	-	1032	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1052	-	74	-	-	~ 108	696
Stage 1	-	-	-	-	-	577	-
Stage 2	-	-	-	-	-	304	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1022	-	74	-	-	~ 102	657
Mov Cap-2 Maneuver	-	-	-	-	-	217	-
Stage 1	-	-	-	-	-	560	-
Stage 2	-	-	-	-	-	295	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	37.8
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1022	-	74	-	-	217	657
HCM Lane V/C Ratio	-	-	-	-	-	0.556	0.019
HCM Control Delay (s)	0	-	0	-	-	40.6	10.6
HCM Lane LOS	A	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0	-	0	-	-	3	0.1

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	1734	434	2	18	2
Future Vol, veh/h	2	1734	434	2	18	2
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	2115	529	2	22	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	561	0	-	0	1652	326
Stage 1	-	-	-	-	560	-
Stage 2	-	-	-	-	1092	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1006	-	-	-	89	670
Stage 1	-	-	-	-	535	-
Stage 2	-	-	-	-	283	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	977	-	-	-	84	632
Mov Cap-2 Maneuver	-	-	-	-	198	-
Stage 1	-	-	-	-	518	-
Stage 2	-	-	-	-	275	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	24.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	977	-	-	-	213
HCM Lane V/C Ratio	0.002	-	-	-	0.115
HCM Control Delay (s)	8.7	-	-	-	24.1
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	567	1150	0	0	232	261	0	0	0	135	0	176
Future Volume (vph)	567	1150	0	0	232	261	0	0	0	135	0	176
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.99				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1563				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1563				3433		2787
Peak-hour factor, PHF	0.83	0.83	0.92	0.92	0.83	0.83	0.92	0.92	0.92	0.83	0.92	0.83
Adj. Flow (vph)	683	1386	0	0	280	314	0	0	0	163	0	212
RTOR Reduction (vph)	0	0	0	0	0	9	0	0	0	0	0	0
Lane Group Flow (vph)	683	1386	0	0	280	305	0	0	0	163	0	212
Confl. Peds. (#/hr)						30						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	20.5	54.5			13.7	33.0				19.3		30.2
Effective Green, g (s)	20.5	54.5			13.7	33.0				19.3		30.2
Actuated g/C Ratio	0.30	0.79			0.20	0.48				0.28		0.44
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	1021	2799			703	868				961		1221
v/s Ratio Prot	c0.20	c0.39			0.08	c0.10				0.05		0.08
v/s Ratio Perm						0.10						
v/c Ratio	0.67	0.50			0.40	0.35				0.17		0.17
Uniform Delay, d1	21.2	2.5			24.0	11.2				18.7		11.8
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	1.5	0.1			0.4	0.3				0.1		0.1
Delay (s)	22.7	2.6			24.4	11.5				18.8		11.8
Level of Service	C	A			C	B				B		B
Approach Delay (s)		9.3			17.6			0.0			14.9	
Approach LOS		A			B			A			B	

Intersection Summary

HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	68.9	Sum of lost time (s)	20.7
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
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)	10	379	20	366	1131	175	1	2	45	32	3	7
Future Volume (vph)	10	379	20	366	1131	175	1	2	45	32	3	7
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	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	0.99			0.96			0.99	
Flpb, ped/bikes	1.00	1.00		0.98	1.00			1.00			0.99	
Frt	1.00	0.99		1.00	0.98			0.87			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.96	
Satd. Flow (prot)	1762	3501		1731	3435			1551			1719	
Flt Permitted	0.14	1.00		0.49	1.00			1.00			0.77	
Satd. Flow (perm)	254	3501		898	3435			1547			1374	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	11	426	22	411	1271	197	1	2	51	36	3	8
RTOR Reduction (vph)	0	2	0	0	8	0	0	42	0	0	7	0
Lane Group Flow (vph)	11	446	0	411	1460	0	0	12	0	0	40	0
Confl. Peds. (#/hr)	30		30	30		30	30		30	30		30
Confl. Bikes (#/hr)			15			15			15			15
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)	45.1	45.1		45.1	45.1			11.1			11.1	
Effective Green, g (s)	45.1	45.1		45.1	45.1			11.1			11.1	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.17			0.17	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	175	2421		621	2376			263			233	
v/s Ratio Prot		0.13			0.42							
v/s Ratio Perm	0.04			c0.46				0.01			c0.03	
v/c Ratio	0.06	0.18		0.66	0.61			0.04			0.17	
Uniform Delay, d1	3.2	3.6		5.7	5.4			22.6			23.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.0		2.7	0.5			0.1			0.4	
Delay (s)	3.4	3.6		8.4	5.9			22.7			23.5	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		3.6			6.4			22.7			23.5	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.1%	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)	10	379	20	366	1131	175	1	2	45	32	3	7
Future Volume (veh/h)	10	379	20	366	1131	175	1	2	45	32	3	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	0.99		0.95	0.97		0.94	0.97		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	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	426	22	411	1271	197	1	2	51	36	3	8
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	215	2039	105	606	1821	280	55	22	390	375	37	65
Arrive On Green	0.59	0.59	0.59	0.59	0.59	0.59	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	361	3427	176	931	3061	470	5	79	1428	1032	135	239
Grp Volume(v), veh/h	11	220	228	411	733	735	54	0	0	47	0	0
Grp Sat Flow(s),veh/h/ln	361	1777	1827	931	1777	1754	1512	0	0	1407	0	0
Q Serve(g_s), s	1.5	3.9	3.9	24.9	19.4	19.9	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	21.4	3.9	3.9	28.9	19.4	19.9	1.8	0.0	0.0	1.3	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.27	0.02		0.94	0.77		0.17
Lane Grp Cap(c), veh/h	215	1057	1087	606	1057	1044	467	0	0	477	0	0
V/C Ratio(X)	0.05	0.21	0.21	0.68	0.69	0.70	0.12	0.00	0.00	0.10	0.00	0.00
Avail Cap(c_a), veh/h	235	1159	1191	659	1159	1144	861	0	0	835	0	0
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	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	17.1	6.4	6.4	13.1	9.5	9.6	18.7	0.0	0.0	18.5	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.1	2.5	1.6	1.8	0.1	0.0	0.0	0.1	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	0.1	1.2	1.2	4.6	6.2	6.3	0.6	0.0	0.0	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	6.5	6.5	15.6	11.1	11.4	18.8	0.0	0.0	18.6	0.0	0.0
LnGrp LOS	B	A	A	B	B	B	B	A	A	B	A	A
Approach Vol, veh/h		459			1879			54			47	
Approach Delay, s/veh		6.7			12.2			18.8			18.6	
Approach LOS		A			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		23.1		45.1		23.1		45.1				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		36.5		44.5		36.5		44.5				
Max Q Clear Time (g_c+I1), s		3.8		23.4		3.3		30.9				
Green Ext Time (p_c), s		0.3		2.7		0.2		9.7				
Intersection Summary												
HCM 6th Ctrl Delay			11.5									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	432	0	1623	72	34	1
Future Vol, veh/h	2	432	0	1623	72	34	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	485	0	1824	81	38	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1935	0	485	-	0	2172	1013
Stage 1	-	-	-	-	-	1895	-
Stage 2	-	-	-	-	-	277	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	300	-	708	-	-	40	237
Stage 1	-	-	-	-	-	104	-
Stage 2	-	-	-	-	-	745	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	291	-	708	-	-	~ 37	224
Mov Cap-2 Maneuver	-	-	-	-	-	86	-
Stage 1	-	-	-	-	-	100	-
Stage 2	-	-	-	-	-	723	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	75.1
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	291	-	708	-	-	86	224
HCM Lane V/C Ratio	0.008	-	-	-	-	0.444	0.005
HCM Control Delay (s)	17.5	-	0	-	-	76.7	21.2
HCM Lane LOS	C	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	1.8	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	456	1619	40	46	12
Future Vol, veh/h	10	456	1619	40	46	12
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	512	1819	45	52	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1894	0	-	0	2180	992
Stage 1	-	-	-	-	1872	-
Stage 2	-	-	-	-	308	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	311	-	-	-	~ 39	244
Stage 1	-	-	-	-	107	-
Stage 2	-	-	-	-	719	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	302	-	-	-	~ 35	230
Mov Cap-2 Maneuver	-	-	-	-	86	-
Stage 1	-	-	-	-	100	-
Stage 2	-	-	-	-	698	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	93.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	302	-	-	-	99
HCM Lane V/C Ratio	0.037	-	-	-	0.658
HCM Control Delay (s)	17.4	-	-	-	93.6
HCM Lane LOS	C	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	3.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	194	313	0	0	1131	73	0	0	0	208	0	554
Future Volume (vph)	194	313	0	0	1131	73	0	0	0	208	0	554
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.98				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1544				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1544				3433		2787
Peak-hour factor, PHF	0.89	0.89	0.92	0.92	0.89	0.89	0.92	0.92	0.92	0.89	0.92	0.89
Adj. Flow (vph)	218	352	0	0	1271	82	0	0	0	234	0	622
RTOR Reduction (vph)	0	0	0	0	0	22	0	0	0	0	0	0
Lane Group Flow (vph)	218	352	0	0	1271	60	0	0	0	234	0	622
Confl. Peds. (#/hr)						30						
Confl. Bikes (#/hr)						15						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	11.5	86.3			42.3	75.0				32.7		33.4
Effective Green, g (s)	11.5	86.3			42.3	75.0				32.7		33.4
Actuated g/C Ratio	0.11	0.85			0.42	0.74				0.32		0.33
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	387	2997			1469	1216				1101		913
v/s Ratio Prot	0.06	0.10			c0.36	0.02				c0.07		c0.22
v/s Ratio Perm						0.02						
v/c Ratio	0.56	0.12			0.87	0.05				0.21		0.68
Uniform Delay, d1	42.8	1.3			27.2	3.7				25.2		29.6
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	1.5	0.0			5.6	0.0				0.1		2.1
Delay (s)	44.3	1.3			32.8	3.7				25.3		31.8
Level of Service	D	A			C	A				C		C
Approach Delay (s)		17.8			31.1			0.0			30.0	
Approach LOS		B			C			A			C	

Intersection Summary

HCM 2000 Control Delay	28.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	101.9	Sum of lost time (s)	20.7
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
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)	4	1088	4	54	334	14	6	2	371	213	2	3
Future Volume (vph)	4	1088	4	54	334	14	6	2	371	213	2	3
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	1.00	0.95		1.00	0.95			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.96			1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00			1.00			0.99	
Frt	1.00	1.00		1.00	0.99			0.87			1.00	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.95	
Satd. Flow (prot)	1726	3536		1763	3506			1558			1759	
Flt Permitted	0.48	1.00		0.14	1.00			0.99			0.37	
Satd. Flow (perm)	874	3536		251	3506			1551			681	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	5	1360	5	68	418	18	8	2	464	266	2	4
RTOR Reduction (vph)	0	1	0	0	4	0	0	4	0	0	1	0
Lane Group Flow (vph)	5	1364	0	68	432	0	0	471	0	0	272	0
Confl. Peds. (#/hr)	30		30	30		30	30		30	30		30
Confl. Bikes (#/hr)			15			15			15			15
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)	29.6	29.6		29.6	29.6			28.9			28.9	
Effective Green, g (s)	29.6	29.6		29.6	29.6			28.9			28.9	
Actuated g/C Ratio	0.44	0.44		0.44	0.44			0.43			0.43	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	383	1550		110	1537			664			291	
v/s Ratio Prot		c0.39			0.12							
v/s Ratio Perm	0.01			0.27				0.30			c0.40	
v/c Ratio	0.01	0.88		0.62	0.28			0.71			0.94	
Uniform Delay, d1	10.7	17.3		14.6	12.1			15.9			18.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	6.2		9.9	0.1			3.5			35.8	
Delay (s)	10.7	23.5		24.5	12.2			19.3			54.3	
Level of Service	B	C		C	B			B			D	
Approach Delay (s)		23.5			13.9			19.3			54.3	
Approach LOS		C			B			B			D	

Intersection Summary

HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	67.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
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)	4	1088	4	54	334	14	6	2	371	213	2	3
Future Volume (veh/h)	4	1088	4	54	334	14	6	2	371	213	2	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.93	1.00		0.93	0.99		0.96	0.99		0.96
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	1360	5	68	418	18	8	2	464	266	2	4
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	403	1475	5	119	1406	60	54	12	729	403	3	5
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	937	3630	13	398	3459	148	9	25	1552	650	7	10
Grp Volume(v), veh/h	5	666	699	68	214	222	474	0	0	272	0	0
Grp Sat Flow(s),veh/h/ln	937	1777	1867	398	1777	1831	1586	0	0	667	0	0
Q Serve(g_s), s	0.3	25.8	25.8	3.7	5.9	5.9	0.0	0.0	0.0	12.3	0.0	0.0
Cycle Q Clear(g_c), s	6.2	25.8	25.8	29.5	5.9	5.9	17.3	0.0	0.0	29.5	0.0	0.0
Prop In Lane	1.00		0.01	1.00		0.08	0.02		0.98	0.98		0.01
Lane Grp Cap(c), veh/h	403	722	759	119	722	744	795	0	0	411	0	0
V/C Ratio(X)	0.01	0.92	0.92	0.57	0.30	0.30	0.60	0.00	0.00	0.66	0.00	0.00
Avail Cap(c_a), veh/h	403	722	759	119	722	744	846	0	0	442	0	0
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	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.6	20.4	20.5	35.7	14.5	14.6	14.8	0.0	0.0	20.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	17.3	16.7	6.3	0.2	0.2	1.0	0.0	0.0	3.3	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	0.1	12.9	13.4	1.4	2.2	2.3	5.6	0.0	0.0	4.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.7	37.7	37.1	42.0	14.8	14.8	15.8	0.0	0.0	24.1	0.0	0.0
LnGrp LOS	B	D	D	D	B	B	B	A	A	C	A	A
Approach Vol, veh/h		1370			504			474			272	
Approach Delay, s/veh		37.3			18.4			15.8			24.1	
Approach LOS		D			B			B			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		38.6		34.0		38.6		34.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		36.5		29.5		36.5		29.5				
Max Q Clear Time (g_c+I1), s		19.3		27.8		31.5		31.5				
Green Ext Time (p_c), s		3.2		1.3		0.9		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	28.4
HCM 6th LOS	C

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1652	0	378	22	99	10
Future Vol, veh/h	0	1652	0	378	22	99	10
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	2015	0	461	27	121	12

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	518	0	2015	-	0	1543	304
Stage 1	-	-	-	-	-	505	-
Stage 2	-	-	-	-	-	1038	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1044	-	72	-	-	~ 106	692
Stage 1	-	-	-	-	-	571	-
Stage 2	-	-	-	-	-	302	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1014	-	72	-	-	~ 100	653
Mov Cap-2 Maneuver	-	-	-	-	-	215	-
Stage 1	-	-	-	-	-	554	-
Stage 2	-	-	-	-	-	293	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	38.5
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1014	-	72	-	-	215	653
HCM Lane V/C Ratio	-	-	-	-	-	0.562	0.019
HCM Control Delay (s)	0	-	0	-	-	41.3	10.6
HCM Lane LOS	A	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0	-	0	-	-	3.1	0.1

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	1734	434	31	42	9
Future Vol, veh/h	11	1734	434	31	42	9
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	2115	529	38	51	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	597	0	-	0	1692	344
Stage 1	-	-	-	-	578	-
Stage 2	-	-	-	-	1114	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	976	-	-	-	84	652
Stage 1	-	-	-	-	524	-
Stage 2	-	-	-	-	276	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	948	-	-	-	78	615
Mov Cap-2 Maneuver	-	-	-	-	191	-
Stage 1	-	-	-	-	501	-
Stage 2	-	-	-	-	268	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	28.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	948	-	-	-	217
HCM Lane V/C Ratio	0.014	-	-	-	0.287
HCM Control Delay (s)	8.9	-	-	-	28.1
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	1.1

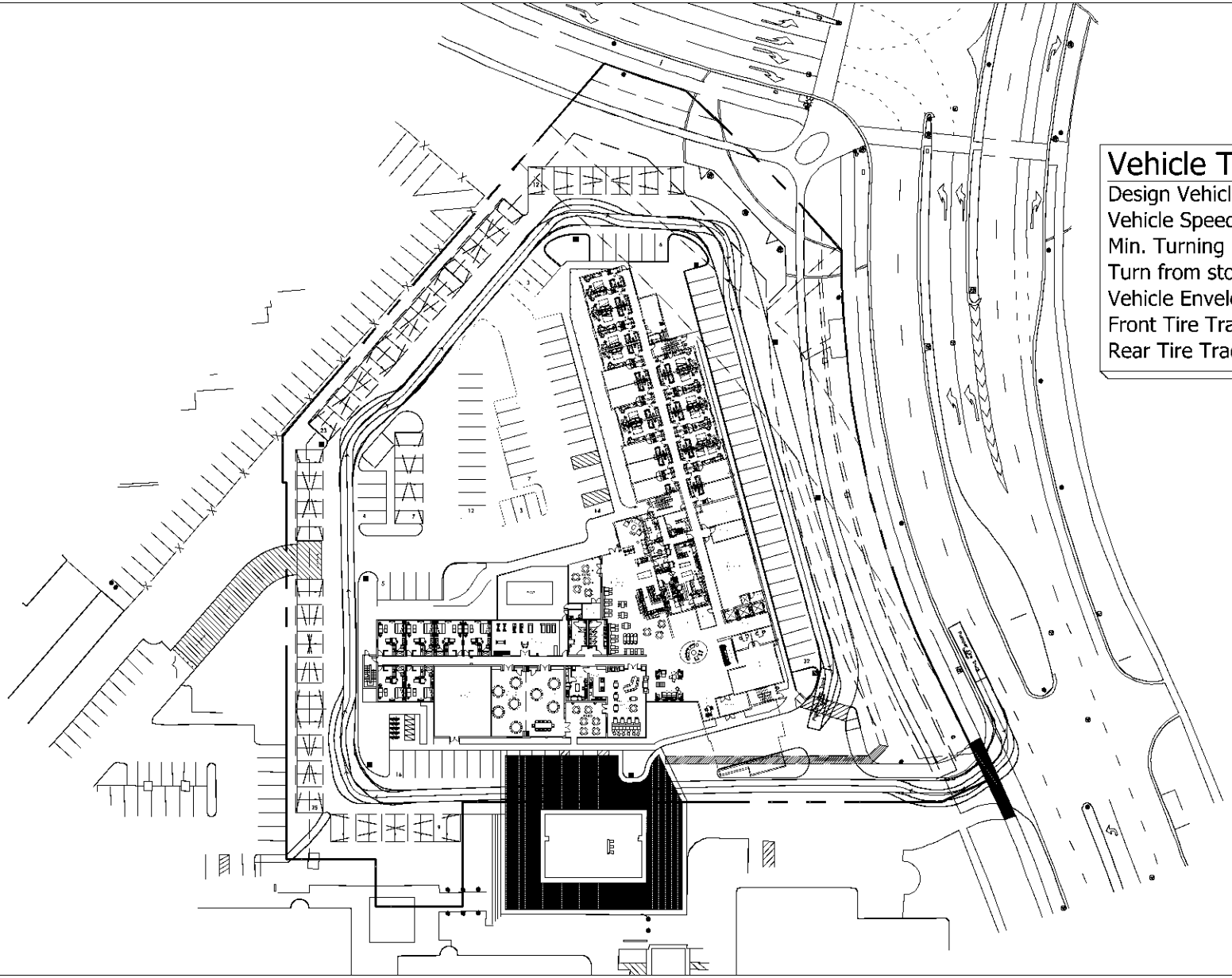
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	578	1163	0	0	248	261	0	0	0	135	0	189
Future Volume (vph)	578	1163	0	0	248	261	0	0	0	135	0	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.3			5.3	5.3				5.3		5.3
Lane Util. Factor	0.97	0.95			0.95	1.00				0.97		0.88
Frpb, ped/bikes	1.00	1.00			1.00	0.99				1.00		1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	3433	3539			3539	1563				3433		2787
Flt Permitted	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	3433	3539			3539	1563				3433		2787
Peak-hour factor, PHF	0.83	0.83	0.92	0.92	0.83	0.83	0.92	0.92	0.92	0.83	0.92	0.83
Adj. Flow (vph)	696	1401	0	0	299	314	0	0	0	163	0	228
RTOR Reduction (vph)	0	0	0	0	0	9	0	0	0	0	0	0
Lane Group Flow (vph)	696	1401	0	0	299	305	0	0	0	163	0	228
Confl. Peds. (#/hr)						30						
Turn Type	Prot	NA			NA	pm+ov			Prot	Prot		pt+ov
Protected Phases	5	2 3!			6	3 4			4!	3 4!		3 5
Permitted Phases						6						
Actuated Green, G (s)	20.5	55.0			13.8	33.5				19.7		30.6
Effective Green, g (s)	20.5	55.0			13.8	33.5				19.7		30.6
Actuated g/C Ratio	0.30	0.79			0.20	0.48				0.28		0.44
Clearance Time (s)	5.3				5.3							
Vehicle Extension (s)	2.5				3.2							
Lane Grp Cap (vph)	1014	2804			703	873				974		1228
v/s Ratio Prot	c0.20	c0.40			0.08	c0.10				0.05		0.08
v/s Ratio Perm						0.10						
v/c Ratio	0.69	0.50			0.43	0.35				0.17		0.19
Uniform Delay, d1	21.6	2.5			24.3	11.2				18.7		11.8
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	1.8	0.2			0.4	0.3				0.1		0.1
Delay (s)	23.4	2.6			24.8	11.4				18.8		11.9
Level of Service	C	A			C	B				B		B
Approach Delay (s)		9.5			17.9			0.0			14.8	
Approach LOS		A			B			A			B	

Intersection Summary

HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	69.4	Sum of lost time (s)	20.7
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

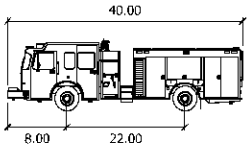
! Phase conflict between lane groups.
c Critical Lane Group

Appendix 5 Truck Turning Templates



Vehicle Turning Settings

Design Vehicle:	Fire Truck
Vehicle Speed:	5 mph
Min. Turning Radius:	
Turn from stop:	Off
Vehicle Envelope	
Front Tire Track	
Rear Tire Track	



Pumper Fire Truck

	feet
Width	: 8.17
Track	: 8.17
Lock to Lock Time	: 5.0
Steering Angle	: 45.0

Scale: 1" = 100'

100 50 0 100

Truck Turning Diagram - Fire Truck
Alameda, CA

Figure
3

C:\Users\ccasey\appdata\local\temp\AcPublish_30572\25448_figs.dwg Jul 30, 2020 - 4:58pm - ccasey Layout Tab: Layout1 (3)

Appendix 6 Collision Data

Collision Severity		
Fatal	0	0%
Injury (Severe)	0	0%
Injury (Other Visible)	8	35%
Injury (Complaint of Pain)	1	4%
PDO	14	61%
Total	23	

Violation Category		
DUI	1	4%
Impeding Traffic	0	0%
Unsafe Speed	6	26%
Following Too Closely	0	0%
Wrong Side of Road	1	4%
Improper Passing	1	4%
Unsafe Lane Change	1	4%
Improper Turning	5	22%
Auto ROW	4	17%
Pedestrian ROW	0	0%
Pedestrian Violation	0	0%
Traffic Signals and Signs	0	0%
Hazardous Parking	0	0%
Lights	0	0%
Brakes	0	0%
Other Equipment	0	0%
Other Hazardous Violation	0	0%
Other Than Driver	2	9%
Unsafe Starting of Backing	0	0%
Other Improper Driving	1	4%
Pedestrian or Other DUI	0	0%
Fell Asleep	0	0%
Unknown	1	4%
Total	23	

Type of Collision		
Head-On	1	4%
Sideswipe	2	9%
Rear End	4	17%
Broadside	5	22%
Hit Object	6	26%
Overturned	0	0%
Vehicle/Pedestrian	0	0%
Other	5	22%
Total	23	

Collision Involved		
Non-Collision	1	4%
Pedestrian	0	0%
Other Motor Vehicle	8	35%
Vehicle on Other Road	0	0%
Parked Vehicle	1	4%
Train	0	0%
Bicycle	4	17%
Animal	0	0%
Fixed Object	8	35%
Other Object	1	4%
Non Stated	0	0%
Total	23	

CASE_ID	ACCIDENT_YEAR	PROC_DATE	JURIS	COLLISION_DATE	COLLISION_TIME	OFFICER_ID	REPORTING_DISTRICT	DAY_OF_WEEK	CHP_SHIFT	POPULATION	CNTY_CITY_LOC
7129713	2015	20160210	101	20151124	1719	61	425	2	5	5	101
7210080	2016	20160322	101	20160224	1739	66	425	3	5	5	101
8073897	2016	20160720	101	20160628	1138	95	425	2	5	5	101
8142186	2016	20161020	101	20161005	1839	10	425	3	5	5	101
8199786	2016	20170103	101	20161215	2115	96	402	4	5	5	101
8325367	2017	20170321	101	20170301	1420	56	425	3	5	5	101
8357526	2017	20170515	101	20170410	1539	50	524	1	5	5	101
8471651	2017	20171025	101	20171001	755	89	425	7	5	5	101
8484023	2017	20171115	101	20171023	1539	51	ALAME	1	5	5	101
8497793	2017	20180120	101	20171101	1726	95	422	3	5	5	101
8550854	2018	20180310	101	20180109	852	70	425	2	5	5	101
8636526	2018	20180620	101	20180608	1540	95	425	5	5	5	101
8742820	2018	20181204	101	20181116	1120	56	425	5	5	5	101
8748641	2018	20181213	101	20181121	1039	97	425	3	5	5	101
8748613	2018	20181212	101	20181121	1629	36	425	3	5	5	101
8862232	2019	20190528	101	20190510	1804	53	425	5	5	5	101
8885654	2019	20190712	101	20190618	655	97	425	2	5	5	101
8898954	2019	20190812	101	20190627	1820	31	425	4	5	5	101
8905978	2019	20190806	101	20190717	1713	52	425	3	5	5	101
8929936	2019	20190903	101	20190813	1606	56	425	2	5	5	101
8955234	2019	20191015	101	20190830	840	95	426	5	5	5	101
8962545	2019	20191024	101	20191003	1721	44	425	4	5	5	101
9007646	2019	20200207	101	20191208	2500	58	425	7	5	5	101

CASE_ID	SPECIAL_COND	BEAT_TYPE	CHP_BEAT_TYPE	CITY_DIVISION_LAPD	CHP_BEAT_CLASS	BEAT_NUMBER	PRIMARY_RD	SECONDARY_RD	DISTANCE	DIRECTION	INTERSECTION
7129713	0	0	0		0	4	HARBOR BAY PKWY	SOUTHLOOP RD	5	W	N
7210080	0	0	0		0	4	HARBOR BAY PKWY	B ST	0		Y
8073897	0	0	0		0	4	LOOP RD	HARBOR BAY PKWY	536	N	N
8142186	0	0	0		0	4	HARBOR BAY PKWY	SOUTH LOOP RD	852	E	N
8199786	0	0	0		0	4	RON COWAN PKWY	HARBOR BAY PKWY	111	W	N
8325367	0	0	0		0	4	HARBOR BAY PKWY	C ST	1180	E	N
8357526	0	0	0		0	4	S LOOP RD	HARBOR BAY PKWY	0		Y
8471651	0	0	0		0	4	HARBOR BAY PKWY	SOUTH LOOP RD	0		Y
8484023	0	0	0		0	425	HARBOR BAY PKWY	SOUTH LOOP RD	0		Y
8497793	0	0	0		0	4	HARBOR BAY PKWY	S LOOP RD	412	W	N
8550854	0	0	0		0	4	RON COWAN PKWY	HARBOR BAY PKWY	157	E	N
8636526	0	0	0		0	4	HARBOR BAY PKWY	SOUTH LOOP RD	590	E	N
8742820	0	0	0		0	4	HARBOR BAY PKWY	SOUTH LOOP RD	75	W	N
8748641	0	0	0		0	4	HARBOR BAY PKWY	RON COWAN PKWY	0		Y
8748613	0	0	0		0	4	RON COWAN PKWY	HARBOR BAY PKWY	43	S	N
8862232	0	0	0		0	4	B ST	HARBOR BAY PKWY	195360	N	N
8885654	0	0	0		0	4	HARBOR BAY PW	PENUMBRA WY	200	S	N
8898954	0	0	0		0	4	HARBOR BAY PKWY	C ST	447	E	N
8905978	0	0	0		0	4	HARBOR BAY PKWY	S LOOP RD	719	E	N
8929936	0	0	0		0	4	HARBOR BAY PKWY	S LOOP RD	0		Y
8955234	0	0	0		0	4	HARBOR BAY PKWY	RON COWAN PKWY	1836	N	N
8962545	0	0	0		0	4	HARBOR BAY PKWY	S LOOP RD	0		Y
9007646	0	0	0		0	4	HARBOR BAY PKWY	C ST	591	E	N

CASE_ID	WEATHER_1	WEATHER_2	STATE_HWY_IND	CALTRANS_COUNTY	CALTRANS_DISTRICT	STATE_ROUTE	ROUTE_SUFFIX	POSTMILE_PREFIX	POSTMILE	LOCATION_TYPE
7129713	A	-	N							
7210080	A	-	N							
8073897	A	-	N							
8142186	A	-	N							
8199786	C	-	N							
8325367	A	-	N							
8357526	A	-	N							
8471651	A	-	N							
8484023	A	-	N							
8497793	A	-	N							
8550854	B	-	N							
8636526	A	-	N							
8742820	F	-	N							
8748641	C	-	N							
8748613	B	-	N							
8862232	A	-	N							
8885654	A	-	N							
8898954	A	-	N							
8905978	A	-	N							
8929936	A	-	N							
8955234	B	-	N							
8962545	A	-	N							
9007646	C	-	N							

CASE_ID	RAMP_INTERSECTION	SIDE_OF_HWY	TOW_AWAY	COLLISION_SEVERITY	NUMBER_KILLED	NUMBER_INJURED	PARTY_COUNT	PRIMARY_COLL_FACTOR	PCF_CODE_OF_VIOL
7129713			N	0	0	0	2	A	-
7210080			N	3	0	1	2	A	-
8073897			Y	0	0	0	1	B	-
8142186			N	0	0	0	1	C	-
8199786			Y	0	0	0	1	A	-
8325367			N	3	0	1	2	A	-
8357526			N	0	0	0	2	A	-
8471651			Y	0	0	0	1	A	-
8484023			Y	3	0	2	2	A	-
8497793			Y	0	0	0	2	A	-
8550854			N	0	0	0	1	A	-
8636526			N	3	0	1	1	C	-
8742820			Y	3	0	1	1	A	-
8748641			N	0	0	0	2	A	-
8748613			N	0	0	0	1	A	-
8862232			N	0	0	0	2	A	-
8885654			N	0	0	0	2	A	-
8898954			N	3	0	1	2	A	-
8905978			N	3	0	1	2	A	-
8929936			Y	4	0	1	2	A	-
8955234			Y	0	0	0	1	A	-
8962545			N	3	0	1	2	A	-
9007646			N	0	0	0	1	A	-

CASE_ID	PCF_VIOL_CATEGORY	PCF_VIOLATION	PCF_VIOL_SUBSECTION	HIT_AND_RUN	TYPE_OF_COLLISION	MVIW	PED_ACTION	ROAD_SURFACE	ROAD_COND_1	ROAD_COND_2	LIGHTING
7129713	3	22350		N	C	C	A	A	H	-	C
7210080	3	22350		N	D	G	A	A	H	-	B
8073897	22			N	A	I	A	A	H	-	A
8142186	18			N	H	J	A	A	H	-	C
8199786	8	22107		M	E	I	A	B	H	-	C
8325367	8	22107		N	H	G	A	A	H	-	A
8357526	6	21755	A	N	B	C	A	A	H	-	A
8471651	1	23152	A	M	E	I	A	A	H	-	A
8484023	9	21801	A	N	D	C	A	A	H	-	A
8497793	9	21801	A	N	D	C	A	A	H	-	A
8550854	3	22350		N	E	I	A	B	H	-	A
8636526	18			N	H	A	A	A	H	-	A
8742820	3	22350		N	H	I	A	A	H	-	A
8748641	8	22107		M	B	C	A	B	H	-	A
8748613	8	22107		M	E	I	A	B	H	-	B
8862232	3	22350		M	C	C	A	A	H	-	A
8885654	0			M	C	E	A	A	H	-	B
8898954	9	21804		N	D	C	A	A	-	-	A
8905978	5	21202	A	F	H	G	A	A	H	-	A
8929936	3	22350		N	C	C	A	A	H	-	A
8955234	7	21658	A	N	E	I	A	A	H	-	A
8962545	9	21801	A	N	D	G	A	A	H	-	A
9007646	8	22107		M	E	I	A	B	H	-	C

CASE_ID	CONTROL_DEVICE	CHP_ROAD_TYPE	PEDESTRIAN_ACCIDENT	BICYCLE_ACCIDENT	MOTORCYCLE_ACCIDENT	TRUCK_ACCIDENT	NOT_PRIVATE_PROPERTY	ALCOHOL_INVOLVED
7129713	A	0					Y	
7210080	D	0		Y			Y	
8073897	D	0					Y	
8142186	D	0					Y	
8199786	A	0					Y	
8325367	D	0		Y			Y	
8357526	A	0					Y	
8471651	D	0					Y	Y
8484023	A	0					Y	
8497793	D	0					Y	
8550854	D	0					Y	
8636526	D	0		Y			Y	
8742820	D	0			Y		Y	
8748641	A	0					Y	
8748613	A	0					Y	
8862232	A	0					Y	
8885654	D	0					Y	
8898954	D	0		Y			Y	
8905978	D	0		Y			Y	
8929936	D	0					Y	
8955234	D	0					Y	
8962545	D	0		Y			Y	
9007646	D	0					Y	

CASE_ID	STWD_VEHTYPE_AT_FAULT	CHP_VEHTYPE_AT_FAULT	COUNT_SEVERE_INJ	COUNT_VISIBLE_INJ	COUNT_COMPLAINT_PAIN	COUNT_PED_KILLED	COUNT_PED_INJURED
7129713	A	1	0	0	0	0	0
7210080	A	1	0	1	0	0	0
8073897	A	1	0	0	0	0	0
8142186	-	-	0	0	0	0	0
8199786	A	1	0	0	0	0	0
8325367	L	4	0	1	0	0	0
8357526	A	1	0	0	0	0	0
8471651	A	7	0	0	0	0	0
8484023	A	1	0	1	1	0	0
8497793	A	1	0	0	0	0	0
8550854	A	1	0	0	0	0	0
8636526	-	-	0	1	0	0	0
8742820	C	3	0	1	0	0	0
8748641	A	1	0	0	0	0	0
8748613	A	1	0	0	0	0	0
8862232	-		0	0	0	0	0
8885654	-	99	0	0	0	0	0
8898954	L	4	0	1	0	0	0
8905978	L	4	0	1	0	0	0
8929936	A	1	0	0	1	0	0
8955234	A	1	0	0	0	0	0
8962545	A	1	0	1	0	0	0
9007646	-	99	0	0	0	0	0

CASE_ID	COUNT_BICYCLIST_KILLED	COUNT_BICYCLIST_INJURED	COUNT_MC_KILLED	COUNT_MC_INJURED	PRIMARY_RAMP	SECONDARY_RAMP	LATITUDE	LONGITUDE
7129713	0	0	0	0	-	-		
7210080	0	1	0	0	-	-		
8073897	0	0	0	0	-	-		
8142186	0	0	0	0	-	-		
8199786	0	0	0	0	-	-		
8325367	0	1	0	0	-	-		
8357526	0	0	0	0	-	-		
8471651	0	0	0	0	-	-		
8484023	0	0	0	0	-	-		
8497793	0	0	0	0	-	-		
8550854	0	0	0	0	-	-		
8636526	0	1	0	0	-	-		
8742820	0	0	0	1	-	-		
8748641	0	0	0	0	-	-		
8748613	0	0	0	0	-	-		
8862232	0	0	0	0	-	-		
8885654	0	0	0	0	-	-		
8898954	0	1	0	0	-	-		
8905978	0	1	0	0	-	-		
8929936	0	0	0	0	-	-		
8955234	0	0	0	0	-	-		
8962545	0	1	0	0	-	-		
9007646	0	0	0	0	-	-		

Appendix 7 95th Percentile Queue Data

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	312	18	324	893	155	1	2	40	12	3	6
Future Vol, veh/h	9	312	18	324	893	155	1	2	40	12	3	6
Conflicting Peds, #/hr	30	0	30	30	0	30	30	0	30	30	0	30
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	115	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	351	20	364	1003	174	1	2	45	13	3	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1207	0	0	401	0	0	1672	2346	246	2075	2269	649
Stage 1	-	-	-	-	-	-	411	411	-	1848	1848	-
Stage 2	-	-	-	-	-	-	1261	1935	-	227	421	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	574	-	-	1154	-	-	63	36	754	31	40	412
Stage 1	-	-	-	-	-	-	589	593	-	77	123	-
Stage 2	-	-	-	-	-	-	180	111	-	755	587	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	558	-	-	1121	-	-	41	23	712	20	25	389
Mov Cap-2 Maneuver	-	-	-	-	-	-	87	55	-	59	61	-
Stage 1	-	-	-	-	-	-	562	566	-	73	81	-
Stage 2	-	-	-	-	-	-	111	73	-	672	560	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	2.3	14.9	70
HCM LOS			B	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	413	558	-	-	1121	-	-	78
HCM Lane V/C Ratio	0.117	0.018	-	-	0.325	-	-	0.303
HCM Control Delay (s)	14.9	11.6	-	-	9.7	-	-	70
HCM Lane LOS	B	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	0.4	0.1	-	-	1.4	-	-	1.1

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	342	0	1329	64	47	1
Future Vol, veh/h	2	342	0	1329	64	47	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	384	0	1493	72	53	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1595	0	384	-	0	1785	843
Stage 1	-	-	-	-	-	1559	-
Stage 2	-	-	-	-	-	226	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	407	-	820	-	-	73	307
Stage 1	-	-	-	-	-	159	-
Stage 2	-	-	-	-	-	790	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	395	-	820	-	-	68	290
Mov Cap-2 Maneuver	-	-	-	-	-	132	-
Stage 1	-	-	-	-	-	154	-
Stage 2	-	-	-	-	-	767	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	48.7
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	395	-	820	-	-	132	290
HCM Lane V/C Ratio	0.006	-	-	-	-	0.4	0.004
HCM Control Delay (s)	14.2	-	0	-	-	49.4	17.5
HCM Lane LOS	B	-	A	-	-	E	C
HCM 95th %tile Q(veh)	0	-	0	-	-	1.7	0

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	388	1336	9	4	0
Future Vol, veh/h	1	388	1336	9	4	0
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	436	1501	10	4	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1541	0	-	0	1786	816
Stage 1	-	-	-	-	1536	-
Stage 2	-	-	-	-	250	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	427	-	-	-	73	320
Stage 1	-	-	-	-	164	-
Stage 2	-	-	-	-	768	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	415	-	-	-	69	302
Mov Cap-2 Maneuver	-	-	-	-	135	-
Stage 1	-	-	-	-	159	-
Stage 2	-	-	-	-	746	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	32.6
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	415	-	-	-	135
HCM Lane V/C Ratio	0.003	-	-	-	0.033
HCM Control Delay (s)	13.7	-	-	-	32.6
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	169	276	1035	73	207	502
v/c Ratio	0.44	0.08	0.65	0.07	0.23	0.51
Control Delay	45.6	3.0	26.1	0.8	25.9	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.6	3.0	26.1	0.8	25.9	22.0
Queue Length 50th (ft)	43	0	196	0	46	107
Queue Length 95th (ft)	112	67	#670	9	77	139
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	698	3285	1599	1261	1242	1268
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.08	0.65	0.06	0.17	0.40

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	321	18	324	905	155	1	2	40	12	3	6
Future Vol, veh/h	9	321	18	324	905	155	1	2	40	12	3	6
Conflicting Peds, #/hr	30	0	30	30	0	30	30	0	30	30	0	30
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	115	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	361	20	364	1017	174	1	2	45	13	3	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1221	0	0	411	0	0	1689	2370	251	2094	2293	656
Stage 1	-	-	-	-	-	-	421	421	-	1862	1862	-
Stage 2	-	-	-	-	-	-	1268	1949	-	232	431	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	567	-	-	1144	-	-	61	34	749	30	39	408
Stage 1	-	-	-	-	-	-	581	587	-	75	121	-
Stage 2	-	-	-	-	-	-	178	110	-	750	581	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	551	-	-	1111	-	-	40	21	707	19	24	385
Mov Cap-2 Maneuver	-	-	-	-	-	-	85	54	-	58	60	-
Stage 1	-	-	-	-	-	-	554	560	-	72	79	-
Stage 2	-	-	-	-	-	-	109	72	-	667	554	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	2.3	15	71.2
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	408	551	-	-	1111	-	-	77
HCM Lane V/C Ratio	0.118	0.018	-	-	0.328	-	-	0.306
HCM Control Delay (s)	15	11.7	-	-	9.8	-	-	71.2
HCM Lane LOS	C	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	0.4	0.1	-	-	1.4	-	-	1.1

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	351	0	1341	64	47	1
Future Vol, veh/h	2	351	0	1341	64	47	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	394	0	1507	72	53	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1609	0	394	-	0	1804	850
Stage 1	-	-	-	-	-	1573	-
Stage 2	-	-	-	-	-	231	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	402	-	808	-	-	71	304
Stage 1	-	-	-	-	-	156	-
Stage 2	-	-	-	-	-	785	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	391	-	808	-	-	67	287
Mov Cap-2 Maneuver	-	-	-	-	-	130	-
Stage 1	-	-	-	-	-	151	-
Stage 2	-	-	-	-	-	762	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	49.8
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	391	-	808	-	-	130	287
HCM Lane V/C Ratio	0.006	-	-	-	-	0.406	0.004
HCM Control Delay (s)	14.3	-	0	-	-	50.5	17.6
HCM Lane LOS	B	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	1.7	0

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	388	1336	39	46	12
Future Vol, veh/h	10	388	1336	39	46	12
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	436	1501	44	52	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1575	0	-	0	1823	833
Stage 1	-	-	-	-	1553	-
Stage 2	-	-	-	-	270	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	414	-	-	-	69	312
Stage 1	-	-	-	-	160	-
Stage 2	-	-	-	-	751	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	402	-	-	-	63	294
Mov Cap-2 Maneuver	-	-	-	-	128	-
Stage 1	-	-	-	-	151	-
Stage 2	-	-	-	-	729	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	48.7
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	402	-	-	-	145
HCM Lane V/C Ratio	0.028	-	-	-	0.449
HCM Control Delay (s)	14.2	-	-	-	48.7
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	-	2

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	189	303	1054	73	207	517
v/c Ratio	0.49	0.09	0.66	0.07	0.23	0.51
Control Delay	46.3	3.0	26.8	0.8	26.0	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.3	3.0	26.8	0.8	26.0	22.0
Queue Length 50th (ft)	48	0	205	0	46	111
Queue Length 95th (ft)	124	74	#693	9	77	144
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	692	3286	1585	1252	1233	1268
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.09	0.66	0.06	0.17	0.41

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection												
Int Delay, s/veh	17.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	861	4	48	272	13	5	2	329	159	2	3
Future Vol, veh/h	4	861	4	48	272	13	5	2	329	159	2	3
Conflicting Peds, #/hr	30	0	30	30	0	30	30	0	30	30	0	30
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	115	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	1076	5	60	340	16	6	3	411	199	3	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	386	0	0	1111	0	0	1441	1625	601	1078	1619	238
Stage 1	-	-	-	-	-	-	1119	1119	-	498	498	-
Stage 2	-	-	-	-	-	-	322	506	-	580	1121	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1169	-	-	624	-	-	93	101	443	~ 173	102	763
Stage 1	-	-	-	-	-	-	220	280	-	523	543	-
Stage 2	-	-	-	-	-	-	664	538	-	467	280	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1136	-	-	606	-	-	80	85	418	~ 2	86	720
Mov Cap-2 Maneuver	-	-	-	-	-	-	169	192	-	~ -55	165	-
Stage 1	-	-	-	-	-	-	213	271	-	506	475	-
Stage 2	-	-	-	-	-	-	575	471	-	~ 7	271	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.7	86.3	
HCM LOS			F	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	406	1136	-	-	606	-	-	+
HCM Lane V/C Ratio	1.034	0.004	-	-	0.099	-	-	-
HCM Control Delay (s)	86.3	8.2	-	-	11.6	-	-	-
HCM Lane LOS	F	A	-	-	B	-	-	-
HCM 95th %tile Q(veh)	13.5	0	-	-	0.3	-	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1330	0	311	20	118	9
Future Vol, veh/h	0	1330	0	311	20	118	9
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	1622	0	379	24	144	11

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	433	0	1622	-	0	1262	262
Stage 1	-	-	-	-	-	421	-
Stage 2	-	-	-	-	-	841	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1123	-	131	-	-	162	737
Stage 1	-	-	-	-	-	630	-
Stage 2	-	-	-	-	-	383	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1091	-	131	-	-	153	695
Mov Cap-2 Maneuver	-	-	-	-	-	275	-
Stage 1	-	-	-	-	-	612	-
Stage 2	-	-	-	-	-	372	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	30.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1091	-	131	-	-	275	695
HCM Lane V/C Ratio	-	-	-	-	-	0.523	0.016
HCM Control Delay (s)	0	-	0	-	-	31.6	10.3
HCM Lane LOS	A	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0	-	0	-	-	2.8	0

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	1441	367	2	16	2
Future Vol, veh/h	2	1441	367	2	16	2
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	1757	448	2	20	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	480	0	-	0	1392	285
Stage 1	-	-	-	-	479	-
Stage 2	-	-	-	-	913	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1079	-	-	-	133	712
Stage 1	-	-	-	-	589	-
Stage 2	-	-	-	-	352	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1048	-	-	-	125	672
Mov Cap-2 Maneuver	-	-	-	-	247	-
Stage 1	-	-	-	-	571	-
Stage 2	-	-	-	-	342	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	19.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1048	-	-	-	266
HCM Lane V/C Ratio	0.002	-	-	-	0.083
HCM Control Delay (s)	8.4	-	-	-	19.7
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	567	1152	233	278	145	181
v/c Ratio	0.52	0.35	0.35	0.44	0.20	0.12
Control Delay	25.8	4.6	25.6	10.0	19.5	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.8	4.6	25.6	10.0	19.5	9.4
Queue Length 50th (ft)	64	0	32	49	20	10
Queue Length 95th (ft)	#340	301	103	67	48	48
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	1083	3247	2481	1116	1790	1580
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.35	0.09	0.25	0.08	0.11

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection												
Int Delay, s/veh	17.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	870	4	48	279	13	5	2	329	159	2	3
Future Vol, veh/h	4	870	4	48	279	13	5	2	329	159	2	3
Conflicting Peds, #/hr	30	0	30	30	0	30	30	0	30	30	0	30
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	115	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	1088	5	60	349	16	6	3	411	199	3	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	395	0	0	1123	0	0	1457	1646	607	1093	1640	243
Stage 1	-	-	-	-	-	-	1131	1131	-	507	507	-
Stage 2	-	-	-	-	-	-	326	515	-	586	1133	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1160	-	-	618	-	-	91	98	439	~ 169	99	758
Stage 1	-	-	-	-	-	-	217	277	-	516	538	-
Stage 2	-	-	-	-	-	-	661	533	-	463	276	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1127	-	-	600	-	-	78	83	414	~ 1	84	715
Mov Cap-2 Maneuver	-	-	-	-	-	-	166	189	-	~ -59	162	-
Stage 1	-	-	-	-	-	-	210	268	-	499	470	-
Stage 2	-	-	-	-	-	-	572	466	-	~ 3	267	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.6	89.7	
HCM LOS			F	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	402	1127	-	-	600	-	-	+
HCM Lane V/C Ratio	1.045	0.004	-	-	0.1	-	-	-
HCM Control Delay (s)	89.7	8.2	-	-	11.7	-	-	-
HCM Lane LOS	F	A	-	-	B	-	-	-
HCM 95th %tile Q(veh)	13.7	0	-	-	0.3	-	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1339	0	318	20	118	9
Future Vol, veh/h	0	1339	0	318	20	118	9
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	1633	0	388	24	144	11

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	442	0	1633	-	0	1277	266
Stage 1	-	-	-	-	-	430	-
Stage 2	-	-	-	-	-	847	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1114	-	129	-	-	158	732
Stage 1	-	-	-	-	-	624	-
Stage 2	-	-	-	-	-	381	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1082	-	129	-	-	149	691
Mov Cap-2 Maneuver	-	-	-	-	-	272	-
Stage 1	-	-	-	-	-	606	-
Stage 2	-	-	-	-	-	370	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	30.6
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1082	-	129	-	-	272	691
HCM Lane V/C Ratio	-	-	-	-	-	0.529	0.016
HCM Control Delay (s)	0	-	0	-	-	32.2	10.3
HCM Lane LOS	A	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0	-	0	-	-	2.9	0

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	1441	367	31	40	9
Future Vol, veh/h	11	1441	367	31	40	9
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	1757	448	38	49	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	516	0	-	0	1432	303
Stage 1	-	-	-	-	497	-
Stage 2	-	-	-	-	935	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1046	-	-	-	125	693
Stage 1	-	-	-	-	577	-
Stage 2	-	-	-	-	342	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1016	-	-	-	116	654
Mov Cap-2 Maneuver	-	-	-	-	238	-
Stage 1	-	-	-	-	553	-
Stage 2	-	-	-	-	332	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	22.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1016	-	-	-	269
HCM Lane V/C Ratio	0.013	-	-	-	0.222
HCM Control Delay (s)	8.6	-	-	-	22.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.8

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	581	1167	252	278	145	196
v/c Ratio	0.54	0.36	0.37	0.43	0.20	0.13
Control Delay	26.1	4.6	25.9	9.9	19.6	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.1	4.6	25.9	9.9	19.6	9.4
Queue Length 50th (ft)	67	0	35	49	20	11
Queue Length 95th (ft)	#353	306	112	67	48	52
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	1079	3248	2471	1117	1786	1575
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.36	0.10	0.25	0.08	0.12

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues

1: South Loop Road/Penumbra Place & Harbor Bay Parkway

07/30/2020

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	10	396	372	1316	49	23
v/c Ratio	0.05	0.18	0.63	0.60	0.15	0.08
Control Delay	8.2	5.9	15.7	9.2	8.3	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.2	5.9	15.7	9.2	8.3	16.9
Queue Length 50th (ft)	1	14	39	67	1	4
Queue Length 95th (ft)	12	88	#330	376	22	20
Internal Link Dist (ft)		1007		522	369	600
Turn Bay Length (ft)	125		115			
Base Capacity (vph)	252	2893	773	2838	1136	1080
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.14	0.48	0.46	0.04	0.02

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	366	0	1458	65	48	1
Future Vol, veh/h	2	366	0	1458	65	48	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	411	0	1638	73	54	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1741	0	411	-	0	1945	916
Stage 1	-	-	-	-	-	1705	-
Stage 2	-	-	-	-	-	240	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	357	-	788	-	-	57	275
Stage 1	-	-	-	-	-	132	-
Stage 2	-	-	-	-	-	777	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	347	-	788	-	-	~ 53	260
Mov Cap-2 Maneuver	-	-	-	-	-	109	-
Stage 1	-	-	-	-	-	127	-
Stage 2	-	-	-	-	-	754	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	65.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	347	-	788	-	-	109	260
HCM Lane V/C Ratio	0.006	-	-	-	-	0.495	0.004
HCM Control Delay (s)	15.4	-	0	-	-	66.7	18.9
HCM Lane LOS	C	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	2.2	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	413	1465	9	4	0
Future Vol, veh/h	1	413	1465	9	4	0
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	464	1646	10	4	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1686	0	-	0	1945	888
Stage 1	-	-	-	-	1681	-
Stage 2	-	-	-	-	264	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	375	-	-	-	57	287
Stage 1	-	-	-	-	136	-
Stage 2	-	-	-	-	756	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	364	-	-	-	54	271
Mov Cap-2 Maneuver	-	-	-	-	113	-
Stage 1	-	-	-	-	132	-
Stage 2	-	-	-	-	734	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	38.2
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	364	-	-	-	113
HCM Lane V/C Ratio	0.003	-	-	-	0.04
HCM Control Delay (s)	14.9	-	-	-	38.2
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	179	294	1133	74	211	551
v/c Ratio	0.47	0.09	0.73	0.07	0.23	0.53
Control Delay	46.9	2.9	28.6	0.8	25.5	22.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.9	2.9	28.6	0.8	25.5	22.1
Queue Length 50th (ft)	46	0	233	0	47	121
Queue Length 95th (ft)	119	71	#784	9	78	154
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	682	3288	1562	1235	1215	1285
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.09	0.73	0.06	0.17	0.43

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

1: South Loop Road/Penumbra Place & Harbor Bay Parkway

07/30/2020

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	10	407	372	1330	49	23
v/c Ratio	0.05	0.18	0.63	0.61	0.15	0.08
Control Delay	8.2	5.8	15.8	9.2	8.3	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.2	5.8	15.8	9.2	8.3	17.0
Queue Length 50th (ft)	1	14	39	70	1	4
Queue Length 95th (ft)	12	91	#332	383	22	20
Internal Link Dist (ft)		1007		522	369	600
Turn Bay Length (ft)	125		115			
Base Capacity (vph)	247	2882	762	2824	1127	1071
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.14	0.49	0.47	0.04	0.02

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	375	0	1470	65	48	1
Future Vol, veh/h	2	375	0	1470	65	48	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	421	0	1652	73	54	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1755	0	421	-	0	1964	923
Stage 1	-	-	-	-	-	1719	-
Stage 2	-	-	-	-	-	245	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	353	-	777	-	-	55	272
Stage 1	-	-	-	-	-	130	-
Stage 2	-	-	-	-	-	773	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	343	-	777	-	-	~ 52	257
Mov Cap-2 Maneuver	-	-	-	-	-	108	-
Stage 1	-	-	-	-	-	125	-
Stage 2	-	-	-	-	-	751	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	66.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	343	-	777	-	-	108	257
HCM Lane V/C Ratio	0.007	-	-	-	-	0.499	0.004
HCM Control Delay (s)	15.6	-	0	-	-	67.7	19.1
HCM Lane LOS	C	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	2.2	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	413	1465	39	46	12
Future Vol, veh/h	10	413	1465	39	46	12
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	464	1646	44	52	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1720	0	-	0	1982	905
Stage 1	-	-	-	-	1698	-
Stage 2	-	-	-	-	284	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	364	-	-	-	54	279
Stage 1	-	-	-	-	133	-
Stage 2	-	-	-	-	739	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	354	-	-	-	~ 49	263
Mov Cap-2 Maneuver	-	-	-	-	107	-
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	718	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	64.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	354	-	-	-	122
HCM Lane V/C Ratio	0.032	-	-	-	0.534
HCM Control Delay (s)	15.5	-	-	-	64.2
HCM Lane LOS	C	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	2.5

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	199	321	1152	74	211	565
v/c Ratio	0.50	0.10	0.75	0.07	0.22	0.54
Control Delay	47.4	2.9	29.6	0.8	25.7	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.4	2.9	29.6	0.8	25.7	22.0
Queue Length 50th (ft)	52	0	244	0	47	125
Queue Length 95th (ft)	132	77	#811	9	78	159
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	675	3290	1546	1223	1204	1278
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.10	0.75	0.06	0.18	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues

1: South Loop Road/Penumbra Place & Harbor Bay Parkway

07/30/2020

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	5	1226	61	386	429	210
v/c Ratio	0.01	0.76	0.47	0.24	0.72	0.77
Control Delay	12.0	18.6	30.7	11.2	22.7	36.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.0	18.6	30.7	11.2	22.7	36.3
Queue Length 50th (ft)	1	162	13	36	129	66
Queue Length 95th (ft)	7	296	#64	80	177	116
Internal Link Dist (ft)		1007		522	369	600
Turn Bay Length (ft)	125		115			
Base Capacity (vph)	508	1901	151	1887	1036	477
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.64	0.40	0.20	0.41	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1456	0	336	20	120	9
Future Vol, veh/h	0	1456	0	336	20	120	9
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	1776	0	410	24	146	11

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	464	0	1776	-	0	1370	277
Stage 1	-	-	-	-	-	452	-
Stage 2	-	-	-	-	-	918	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1094	-	104	-	-	~ 137	720
Stage 1	-	-	-	-	-	608	-
Stage 2	-	-	-	-	-	349	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1063	-	104	-	-	~ 129	679
Mov Cap-2 Maneuver	-	-	-	-	-	249	-
Stage 1	-	-	-	-	-	590	-
Stage 2	-	-	-	-	-	339	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	36.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1063	-	104	-	-	249	679
HCM Lane V/C Ratio	-	-	-	-	-	0.588	0.016
HCM Control Delay (s)	0	-	0	-	-	38.2	10.4
HCM Lane LOS	A	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0	-	0	-	-	3.4	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	1569	393	2	16	2
Future Vol, veh/h	2	1569	393	2	16	2
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	1913	479	2	20	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	511	0	-	0	1501	301
Stage 1	-	-	-	-	510	-
Stage 2	-	-	-	-	991	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1050	-	-	-	113	695
Stage 1	-	-	-	-	568	-
Stage 2	-	-	-	-	320	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1020	-	-	-	106	656
Mov Cap-2 Maneuver	-	-	-	-	225	-
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	311	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	21.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1020	-	-	-	243
HCM Lane V/C Ratio	0.002	-	-	-	0.09
HCM Control Delay (s)	8.5	-	-	-	21.3
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	618	1254	253	284	147	192
v/c Ratio	0.57	0.39	0.37	0.44	0.20	0.13
Control Delay	26.5	4.8	25.9	10.1	19.6	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.5	4.8	25.9	10.1	19.6	9.4
Queue Length 50th (ft)	72	0	35	50	20	11
Queue Length 95th (ft)	#385	340	112	69	48	51
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	1078	3248	2469	1116	1784	1575
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.39	0.10	0.25	0.08	0.12

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

1: South Loop Road/Penumbra Place & Harbor Bay Parkway

07/30/2020

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	5	1238	61	395	429	210
v/c Ratio	0.01	0.76	0.48	0.24	0.72	0.77
Control Delay	12.0	18.8	31.2	11.3	22.8	36.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.0	18.8	31.2	11.3	22.8	36.4
Queue Length 50th (ft)	1	164	13	37	130	66
Queue Length 95th (ft)	7	301	#65	82	178	116
Internal Link Dist (ft)		1007		522	369	600
Turn Bay Length (ft)	125		115			
Base Capacity (vph)	501	1889	148	1876	1029	474
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.66	0.41	0.21	0.42	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1465	0	343	20	120	9
Future Vol, veh/h	0	1465	0	343	20	120	9
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	1787	0	418	24	146	11

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	472	0	1787	-	0	1384	281
Stage 1	-	-	-	-	-	460	-
Stage 2	-	-	-	-	-	924	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1086	-	102	-	-	~ 135	716
Stage 1	-	-	-	-	-	602	-
Stage 2	-	-	-	-	-	347	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1055	-	102	-	-	~ 127	676
Mov Cap-2 Maneuver	-	-	-	-	-	247	-
Stage 1	-	-	-	-	-	585	-
Stage 2	-	-	-	-	-	337	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	36.8
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1055	-	102	-	-	247	676
HCM Lane V/C Ratio	-	-	-	-	-	0.592	0.016
HCM Control Delay (s)	0	-	0	-	-	38.8	10.4
HCM Lane LOS	A	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0	-	0	-	-	3.4	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	1569	393	31	40	9
Future Vol, veh/h	11	1569	393	31	40	9
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	1913	479	38	49	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	547	0	-	0	1541	319
Stage 1	-	-	-	-	528	-
Stage 2	-	-	-	-	1013	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1018	-	-	-	106	677
Stage 1	-	-	-	-	556	-
Stage 2	-	-	-	-	312	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	989	-	-	-	99	639
Mov Cap-2 Maneuver	-	-	-	-	217	-
Stage 1	-	-	-	-	533	-
Stage 2	-	-	-	-	303	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	24.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	989	-	-	-	247
HCM Lane V/C Ratio	0.014	-	-	-	0.242
HCM Control Delay (s)	8.7	-	-	-	24.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.9

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	631	1270	272	284	147	207
v/c Ratio	0.59	0.39	0.40	0.44	0.20	0.14
Control Delay	26.8	4.8	26.1	10.0	19.7	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.8	4.8	26.1	10.0	19.7	9.4
Queue Length 50th (ft)	75	0	38	50	20	12
Queue Length 95th (ft)	#397	345	120	69	48	54
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	1072	3249	2457	1117	1778	1570
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.39	0.11	0.25	0.08	0.13

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues

1: South Loop Road/Penumbra Place & Harbor Bay Parkway

07/30/2020

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	11	438	411	1454	54	47
v/c Ratio	0.06	0.18	0.67	0.62	0.18	0.20
Control Delay	8.7	5.7	17.3	9.5	8.2	20.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.7	5.7	17.3	9.5	8.2	20.2
Queue Length 50th (ft)	1	17	53	89	1	13
Queue Length 95th (ft)	13	98	#392	444	23	35
Internal Link Dist (ft)		1007		522	369	600
Turn Bay Length (ft)	125		115			
Base Capacity (vph)	185	2484	639	2440	925	800
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.18	0.64	0.60	0.06	0.06

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	423	0	1611	72	34	1
Future Vol, veh/h	2	423	0	1611	72	34	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	475	0	1810	81	38	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1921	0	475	-	0	2153	1006
Stage 1	-	-	-	-	-	1881	-
Stage 2	-	-	-	-	-	272	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	304	-	718	-	-	41	239
Stage 1	-	-	-	-	-	106	-
Stage 2	-	-	-	-	-	749	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	295	-	718	-	-	~ 38	226
Mov Cap-2 Maneuver	-	-	-	-	-	88	-
Stage 1	-	-	-	-	-	102	-
Stage 2	-	-	-	-	-	727	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	72.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	295	-	718	-	-	88	226
HCM Lane V/C Ratio	0.008	-	-	-	-	0.434	0.005
HCM Control Delay (s)	17.3	-	0	-	-	74.2	21
HCM Lane LOS	C	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	1.8	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	456	1619	10	4	0
Future Vol, veh/h	1	456	1619	10	4	0
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	512	1819	11	4	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1860	0	-	0	2143	975
Stage 1	-	-	-	-	1855	-
Stage 2	-	-	-	-	288	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	321	-	-	-	42	251
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	735	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	312	-	-	-	39	237
Mov Cap-2 Maneuver	-	-	-	-	91	-
Stage 1	-	-	-	-	106	-
Stage 2	-	-	-	-	714	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	46.6
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	312	-	-	-	91
HCM Lane V/C Ratio	0.004	-	-	-	0.049
HCM Control Delay (s)	16.6	-	-	-	46.6
HCM Lane LOS	C	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	198	325	1252	82	234	608
v/c Ratio	0.50	0.10	0.82	0.07	0.24	0.57
Control Delay	48.2	2.9	32.7	0.8	25.6	22.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.2	2.9	32.7	0.8	25.6	22.8
Queue Length 50th (ft)	53	0	287	0	53	136
Queue Length 95th (ft)	133	78	#927	9	85	172
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	665	3292	1524	1220	1212	1282
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.10	0.82	0.07	0.19	0.47

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues

1: South Loop Road/Penumbra Place & Harbor Bay Parkway

07/30/2020

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	11	448	411	1468	54	47
v/c Ratio	0.06	0.19	0.67	0.62	0.18	0.20
Control Delay	8.8	5.7	17.4	9.6	8.2	20.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	5.7	17.4	9.6	8.2	20.2
Queue Length 50th (ft)	1	18	53	91	1	13
Queue Length 95th (ft)	13	100	#395	452	23	35
Internal Link Dist (ft)		1007		522	369	600
Turn Bay Length (ft)	125		115			
Base Capacity (vph)	178	2451	624	2405	912	789
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.18	0.66	0.61	0.06	0.06

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	2	432	0	1623	72	34	1
Future Vol, veh/h	2	432	0	1623	72	34	1
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	2	485	0	1824	81	38	1

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	1935	0	485	-	0	2172	1013
Stage 1	-	-	-	-	-	1895	-
Stage 2	-	-	-	-	-	277	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	300	-	708	-	-	40	237
Stage 1	-	-	-	-	-	104	-
Stage 2	-	-	-	-	-	745	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	291	-	708	-	-	~ 37	224
Mov Cap-2 Maneuver	-	-	-	-	-	86	-
Stage 1	-	-	-	-	-	100	-
Stage 2	-	-	-	-	-	723	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	75.1
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	291	-	708	-	-	86	224
HCM Lane V/C Ratio	0.008	-	-	-	-	0.444	0.005
HCM Control Delay (s)	17.5	-	0	-	-	76.7	21.2
HCM Lane LOS	C	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0	-	0	-	-	1.8	0

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	456	1619	40	46	12
Future Vol, veh/h	10	456	1619	40	46	12
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	512	1819	45	52	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1894	0	-	0	2180	992
Stage 1	-	-	-	-	1872	-
Stage 2	-	-	-	-	308	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	311	-	-	-	~ 39	244
Stage 1	-	-	-	-	107	-
Stage 2	-	-	-	-	719	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	302	-	-	-	~ 35	230
Mov Cap-2 Maneuver	-	-	-	-	86	-
Stage 1	-	-	-	-	100	-
Stage 2	-	-	-	-	698	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	93.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	302	-	-	-	99
HCM Lane V/C Ratio	0.037	-	-	-	0.658
HCM Control Delay (s)	17.4	-	-	-	93.6
HCM Lane LOS	C	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	3.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	218	352	1271	82	234	622
v/c Ratio	0.54	0.11	0.84	0.07	0.24	0.57
Control Delay	48.9	2.9	33.9	0.8	25.7	23.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.9	2.9	33.9	0.8	25.7	23.0
Queue Length 50th (ft)	59	0	300	0	54	140
Queue Length 95th (ft)	144	84	#946	9	85	178
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	660	3292	1512	1212	1204	1279
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.11	0.84	0.07	0.19	0.49

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

1: South Loop Road/Penumbra Place & Harbor Bay Parkway

07/30/2020

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	5	1354	68	427	475	273
v/c Ratio	0.01	0.88	0.62	0.28	0.71	0.93
Control Delay	14.0	28.3	47.7	14.1	21.7	58.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	28.3	47.7	14.1	21.7	58.0
Queue Length 50th (ft)	1	288	23	62	152	102
Queue Length 95th (ft)	7	#354	#79	88	205	#200
Internal Link Dist (ft)		1007		522	369	600
Turn Bay Length (ft)	125		115			
Base Capacity (vph)	395	1583	114	1573	862	379
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.86	0.60	0.27	0.55	0.72

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1643	0	371	22	99	10
Future Vol, veh/h	0	1643	0	371	22	99	10
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	2004	0	452	27	121	12

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	509	0	2004	-	0	1528	300
Stage 1	-	-	-	-	-	496	-
Stage 2	-	-	-	-	-	1032	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1052	-	74	-	-	~ 108	696
Stage 1	-	-	-	-	-	577	-
Stage 2	-	-	-	-	-	304	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1022	-	74	-	-	~ 102	657
Mov Cap-2 Maneuver	-	-	-	-	-	217	-
Stage 1	-	-	-	-	-	560	-
Stage 2	-	-	-	-	-	295	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	37.8
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1022	-	74	-	-	217	657
HCM Lane V/C Ratio	-	-	-	-	-	0.556	0.019
HCM Control Delay (s)	0	-	0	-	-	40.6	10.6
HCM Lane LOS	A	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0	-	0	-	-	3	0.1

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

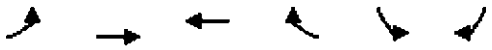
Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	1734	434	2	18	2
Future Vol, veh/h	2	1734	434	2	18	2
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	2115	529	2	22	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	561	0	-	0	1652	326
Stage 1	-	-	-	-	560	-
Stage 2	-	-	-	-	1092	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	1006	-	-	-	89	670
Stage 1	-	-	-	-	535	-
Stage 2	-	-	-	-	283	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	977	-	-	-	84	632
Mov Cap-2 Maneuver	-	-	-	-	198	-
Stage 1	-	-	-	-	518	-
Stage 2	-	-	-	-	275	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	24.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	977	-	-	-	213
HCM Lane V/C Ratio	0.002	-	-	-	0.115
HCM Control Delay (s)	8.7	-	-	-	24.1
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.4



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	683	1386	280	314	163	212
v/c Ratio	0.64	0.43	0.41	0.48	0.22	0.14
Control Delay	27.7	5.1	26.4	10.6	19.7	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.7	5.1	26.4	10.6	19.7	9.4
Queue Length 50th (ft)	84	0	40	57	22	12
Queue Length 95th (ft)	#446	392	124	77	53	55
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	1065	3251	2441	1115	1772	1568
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.43	0.11	0.28	0.09	0.14

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

1: South Loop Road/Penumbra Place & Harbor Bay Parkway

07/30/2020

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	5	1365	68	436	475	273
v/c Ratio	0.01	0.88	0.62	0.28	0.71	0.94
Control Delay	14.0	28.4	48.8	14.1	22.0	60.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	28.4	48.8	14.1	22.0	60.3
Queue Length 50th (ft)	1	293	23	64	152	103
Queue Length 95th (ft)	7	#364	#80	90	205	#201
Internal Link Dist (ft)		1007		522	369	600
Turn Bay Length (ft)	125		115			
Base Capacity (vph)	387	1571	111	1561	854	374
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.87	0.61	0.28	0.56	0.73

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBU	WBT	WBR	SBL	SBR
Lane Configurations							
Traffic Vol, veh/h	0	1652	0	378	22	99	10
Future Vol, veh/h	0	1652	0	378	22	99	10
Conflicting Peds, #/hr	30	0	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	None
Storage Length	100	-	100	-	-	0	25
Veh in Median Storage, #	-	0	-	0	-	1	-
Grade, %	-	0	-	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	2015	0	461	27	121	12

Major/Minor	Major1		Major2			Minor2	
Conflicting Flow All	518	0	2015	-	0	1543	304
Stage 1	-	-	-	-	-	505	-
Stage 2	-	-	-	-	-	1038	-
Critical Hdwy	4.14	-	6.44	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	2.52	-	-	3.52	3.32
Pot Cap-1 Maneuver	1044	-	72	-	-	~ 106	692
Stage 1	-	-	-	-	-	571	-
Stage 2	-	-	-	-	-	302	-
Platoon blocked, %		-		-	-		
Mov Cap-1 Maneuver	1014	-	72	-	-	~ 100	653
Mov Cap-2 Maneuver	-	-	-	-	-	215	-
Stage 1	-	-	-	-	-	554	-
Stage 2	-	-	-	-	-	293	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	38.5
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBU	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1014	-	72	-	-	215	653
HCM Lane V/C Ratio	-	-	-	-	-	0.562	0.019
HCM Control Delay (s)	0	-	0	-	-	41.3	10.6
HCM Lane LOS	A	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0	-	0	-	-	3.1	0.1

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	1734	434	31	42	9
Future Vol, veh/h	11	1734	434	31	42	9
Conflicting Peds, #/hr	30	0	0	30	30	30
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	95	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	1	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	2115	529	38	51	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	597	0	-	0	1692	344
Stage 1	-	-	-	-	578	-
Stage 2	-	-	-	-	1114	-
Critical Hdwy	4.14	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	976	-	-	-	84	652
Stage 1	-	-	-	-	524	-
Stage 2	-	-	-	-	276	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	948	-	-	-	78	615
Mov Cap-2 Maneuver	-	-	-	-	191	-
Stage 1	-	-	-	-	501	-
Stage 2	-	-	-	-	268	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	28.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	948	-	-	-	217
HCM Lane V/C Ratio	0.014	-	-	-	0.287
HCM Control Delay (s)	8.9	-	-	-	28.1
HCM Lane LOS	A	-	-	-	D
HCM 95th %tile Q(veh)	0	-	-	-	1.1

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	696	1401	299	314	163	228
v/c Ratio	0.66	0.43	0.43	0.48	0.21	0.15
Control Delay	28.3	5.1	26.7	10.4	19.7	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.3	5.1	26.7	10.4	19.7	9.4
Queue Length 50th (ft)	90	0	44	57	23	14
Queue Length 95th (ft)	#459	397	133	77	53	59
Internal Link Dist (ft)		392	998			
Turn Bay Length (ft)	200			140	190	
Base Capacity (vph)	1055	3252	2417	1112	1758	1566
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.43	0.12	0.28	0.09	0.15

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Appendix 8 Signal Warrants

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Existing Plus Project Conditions – Weekday AM Peak Hour**
Intersection: **C Street & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☐ NO ☒

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

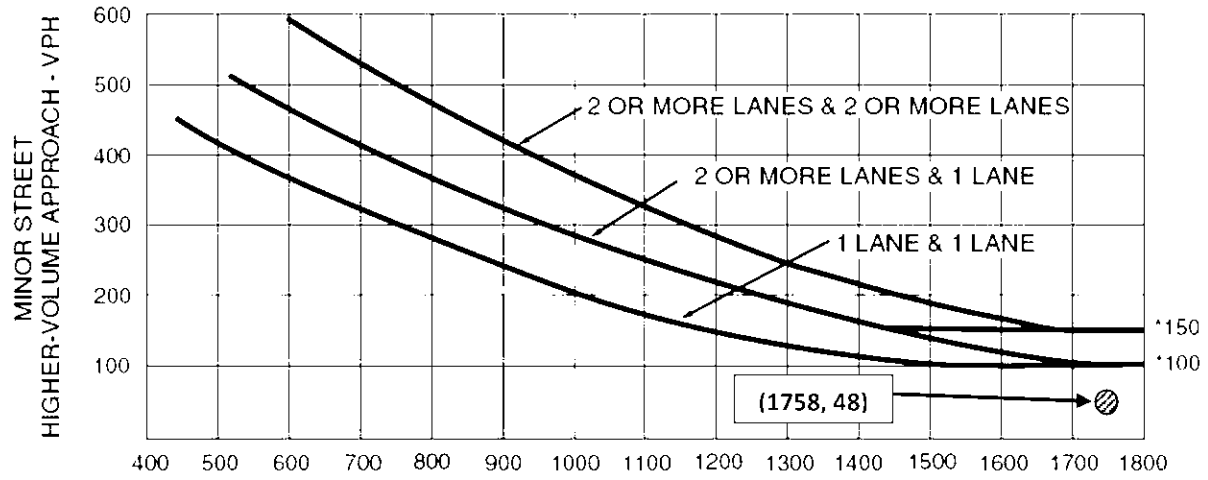
1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (0.66 hours ; one lane) YES ☐ NO ☒
2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (48 vph ; one lane) YES ☐ NO ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (1806 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	1758
Highest Approaches – Minor Street	1	48

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Existing Plus Project Conditions – Weekday PM Peak Hour**
Intersection: **C Street & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☒ NO ☐

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

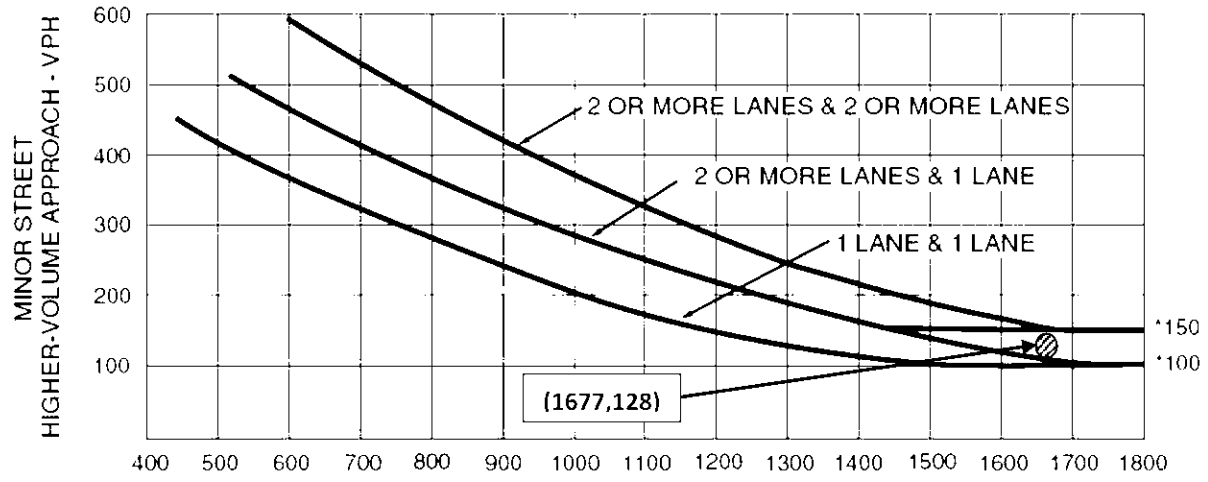
1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (1.09 hours ; one lane) YES ☐ NO ☒
2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (128 vph ; one lane) YES ☒ NO ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (1805 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☒ NO ☐

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	1677
Highest Approaches – Minor Street	1	128

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Baseline Plus Project Conditions – Weekday AM Peak Hour**
Intersection: **C Street & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☐ NO ☒

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

4. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (0.91 hours ; one lane) YES ☐ NO ☒

5. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (49 vph ; one lane) YES ☐ NO ☒

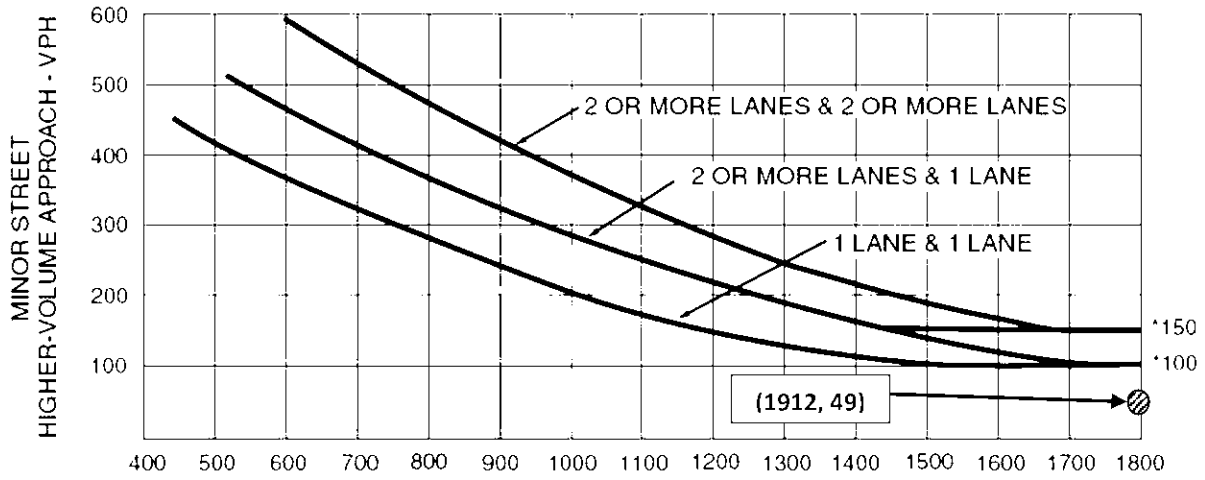
6. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (1912 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	1912
Highest Approaches – Minor Street	1	49

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Baseline Plus Project Conditions – Weekday PM Peak Hour**
Intersection: **C Street & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☒ NO ☐

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

4. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (1.32 hours ; one lane) YES ☐ NO ☒

5. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (129 vph ; one lane) YES ☒ NO ☐

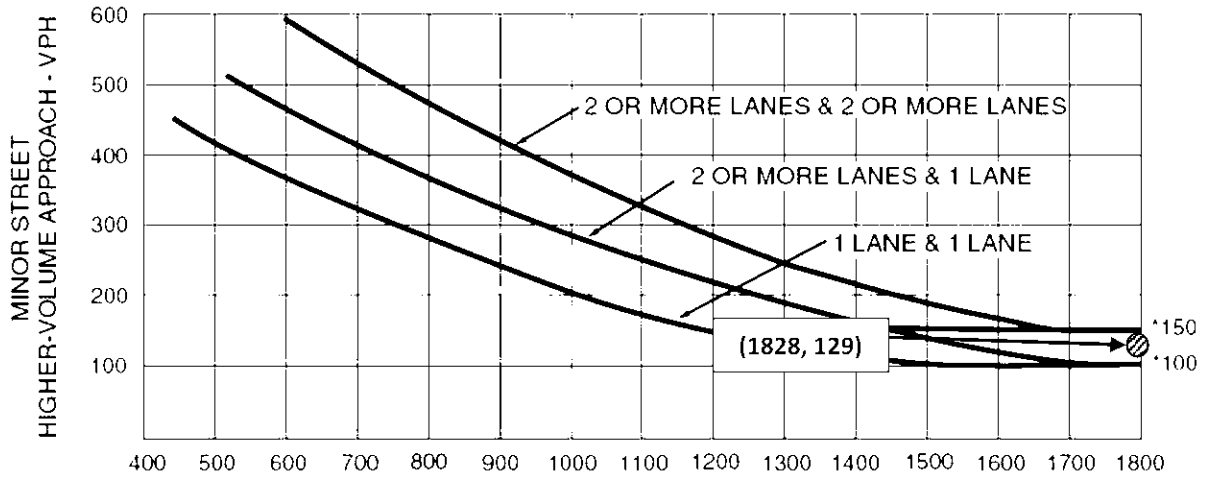
6. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (1828 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☒ NO ☐

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	1828
Highest Approaches – Minor Street	1	129

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Cumulative Plus Project Conditions – Weekday AM Peak Hour**
Intersection: **C Street & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☐ NO ☒

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

7. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (0.73 hours ; one lane) YES ☐ NO ☒

8. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (35 vph ; one lane) YES ☐ NO ☒

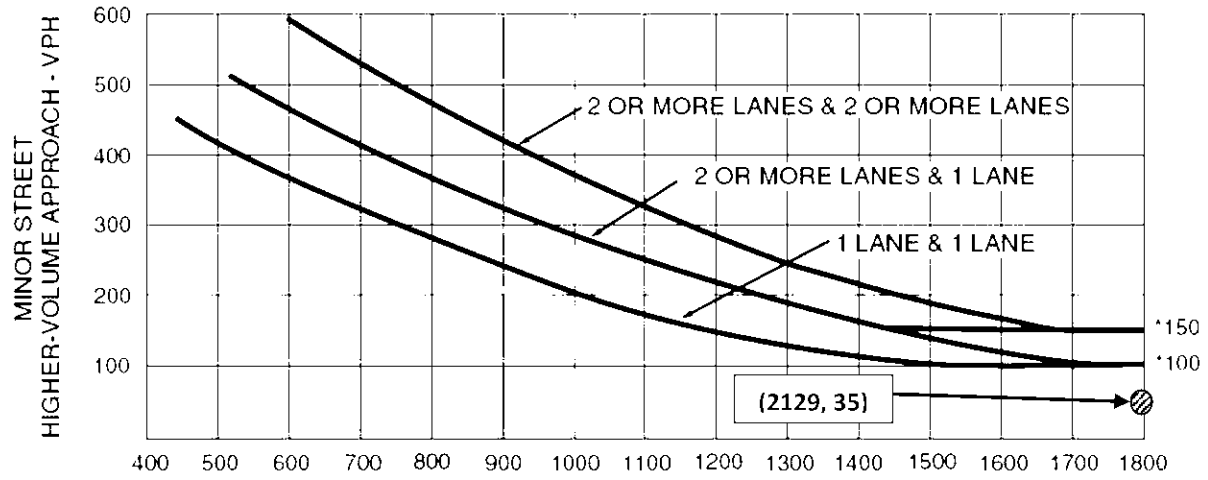
9. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (2129 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	2129
Highest Approaches – Minor Street	1	35

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Cumulative Plus Project Conditions – Weekday PM Peak Hour**
Intersection: **C Street & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☒ NO ☐

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

7. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (1.17 hours ; one lane) YES ☐ NO ☒

8. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (109 vph ; one lane) YES ☒ NO ☐

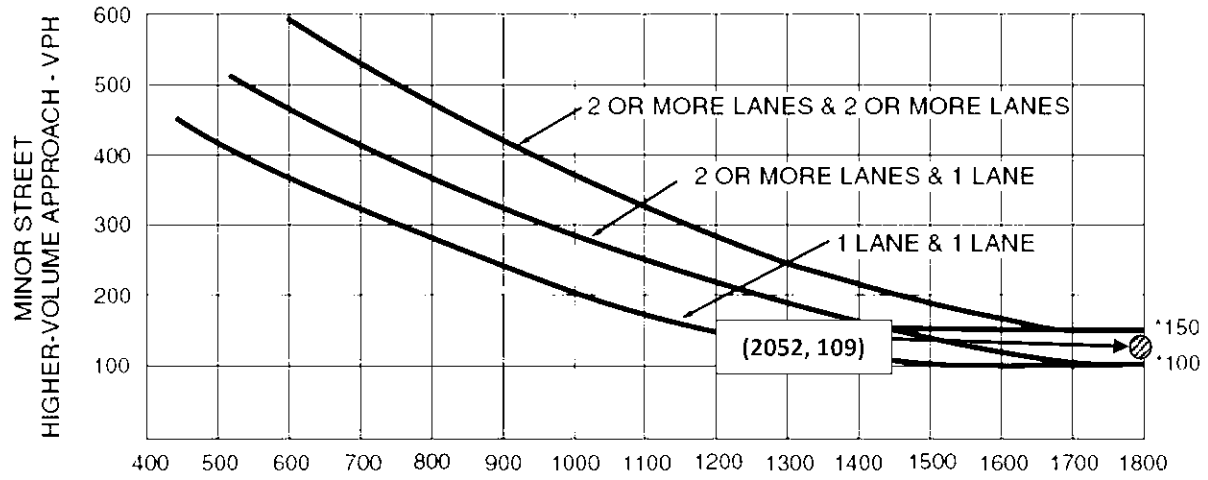
9. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (2052 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☒ NO ☐

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	2052
Highest Approaches – Minor Street	1	109

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Existing Plus Project Conditions – Weekday AM Peak Hour**
Intersection: **Project Driveway & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☐ NO ☒

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

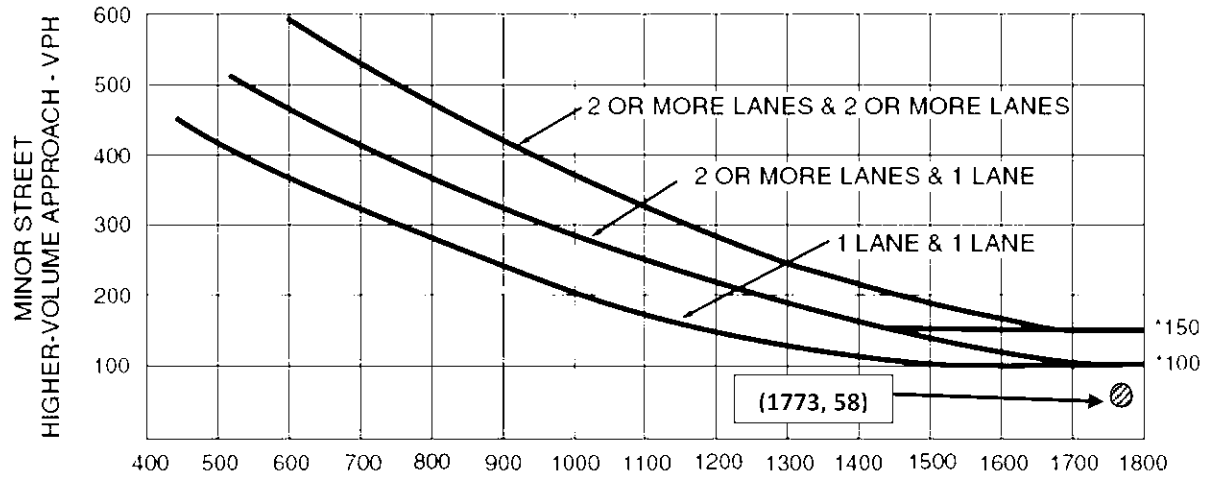
1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (0.78 hours ; one lane) YES ☐ NO ☒
2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (58 vph ; one lane) YES ☐ NO ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (1831 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	1773
Highest Approaches – Minor Street	1	58

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Existing Plus Project Conditions – Weekday PM Peak Hour**
Intersection: **Project Driveway & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☐ NO ☒

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

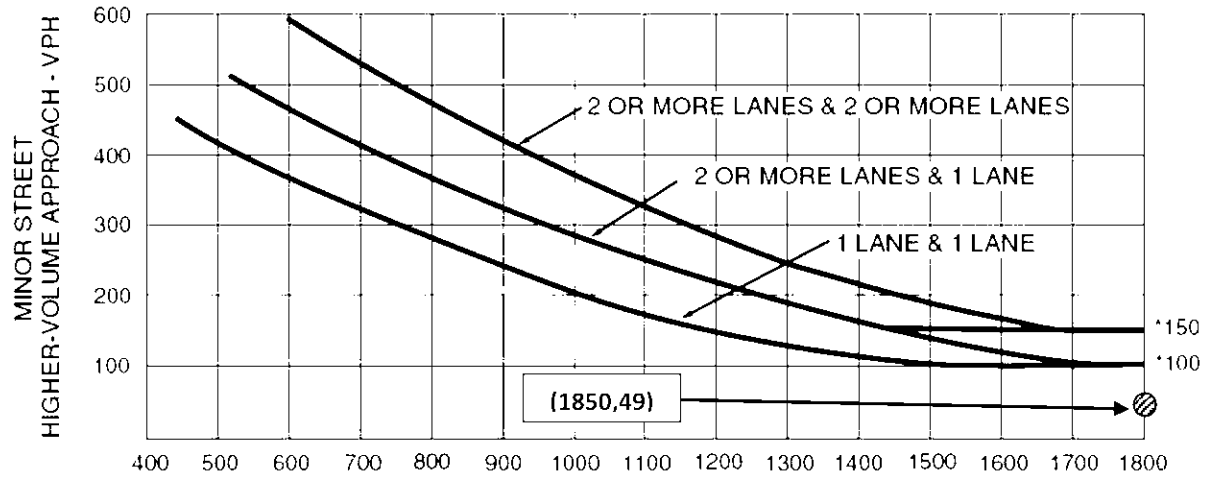
1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (0.30 hours ; one lane) YES ☐ NO ☒
2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (49 vph ; one lane) YES ☐ NO ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (1850 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	1850
Highest Approaches – Minor Street	1	49

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Baseline Plus Project Conditions – Weekday AM Peak Hour**
Intersection: **Project Driveway & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☐ NO ☒

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

4. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (1.03 hours ; one lane) YES ☐ NO ☒

5. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (58 vph ; one lane) YES ☐ NO ☒

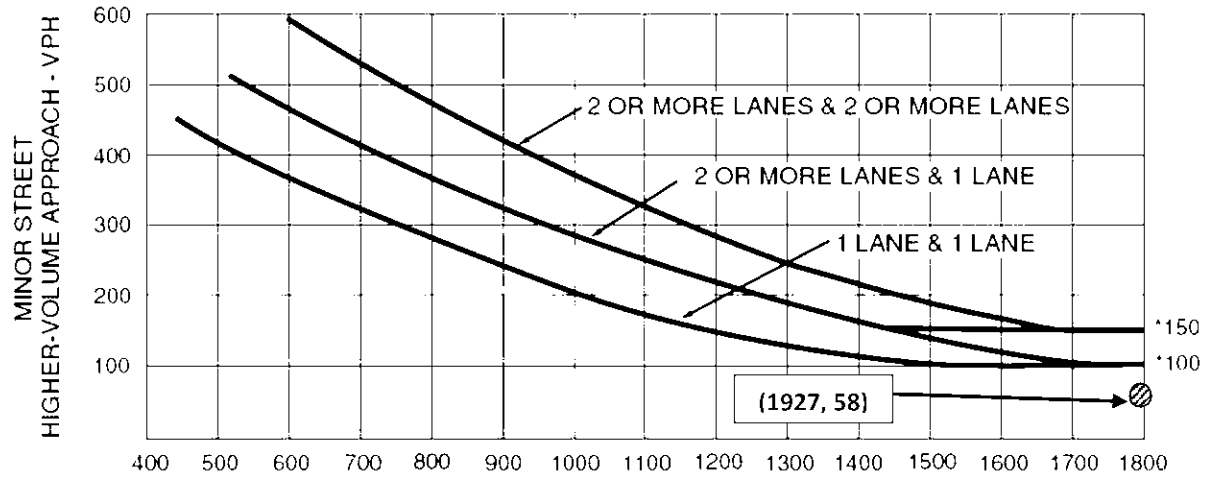
6. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (1927 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	1927
Highest Approaches – Minor Street	1	58

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Baseline Plus Project Conditions – Weekday PM Peak Hour**
Intersection: **Project Driveway & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☐ NO ☒

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

4. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (0.33 hours ; one lane) YES ☐ NO ☒

5. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (49 vph ; one lane) YES ☐ NO ☒

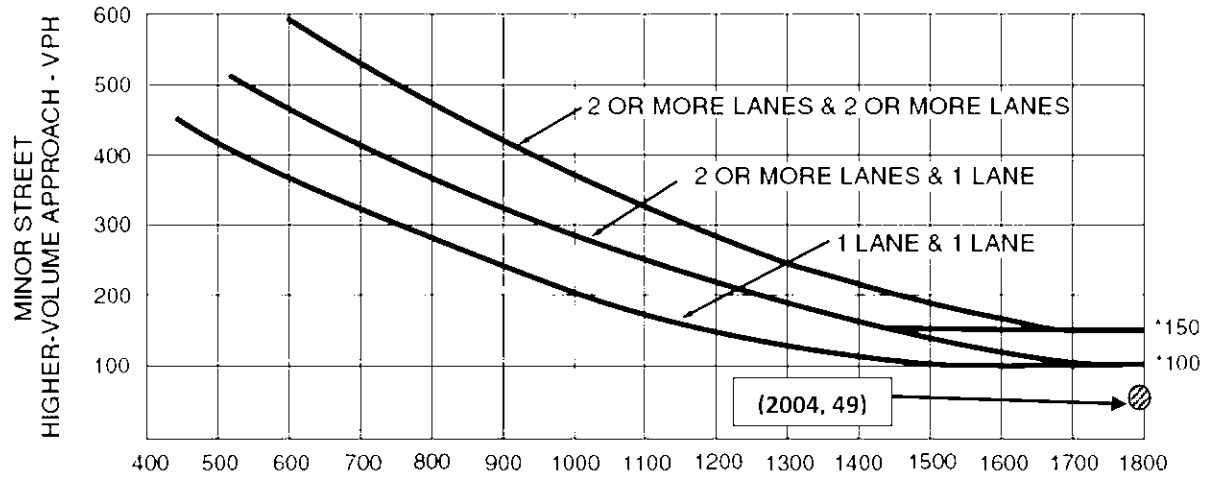
6. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (2053 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	2004
Highest Approaches – Minor Street	1	49

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Cumulative Plus Project Conditions – Weekday AM Peak Hour**
Intersection: **Project Driveway & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☐ NO ☒

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

7. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (1.51 hours ; one lane) YES ☐ NO ☒

8. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (58 vph ; one lane) YES ☐ NO ☒

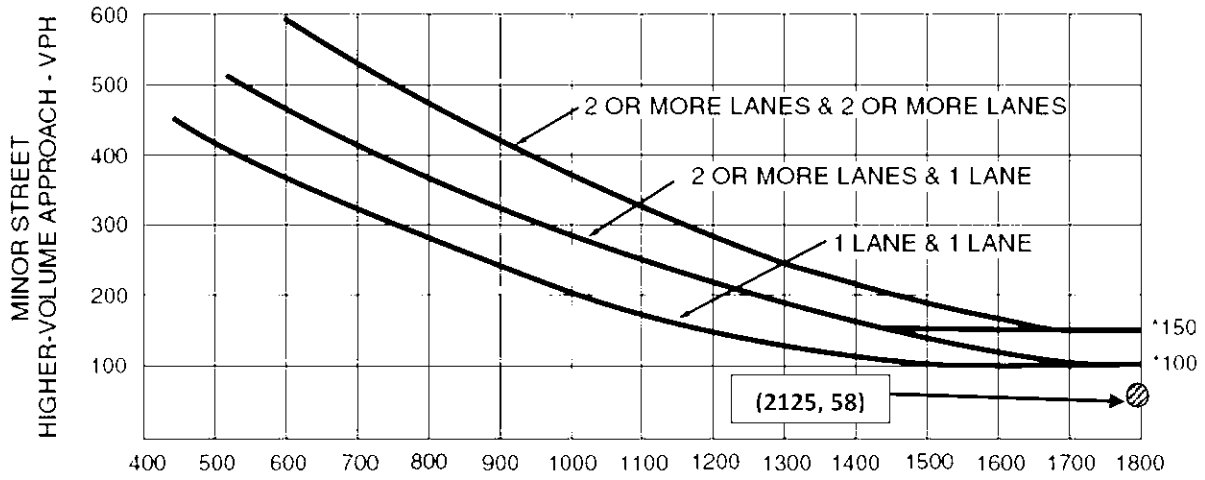
9. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (2183 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	2125
Highest Approaches – Minor Street	1	58

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Traffic Signal Warrants Worksheet

MUTCD Warrant 3: Peak Hour

Scenario: **Cumulative Plus Project Conditions – Weekday PM Peak Hour**
Intersection: **Project Driveway & Harbor Bay Parkway**

PART A or PART B SATISFIED YES ☐ NO ☒

PART A SATISFIED YES ☐ NO ☒
(All parts 1, 2, and 3 below must be satisfied)

7. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND — (0.40 hours ; one lane) YES ☐ NO ☒

8. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND — (51 vph ; one lane) YES ☐ NO ☒

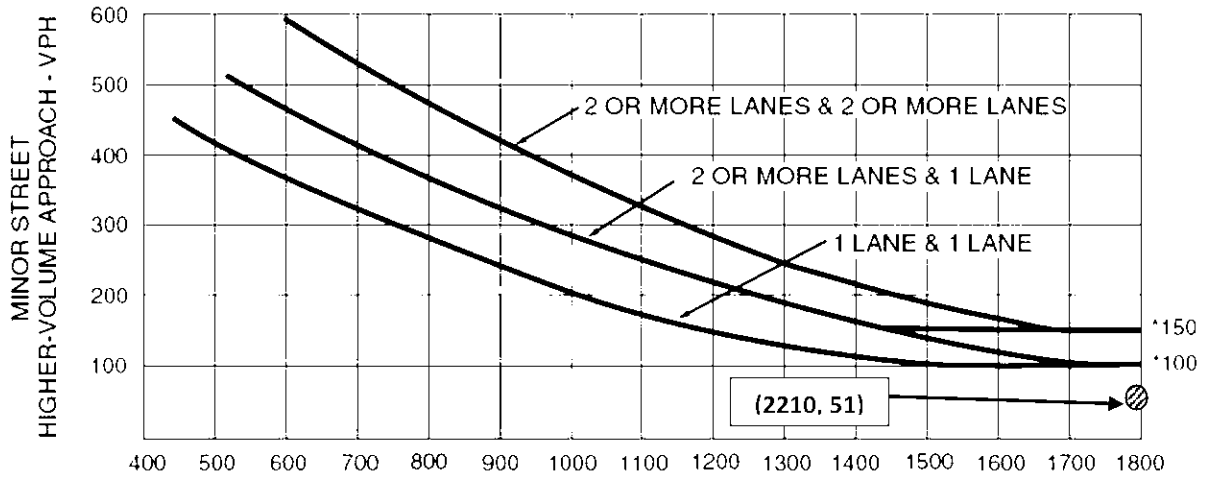
9. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches. — (2261 vph ; 3 approach) YES ☒ NO ☐

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	Lanes	VPH
Both Approaches – Major Street	1	2210
Highest Approaches – Minor Street	1	51

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3.

Figure 4C-3.Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Appendix 9 Traffic Volume Increase Due to Project at Study Intersections

Total Vehicle Volume Entering the Intersection

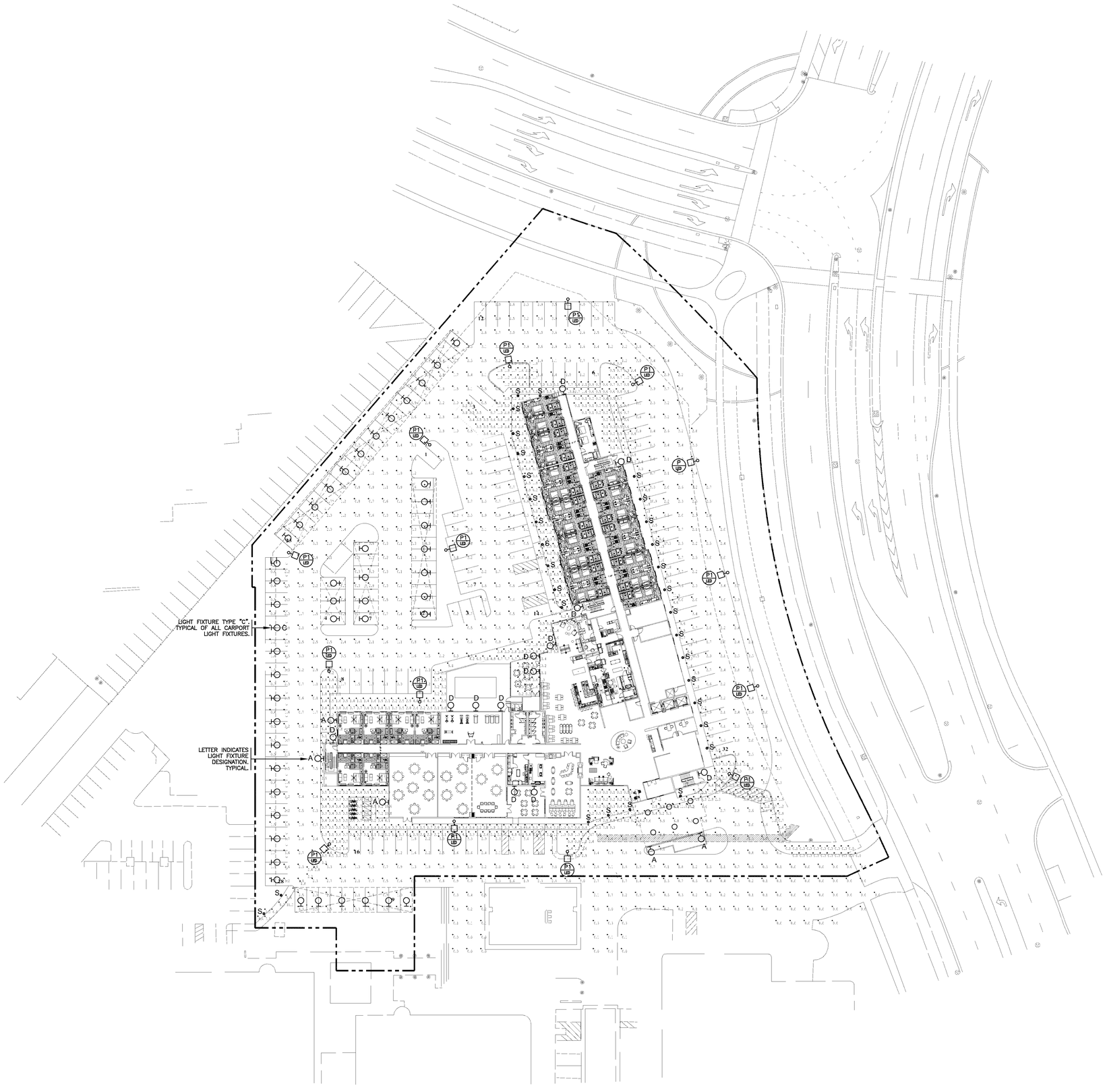
AM Peak Hour

	Intersection	Existing Conditions			Baseline Conditions			Cumulative Conditions		
		No Project	Project	% Increase	No Project	Project	% Increase	No Project	Project	% Increase
1	Penumbra Place & Harbor Bay Parkway	1,775	1,796	1.2%	1,929	1,950	1.1%	2,150	2,171	1.0%
2	C Street & Harbor Bay Parkway	1,785	1,806	1.2%	1,940	1,961	1.1%	2,143	2,164	1.0%
3	Project Entrance & Harbor Bay Parkway	1,738	1,831	5.4%	1,892	1,985	4.9%	2,090	2,183	4.4%
4	Ron Cowan Parkway & Harbor Bay Parkway	2,013	2,085	3.6%	2,173	2,245	3.3%	2,401	2,473	3.0%

PM Peak Hour

	Intersection	Existing Conditions			Baseline Conditions			Cumulative Conditions		
		No Project	Project	% Increase	No Project	Project	% Increase	No Project	Project	% Increase
1	Penumbra Place & Harbor Bay Parkway	1,702	1,718	0.9%	1,853	1,869	0.9%	2,079	2,095	0.8%
2	C Street & Harbor Bay Parkway	1,788	1,804	0.9%	1,941	1,957	0.8%	2,145	2,161	0.7%
3	Project Entrance & Harbor Bay Parkway	1,830	1,899	3.8%	1,984	2,053	3.5%	2,192	2,261	3.1%
4	Ron Cowan Parkway & Harbor Bay Parkway	2,121	2,174	2.5%	2,281	2,334	2.3%	2,521	2,574	2.1%

Appendix 10 Photometric Analysis



K12 SITE LIGHTING PHOTOMETRICS PLAN
SCALE: 1" = 30'-0"

PROJECT NORTH ACTUAL NORTH

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PROJECT # 2019.365

REGISTERED PROFESSIONAL ENGINEER No. 012571 Exp. 9-30-21 ELECTRICAL STATE OF CALIFORNIA

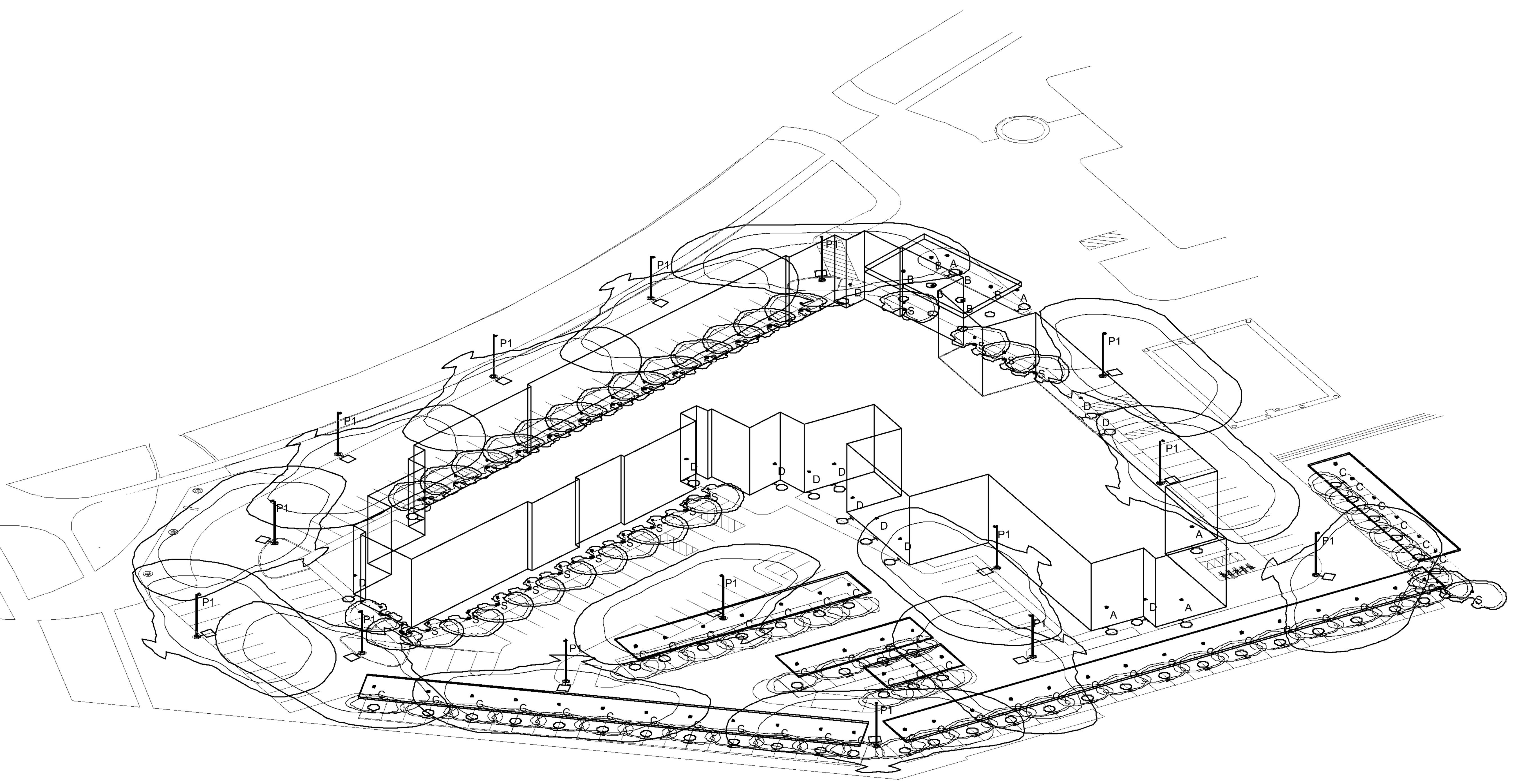
Client
HARBOR BAY HOTEL

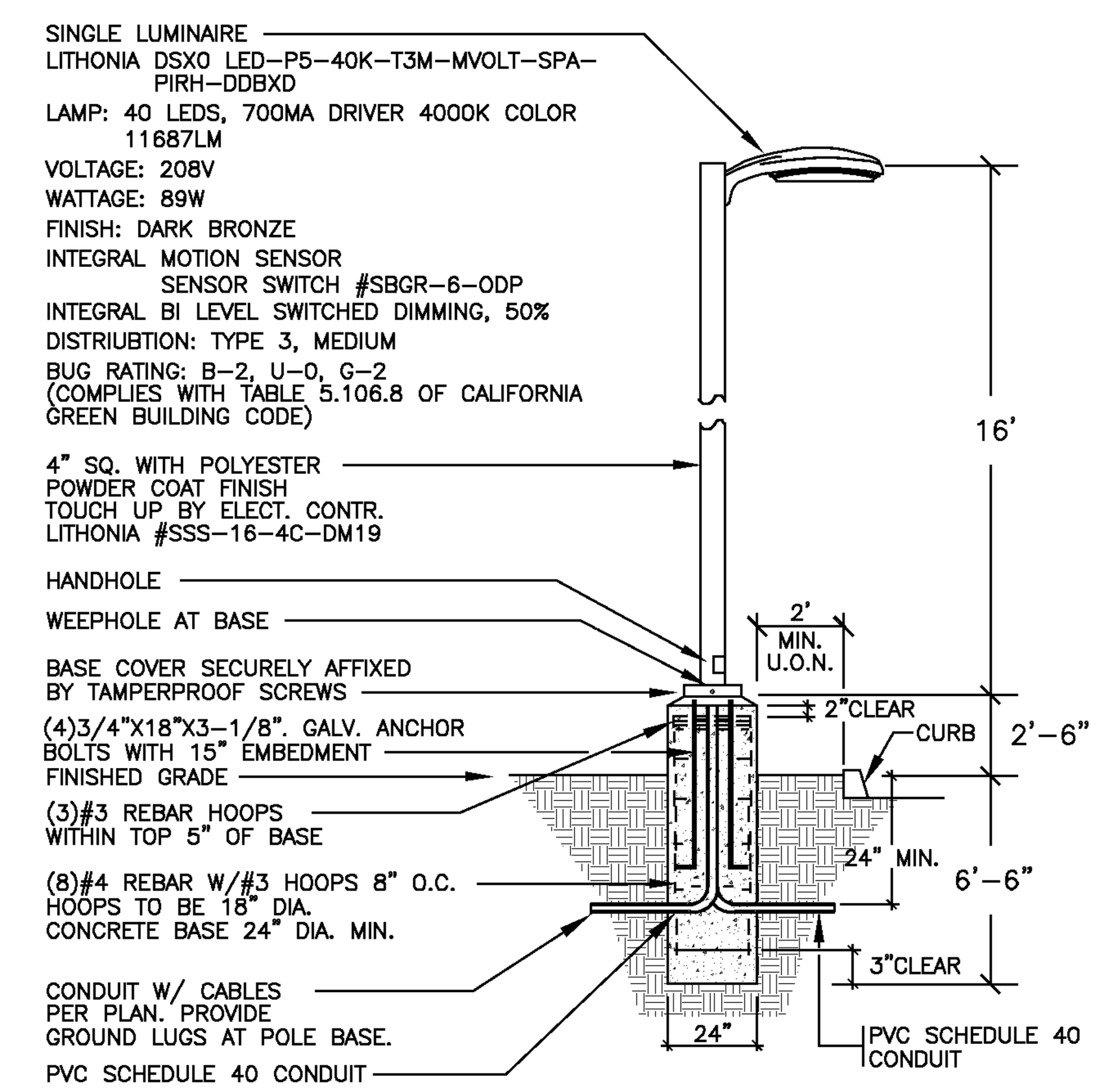
HILTON GARDEN INN AND HOMEWOOD SUITES
ALAMEDA, CA
SITE LIGHTING PHOTOMETRICS PLAN

NO.	REVISION	DATE

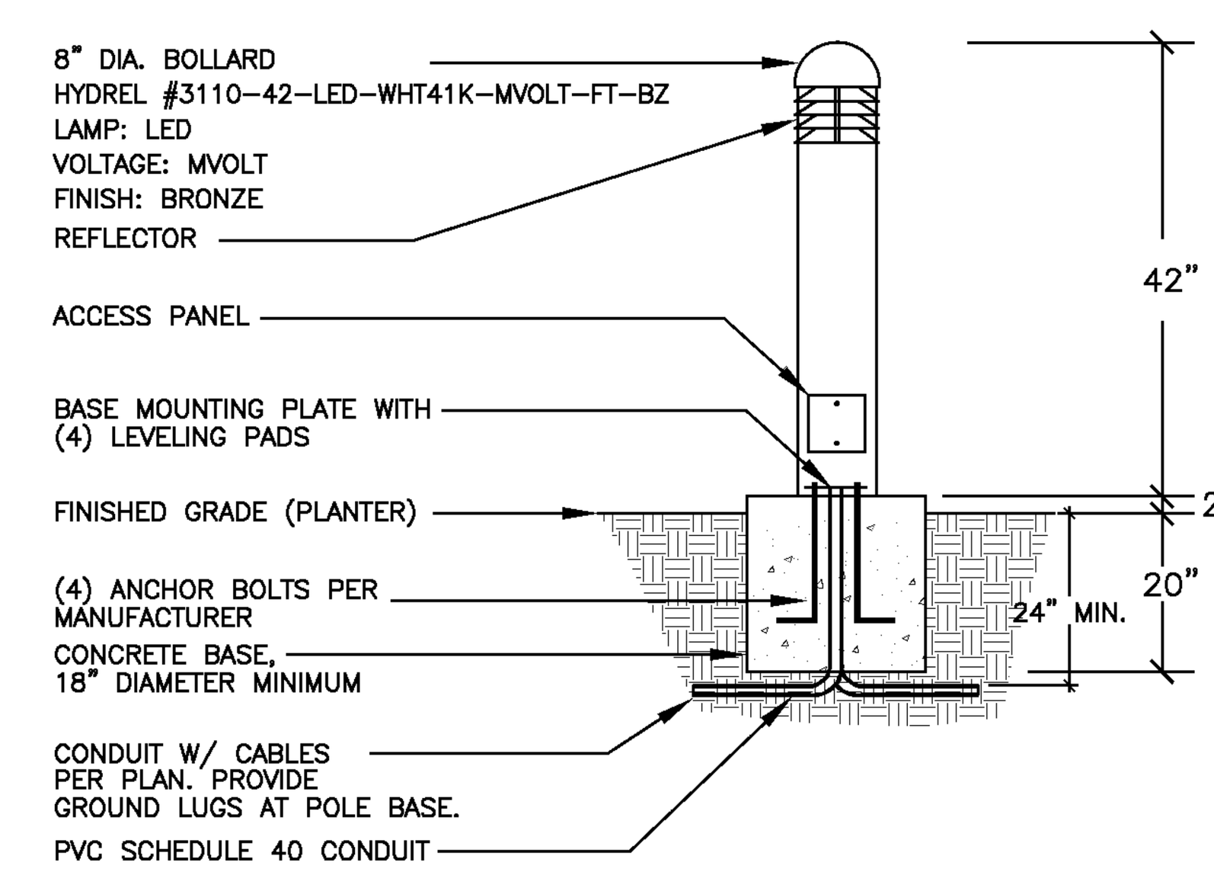
Project A16051
Date 11/25/2019
Sheet **E1.1**

LIGHT FIXTURE SCHEDULE					
TYPE	DESCRIPTION	MANUFACTURER'S NO.	MTG. HGT.	VOLTAGE	WATTAGE
A	17"Wx10-3/16"Dx9-1/2"H WALL MOUNT LED LIGHT FIXTURE. WET LABEL.	LITHONIA #WSTLED-P2-40K-VF-MVOLT-	+9'-0" TO BOTTOM OF LIGHT	120	25
B	13"Wx5"D CEILING MOUNT LED LIGHT FIXTURE. WET LABEL.	LUMINAIRE #APX13HO-4000K-120/277V	+12'-0" TO BOTTOM OF LIGHT	120	50
C	11-5/8"Wx7-7/8"Dx7-1/2"H, FRAME-MOUNT SURFACE LED LIGHT FIXTURE. WET LABEL.	TERON #DR-L12.3-120V-BZ-40K	+9'-0" TO BOTTOM OF LIGHT	120	12.3
D	11-3/8"Wx7-3/4"Dx6-1/4"H WALL MOUNT LED LIGHT FIXTURE. WET LABEL.	TERON #CDM-L12.0-LT350-120/277V	+9'-0" TO BOTTOM OF LIGHT	120	12
P1	SEE DETAIL FOR DESCRIPTION.			208	89
S	SEE DETAIL FOR DESCRIPTION.			120	60.3


North West View



PARKING LOT LIGHTING LUMINAIRE "P1" (A / E1.2)



LIGHTING BOLLARD TYPE "S" (B / E1.2)

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HILTON GARDEN INN AND HOMEWOOD SUITES
ALAMEDA, CA

SITE LIGHTING DETAILS

NO.	REVISION	DATE

Project A16051
Date 11/25/2019
Sheet E1.2